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ISTEC 2019

ISSN: 2146-7382

INTERNATIONAL SCIENCE AND TECHNOLOGY CONFERENCE

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ISTEC conferences are now well-known international academic events and the number of paper submissions and attendees are increasing every year. This year our conferences have received more than 200 applications. The Conference Academic Advisory Board has accepted approximately 100 papers to be presented at ISTEC 2019 Europe & America.

We would like to thank Prof. Dr.Fatih SAVAŞAN, Rector of Sakarya University, Prof. Dr. Nuri AYDIN, Rector of Istanbul University- Cerrahpasa and the President of the Association of Quality in Higher Education Prof. Dr. Muzaffer ELMAS, for their support of organizing these conferences.

We also would like to thank our distinguished guests, keynote speakers for their collaborations and contributions for the success of these conferences.

And finally, we would like to thank to all of our participants who have presented their academic works in ISTEC 2019. Without your participation, ISTEC 2019 would, of course, have been impossible. We would like to sincerely thank all of you for coming, presenting, and joining in the academic activities.

We would also like to thank all of those who have contributed to the reviewing process of ISTEC 2019 conference papers, which will be also published in TOJSAT.

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Hamza Osman ILHAN

hoilhan@yildiz.edu.tr

Abstract:

In the proposed system, an embedded design has been realized that will allow the projection device to be accessed by multiple users wirelessly. In the classroom environment, not only the teachers but also the students can use his / her own computer or tablet to connect to the projection device by wireless access and make presentations remotely. Teacher coordinates the permissions for certain student access by using his own computer or tablet. The proposed system also broadcast the current presentation as a live streaming protocol to have another person's presentation on his / her computer or tablet screen as well. System provides all these functionalities on a UNIX based special internal operating system that supports many file formats. This system can increase the productivity and attendance in the courses remarkably. This is a novel approach in the innovative education era for both students and tutors. It’s simple, less costly, and can be utilized in every classes easily.

A STUDY ON ECONOMIC ANALYSIS OF IAMS IMPLEMENTATION IN SMALL AND MEDIUM-SIZED INJECTION MANUFACTURER

Minje Shin*, Seungbeom Son**, Chaesoo Kim***

*Seung-san Industry LTD., Accounting Department, Kyungbuk, Korea
**SDS LTD., Songjeongdong, Busan, Korea
***Dong-A University, Department of Industrial Engineering, Busan, Korea

cskim@dau.ac.kr (corresponding author)

Abstract: This The technical effect is important when introducing IAMS(Indoor Atmosphere Monitoring System), but it is also very important to evaluate the effect on investment. In order to evaluate the economic efficiency, it is necessary to measure the benefits and costs accurately and utilize the criteria such as benefit and cost ratio, net present value, and internal rate of return. In this study, we analyzed performance data based on key performance index (KPI), which is widely used in injection molding companies, for the economic evaluation of IAMS at company A, Quantitative data such as the work day of the company and the status of bad PPM were analyzed and unconfirmed data was deduced by using regression analysis. In addition, the interpretation of economic evaluation results is also presented considering the characteristics of injection molding companies.

Keywords: Indoor Atmosphere Monitoring System, Economic Evaluation, Key Performance Index

Acknowledgement
This paper was supported by Dong-A University Research Park (DAURP) of Busan Metropolitan City.

ABOVE SEMIOLOGY COMPARING AND CONTRASTING THE REFLECTIONS OF HOLLYWOOD ACTORS AND ACTRESSES ON YEŞİLÇAM ACTORS AND ACTRESSES IN THE 1950-1970 PERIOD

Nevin ALGÜL

Marmara University, Department of Communication, İstanbul-Türkiye

nevinalgul@marmara.edu.tr

Abstract: The aim of this article is to explain the effects of Hollywood actors and actresses on the structuring of Turkish cinema Yeşilçam period actors and actresses by using the data of semiotics. It covers the tone, body language and all visual elements. Such as Clark Gable look and his moustache, Kim Novak's posture, hair and his gaze at the camera.

Keywords: Semiotics, Clark Gable Look, Kim Novak, Moustache of Clark Gabel, Body Language,

Introduction

The Western world met the ideology of capitalism after the 18th century enlightenment. The environment of the 18th century Enlightenment which valued to human and put it into the center and put emphasis on humanitarian values must not have satisfied the playmakers who wanted to make money without putting too much effort that, the foundation of the ideology of capitalism was formed. The answer to the question what were the reflections of the determinations in the nature saying "whoever fits he survives, natural selection" on the social life may be also the proliferation and deepening of capitalization. If the strong defeats and eats the weak in nature, and if it is only those who keep up with this system will have the chance to survive, then it is also the case for the human being. This is the law of jungle. In the current system, the one who can remain standing will survive. Yet we, as 'animals which can think and talk', could have also preferred to protect the weak, powerless, child, and old and also protect the animals that need help within the framework of all those universal human rights, push them up, save them and aggrandize them, this is a philosophy that has been existed in the Anatolian land at the same time, however, then, the others would not exist and it would not be possible to earn lots of money. The cinema industry is considered as a cruel world that has been established on such a system and which is prioritizing capital. The cinema industry is being considered as a cruel world that has been established on such a system and that is putting the money in the center and thinking about the capital in the first plan. This may have been the case, particularly for women. Because it is Hollywood that is being talked about, some differences have occurred between the American and the European cinemas starting from the first quarter of the 20th century. While American cinema focused on profitability as the main starting point, the Europeans have continued to improve the art of cinema in a people-oriented way.(moviesdatabase.weebly.com/tarih)

Some references were necessary to be put in the center of the profit-oriented cinema. Although the silent cinema periods must be studied in terms of 'fame' and 'celebrity' concepts, the following can be said from a birds-eye-view: In that period, fame was not a thing to be designed and sold. Charlie Chaplin may be a 'celebrity' created by himself: He had inborn acting talents and his intelligence was included in that. Maybe, that is why he could survive strongly among the gears of the period; at least without being ground…
Hollywood was sales-oriented and therefore impressing was the star. It was more like company management rather than a state founded around oil. The Hollywood movies were being marketed in a jaw-dropping way in the other countries of the world that were developing and were being avoided to develop. Top model Fords were being watched in admiration from all countries of the world. The state-of-the-art products to be put on the world market: Toasters, clothing for men and women,

Well, then, through whom could they realize all those sales? Why and how was the 'celebrity' concept fabricated in the first place? Did technology alone fail to direct people to purchase? Did they see it in a movie house, left it there and ran away? Perhaps it was scientific data that triggered the act of realizing sales through 'celebrity'. For people to interiorize something, they need to find it close to themselves or develop role models. And to some extent, it was necessary to idealize these people, so that the public could emulate and say that I also can possess everything that supreme existence (the perception created) has.… The first years of 'Perception is everything'. Perception is everything: Was it created for Hollywood? This article has brought along many topics to study and everything that was included in the content of this article as a question and a subject that could not be explained completely will be planned to be discussed through either an article or a book.

The Ongoing Effects of Hollywood's Beauty Criteria on Yeşilçam Actors and Actresses

In the silent motion pictures period, along with the words, fame and even faces were almost absent and the technology was not developed enough to transfer everything in detail. Maybe this was the reason why makeup was not that important: So we do not observe dominant makeup examples. It is movement-oriented and depending on an incident. The message arises from an act or incident. In the beginning, the characters seem to be weak. The first examples of makeup are seen on Laurel of Laurel and Hardy. There is kohl on Stanley's eyes. Gestures facial expressions are important and this may have been considered necessary because Laurel's eyes could not be differentiated from the frame enough. Charlie Chaplin's makeup is much more significant. Like a clown… This kind of makeups has been present since the beginning of the theatre. The purpose is to ensure even the most distant spectator can see it and furthermore, to transfer the emotion, sustain the continuity of the watching, ensure the focusing and of course, impressing.
The development of the technology has revealed for the directors the necessity that the face and body should be more significant and clear and that the actors and actresses should be much more careful than before. Ways to be effective and attractive on the magical screen have probably been researched. It is not a desirable situation for a celebrity to be overweight. Moreover, the movements of an over-weighted person are limited. Note that, the public emulates the characters idealized as a role model. Or this is the perception created: 'you should take the ideal as the role model; and it is me who creates the ideal patterns'. Is it possible that the aesthetics sector in the entire world is formed in this way? What are the possible reasons that these created beauty criteria are still considered as the ideal criteria in third world countries and developing countries? There is a technology that is being used also in the aesthetics world and it may be so valuable that it cannot be thrown to the garbage with every value and this is because the entire system may have been established on 'money'.

European cinema does not have such a problem. There are all kinds of people: there are more human and it is more human-oriented, it is more realistic, it includes more humane problems and therefore it is more of an art branch … Just like theatre… It is improvement-oriented, established less on the exploitation system… In fact, when you look from the physical aspect, they don't seem to need aesthetics that much: for example the Sweden cinema; smaller noses, colorful eyes, and they seem fitter and healthy perhaps due to their healthy food habits…

How should the role models who are being imitated be? The aesthetics industry will be brought into existence; it will be one of those sustainable sources of money and this industry will be constantly supported by Hollywood cinema.

Role models to be effective when seen in the frame: thick lips, big eyes, well-shaped thick eyebrows, and there should be a distance between the eyebrows and the eyes. Abundant hair with brilliantine, suits, tie, flowers on the neck, ironed trousers, tight dresses, flaring skirt dresses, elegant, dresses with full pleat skirt (Marilyn Monroe's subway dress)… https://www.youtube.com/watch?v=ej5vaUwDsp8

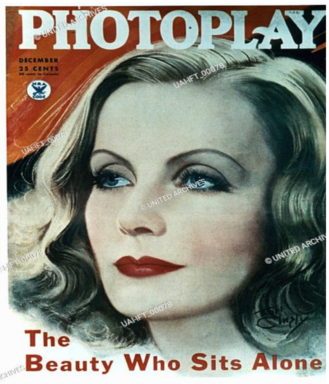
Once the role model impression is created, the sales will always realize this through these 'famous' role models. More well-coordinated, hitting target and effective, the science must have been also benefited from.

It is quite certain that Hollywood actors and actresses were effective on Yeşilçam actors and actresses not only in terms of visuality but also acting. Filiz Akın has told in the interviews she made with reporters that she had many times watched and tried to imitate Kim Novak's stance and glances against the cameras. Although the actors and actresses were unaware of this situation, it was impossible for the directors to be unaware. At the end of the day, the actors and actresses taking their place in Yeşilçam were not coming from extremely wealthy families. Some has completed their education while the rest discontinued. Later on, the money-oriented position remained intact, however, in an attempt to attract more educated people to the cinema for more sectorial success, many actresses were removed from the university environment, particularly from one university. This information has also been taken from the public through digital environments.

Greta Garbo look, Marilyn Monroe who was inspired by her and made the same makeup, and Cahide Sonku and Bedia Muvahhit among Yeşilçam actresses who imitated this sleepy look

https://www.agefotostock.com

In Turkish cinema of Yeşilçam period, female visuality came first. Visuality is a concept which encompasses attractiveness for a woman and is equivalent to beauty. Adjectives used for women such as beautiful eyes, full-figured body, slim waist, long hair are the reflections of the



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values of the general society about liking on female artists. One of these artists is Türkan Şoray: She has enabled conversion of praises of female appearance as embraced and supported also by women in Turkish culture with her eyes, eyelashes, looks, hair and full-figured body to a cultural code as done by women(Algül, 2017:198)

Visuality praising in Yeşilçam: These data which were announced to be physically superior, apply to also men in different qualifications. There was a period even this handsome and fit male actor rule has been attempted to demolish in line with rumors heard among the public. All of them were moves towards realizing more sales.

Clark Gable moustache, look and Ayhan Işık, Kim Novak and Filiz Akın

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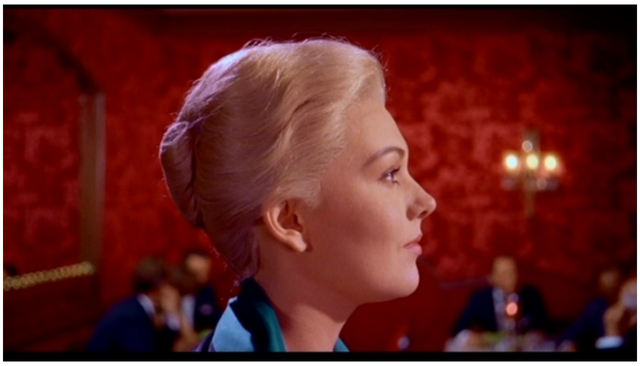

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Results and Discussion

In the magical effect of the cinema, the designs of the movie houses that are indexed to the developing technology have a big role. A huge dark movie house which is silent first and noisy later on, first colorless and colorful and magical images later on: which talk about other lives, other lands other worlds. That creates a hypnotic effect and attract all the attention, and that is equipped with the most accessible technology of the period; an environment that all the senses are ready to get and that is thirsty for stealing all the humane senses, and having hitting, impressive and transforming characters to the same extent and could play to this. For this reason, the way and purpose such important and transforming power is used is important to the same degree. Therefore, in order to protect the identity and integrity of the state and not to be deceived by the company-state plan of the imperialist powers, it may be a solution for everyone to go through an inquisitive education from the early childhood. The roads to the solutions of all problems come to *education* because the thing that we call *education*: is not something that can be realized without information transfer.

It is also the Hollywood cinema industry that is being modeled. Everything is established on money and sales. Above all, together with the digital age, Turkish cinema may engage in a race with Netflix and Hollywood in terms of exploiting the digital media to gather a bigger number of spectators. It is acting as if they are a common culture fueled by the same source: it seems like cultural texture that has a structure which is placing money on top of all kinds of humanitarian values, rejecting the humanitarian values if they are not being used for returning profit and that has been inured through centuries (transition of genetic code). Commercial morality (!) seems to be restructured on this cultural texture. Working conditions, the seizure methods of the subjects to make commercial sales (various plagiarism cases and unrevealed digital enslavement), attitudes considering everything as fair for the sake of money, to use everything for ensuring sales and doing this by its very nature, doing this without any discomfort can possible only through internalization that becomes a reflex. This kind of movie-making culture is not a movie-making culture that has arisen from the core of this land. The development of the cinema sector which has started with Yeşilçam has occurred in this direction and this will be the subject of a separate study. There is the internalization of humanitarian values in the essence of the Anatolian land. There is humanity and one cannot dice with the lives of people for profit or money. And since the same team is monopolizing also the TV sector, the folks and the ensnared people become the natural victims of this system and solutions for this problem have to found promptly.

The interesting part is that these beauty criteria are still relevant for some people even in 2019. Or the fact that these kinds of personalities are still preferred because they can work only with them. Even if Netflix and even Hollywood which have realized that it will fade away in this way have started to give place in a wrong way to people who may otherwise be ordinary. This 'mistake' is so comprehensive that it can be the subject of a book, therefore, it will not be elaborated in this article.

The answer that will be given to this question will be one of the auxiliary element for understanding the general mindset.

Are the products of IKEA being advertised mostly in Swedish movies or rather in Netflix and Hollywood movies?

References

Algül, Nevin(2017). Conversion Process of Visual Related-Praises of Woman During Yeşilçam Period of Turkish Cinema to Visual Codes of Culture as Embodied by Türkân Şoray, International Science and Technology Conference, July, 17- 19 Berlin Germany & August 16-18, 2017. Cambridege,USA

Internet

https://www.tojsat.net/journals/tojsat/articles/v08i01/v08i01-07.pdf

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https://www.youtube.com/watch?v=ej5vaUwDsp8
https://www.agefotostock.com/age/en/Stock-Images/gerta.html
https://radaronline.com/exclusives/2019/08/killing-of-marilyn-monroe-podcast-episode-2-explores-her-childhood/
https://www.biyografya.com/biyografi/292
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ANALYTICAL MODEL OF STEEL PLATE SHEAR WALLS

Erdal COŞKUN*, Bülent KOPARAN

*IKU Engineering Faculty, Civil Engineering Department, Istanbul -TURKEY
Kocaeli University, KMYO, Civil Engineering Technology, Kocaeli-TURKEY

erdal.coskun@gmail.com, bulentkoparan@gmail.com

Abstract: Recently there has been a considerable increase in the number of high-rise building, both residential and commercial and towards the taller structure. There are several different lateral load resisting system but steel shear wall system is commonly adopted in a high-rise building. A steel plate shear wall (SPSW) is a lateral-load-resisting system consisting of vertical steel plate infills in which the steel plates behave like the web, the columns behave as the flanges, and the cross elements represent the transverse stiffeners. During the last twenty-five years, a considerable amount of research is conducted in the around of the world on analytical modeling of steel plate shear walls. The global deformation of an SPSW system is a combination of shear force and bending moment deformations, both of which should be considered in the analytical model for this type of system. In this review paper, a simple shear analytic model for steel plate walls in new and, retrofitted building construction has been evaluated.

Keywords: Steel plate shear walls, cross beams, buckling

Introduction

Steel Plate Shear Walls (SPW) are very effective structural system to resist lateral forces. A steel plate wall frame can be described as a vertical cantilever plate girder in which the thin steel plates act as the web, the columns act as the flanges, and the cross beams represent transverse stiffeners (Fig. 1). A thin steel plate called a web plate is the main component of an SPW system.

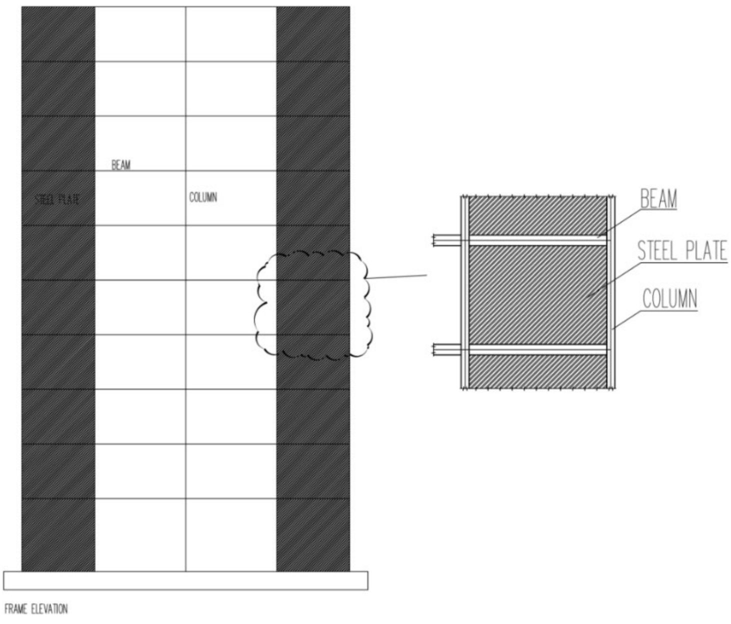


Figure1. Shematic of a steel plate wall with details

A significant amount of research has been conducted as a means to advanced analysis and design methodologies for the engineering practice (Thorburn et al. 1983; Timler and Kulak 1983; Tromposch and Kulak 1987; Driver et al. 1997; Applied Technology Council 1997; Roberts and Sabouri-Ghomi 1991,1992; Berman and Bruneau 2005; Kharrazi, Ventura, Prion 2011,2015). Finite element modeling of unstiffened steel plate shear walls has been investigated in some papers as well as by Elgaaly et al. (1993) and Driver et al. (1998). This review article present the analysis used for pure shear analysis.

Shear Analysis of A Steel Plate Wall

Basic assumptions:

1) The steel plate is considered as simply supported at its boundaries.
2) The columns are sufficiently stiff
3) The effect caused by bending stresses on shear buckling stress of the steel plate is negligible.
4) The effect of the gravity load on the panel negligible.

The shear load-displacement diagram (Fig. 2) is obtained by superimposing the load-displacement diagrams for the steel plate and surrounding frame, and by considering their displacement compatibility (Roberts and Sabouri-Ghomi 1992).

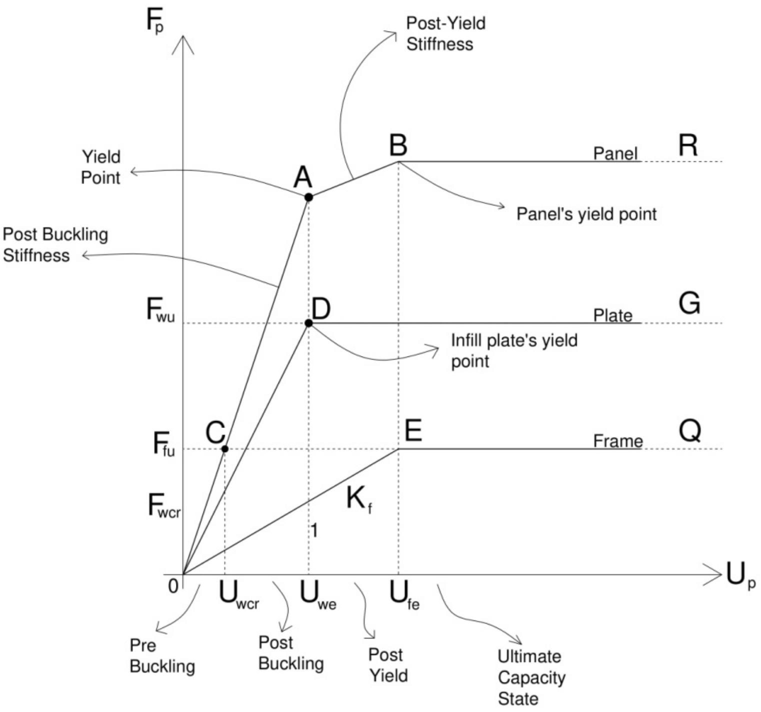


Figure 2. Shear-Load Displacement

The elastic critical buckling shear stress is

$$\tau_{cr} = \frac{K\pi^2 E}{12(1-\mu^2)}\left(\frac{t}{b}\right)^2 \leq \sigma_0 \qquad \begin{cases} K = 5.35 + 4(b/d)^2 \; for \; (d/b) \geq 1 \\ K = 5.35(b/d)^2 \; for \; (d/b) \leq 1 \end{cases} \tag{1}$$

where E, t, σ_0, and μ represent modulus of elasticity, steel plate thickness, yield stress, and Poisson's ratio, respectively (Timoshenko and Gere 1961).

From the critical shear stress, the critical shear force of the web plate F_{wcr} is

$$F_{wcr} = \tau_{cr} bt \tag{2}$$

and the critical shear displacement, U_{wcr} is

$$U_{wcr} = \frac{\tau_{cr}}{G} d \tag{3}$$

Where G is the modular of the steel plate.

The shear strength of the plate is then determined by

$$F_{wu} = \tau_{xy} \cdot b \cdot t = \left(\tau_{cr} + \frac{1}{2} \cdot \tau_{ty} \cdot \sin 2\theta\right) \cdot b \cdot t \tag{4}$$

τ_{xy} shear stress in the xy place and τ_{ty} at yielding of the plate.

The limiting elastic shear displacement, U_{we} defines the displacement at which panel yields and is

$$U_{we} = U_{wcr} + U_{wpb} \tag{5}$$

Where U_{wcr} is the critical shear displacement in Eq.3, and U_{wpb} is the shear displacement from the post buckling component of the shear forces.

The Eq.9 is determined by equating the work done by the post buckling component of the shear forces to the strain energy produced by the tension field (Kharrazi 2005) :

$$U_{wpb} = \frac{2\tau_{ty}}{E \cdot \sin 2\theta} \cdot d \tag{6}$$

Substituting U_{wpb} from Eq.6 and U_{wcr} from Eq.3 into Eq.5 gives

$$U_{we} = \left(\frac{\tau_{cr}}{G} + \frac{2\tau_{ty}}{E \cdot \sin 2\theta}\right) \cdot d \tag{7}$$

For the steel thin plate, the critical shear buckling stress is considered zero, and $U_{we}$is thus independent of the plate thickness.

Eq. 4 and Eq.7 define point D in Fig 2.

The slope of line 0D is calculated for thin plates $(\tau_{cr} \cong 0)$ as

$$K_w = \frac{E_{bt}(\sin 2\theta)^2}{4d} \tag{8}$$

Any increase in the b/d ratio leads to a significant increase in panel shear stiffness $K_{w.}$ (Kharrazi, Ventura, Prion,2011)

Shear Load-Displacement Relationships For Frame

The beam to column is assumed to be rigid, and the beams are assumed to develop plastic hinges (AISC 327-05,2005)

From the frame idealization, the ultimate shear force of the frame;

$$F_{fu} = 4\frac{M_{fp}}{d_f} \tag{9}$$

U_{fe}, defines the displacement at which the frame yields and is,

$$U_{fe} = \frac{4M_{fp} \cdot d_f^2/2g + 4}{6EIf/2g + 1} \tag{10}$$

If is the moment of inertia of the column and I_b is the moment of the inertia of the beam.

$$\delta = \frac{\sum(Elb/bf)}{\sum(Elg/dg)} \tag{11}$$

Point E in Fig. 2 is defined by Eq. 10 and Eq. 11

The slope of line (OE) in Fig.2 is the stiffness of the frame an given by

$$K_f = \frac{24Elf}{d_f^3} \cdot \frac{12g + 1}{12g + 4} \tag{12}$$

For interior panels, the stiffness of the panels on both sides of beam will increase the effective stiffness of the beams, resulting in a simplified assumption;

The shear load-displacement of the panel can be obtained by superimposing curves 0DG and 0EQ (Fig 2).

To ensure that the plate act as a force and yields prior to the frame, SPW must be designed to satisfy:

$$U_{ge} > U_{we} \tag{13}$$

Conclusions

- An overview of the simple shear analytic model for steel plate walls in new and retrofit building construction has been provided.
- In this review, the works of Kharrazi and Venture were taken into consideration.
- By reducing the yield stress τ_0, of the steel plate only, F_{wn} and U_{we} are proportionally reduced without any reduction in the stiffness of the steel plate.
- Thus, by using a steel plate with much lower yield strength than the steel used for the frame, a distinct separation is created between U_{we} and U_{fe}.

References

American Institute of Steel Construction. 2006. AISC Seismic De-sign Manual. 1st ed. (May 2006). AISC 327-05. American Institute of Steel Construction Publisher, Chicago, Ill.

Applied Technology Council (ATC). 1997. NEHRP guidelines for the seismic rehabilitation of buildings. ATC 33 project. FEMA-273. Federal Emergency Management Agency (FEMA), Washington, D.C.

Kharrazi,M., Ventura, C., and Prion, H. 2011. Analysis and design of steel plate walls. analytical model. Can. J. Civil Engineering 38: 49-59.

Thorburn, L.J., Kulak, G.L., and Montgomery, C.J. 1983. Analysis of steel plate shear walls. Structural Engineering Report No. 107. Department of Civil Engineering, University of Alberta, Edmonton, Alta.

Timoshenko, S.P., and Gere, J.M. 1961. Theory of elastic stability. McGraw-Hill Book Company, Columbus, OH.

Timler, P.A., and Kulak, G.L. 1983. Experimental study of steel plate shear walls. Structural Engineering Report No. 114. Department of Civil Engineering, University of Alberta, Edmonton,Alta.

Roberts, T.M., and Sabouri-Ghomi, S. 1991. Hysteretic characteristics of unstiffened plate shear panels. Thin walled Structures, 12 (2): 145–162. doi:10.1016/0263-8231(91)90061-M.

Driver, R.G., Kulak, G.L., Kennedy, D.L., and Elwi, A.E. 1997.Seismic behaviour of steel plate shear walls. Structural Engineering Report 215. Department of Civil and Environmental Engineering, University of Alberta, Edmonton, Alta.

Kharrazi, M.H.K. 2005. Rational method for analysis and design of steel plate walls. Ph.D. dissertation, University

of British Columbia, Vancouver, B.C.
Sabouri-Ghomi, S., Ventura, C.E., and Kharrazi, M.H.K. 2005. Shear analysis and design of ductile steel plate walls. Journal of Structural Engineering, ASCE, 131 (6): 878–889. doi:10.1061/ (ASCE)0733 9445(2005)131:6(878).
Berman, J.W., and Bruneau, M. 2005. Experimental investigation of light-gauge steel plate shear walls. Journal of Structural Engi-neering,131(2): 259–267. doi:10.1061/(ASCE)0733-9445(2005)131:2(259).
Paik, J.K., and Thayamballi, A.K. 2003. Ultimate limit state design of steel-plated structures. John Wiley &Sons.
Rezai, M. 1999. Seismic behaviour of steel plate shear walls by shake table testing. Ph.D. dissertation, University of British Columbia, Vancouver, B.C.

ANTI-CANCER PROPERTIES OF LACTOBACILLUS SP. ISOLATED FROM CASSAVA PULP

Ratchadaporn Oonsivilai

roonsivi@sut.ac.th

Sadudee Sengsaengthong

noodee101112@gmail.com

Nipha Chaicharoenaudomrung

nipha.chai@gmail.com

Parinya Noisa

p.noisa@sut.ac.th

Abstract

The objectives of this study were to investigate the cell adhesion and anti-cancer properties of Lactobacillus sp. 21C2-10 isolated from cassava pulp on Caco-2 cells. The results showed that Lactobacillus sp. 21C2-10 strengthened adherence to Caco-2 cells of 14.44±0.58%. Moreover, the secreted metabolites from Lactobacillus sp. 21C2-10 (SML) toxic to Caco-2 cells were analyzed through an MTT assay. The results revealed that cytotoxicity caused Caco-2 cells to die as a result of the induction of apoptosis which was confirmed by the Tali image based on the cytometry and DAPI staining tests. Moreover, the results of gene expression from RT-PCR assay showed significant effects on apoptosis by modulating an increased expression of BAX, P53, Caspase-3, Caspase-8 and Caspase-9, and by inhibiting the expression of BCL-2 on Caco-2 cell lines. This result confirmed that Lactobacillus sp. 21C2-10 had strengthened cell adhesion properties and that SML were able to show anti-cancer properties through the induction of the apoptosis pathway.

APOPTOTIC EFFECTS OF CAPSAICIN IN NON-SMALL CELL LUNG CANCER

Sabire GÜLER
Uludag University, Department of Histology Embryology, Bursa- TURKEY
sabirepr@uludag.edu.tr

Abstract: Lung cancer is the leading cause of cancer-related deaths in the world. Non-small cell lung cancer (NSCLC) comprises 85% of all lung cancer cases and that is resistant to chemotherapy. Capsaicin (CAP) (8-methyl-N-vanillyl-6-nonenamide) is an alcaloid derived and pungent ingredient in red peppers. In addition to being used in many different application areas, CAP is also known to suppress different types of cancers. In this study, it was aimed to determine proliferative and/or apoptotic effects of low and high doses of CAP on A549 cells a model of NSCLC. In accordance with this purpose, A549 cells treated with cell culture media (control group), 50 µM CAP (low dose group) and 200 µM CAP (high dose group). After 24 hours of CAP administration, cells are fixed and immunocytochemistry procedure was performed. PCNA expression was examined for proliferative effects and cleaved-PARP expression was examined for apoptotic effects. As a result of the experiments, PCNA expression decrease and cleaved-PARP expression increase with increased doses of CAP. In consequence of the present study, the apoptosis was occurred when the dose increase in A549 cells. Because of these effects, this study can be lead of future Chemoprevention studies and CAP can be combined with chemotheropatic agents and used in treatment of Non-small cell lung cancer.

Keywords: apoptosis, capsaicin, non-small cell lung cancer

Introduction

Lung cancer is the most commonly diagnosed cancer and the leading cause of cancer death. The most common (~80%) type of of all lung cases is non small-cell lung carcinoma (NSCLC) that is highly resistant (Freddie, 2018). However chemotherapy, radiation, and surgery are therapies for NSCLC, side effects of the treatment can be caused by physical and mental problems. Furthermore, chemoresistance and adverse side-effects induced by chemotherapeutic agents can not be neglected (Yang, 2017). Therefore, not only in lung cancer but also in many cancer types, some food additives are used to reduce the side effects of chemotherapists (Lewinska, 2015; Yang,2017; Zhang, 2017).

Capsaicin (CAP) (trans-8-methyl-N-vanillyl6-nonenamide), the most common and pungent component in a variety of hot peppers, has been used extensively as a food additive in countries worldwide (Surh,1996). CAP excites sensory neurons by binding to its receptor in the plasma membrane and activating ligand-gated, nonselective cation channels (Nagy, 2004; Nakagawa, 2006). The CAP receptor, vanilloid receptor (VR1), was cloned and belongs to a family of transient receptor potential (TRP) (Minke, 1975). CAP has been previously used for various clinical conditions such as neuropathic pain, rheumatoid arthritis, cluster headaches, herpes zoster and vasomotor rhinitis, obesity, cardiovascular and gastrointestinal conditions (Josse, 2010; Sharma, 2013). More recently, the anticancer activity of capsaicin has been demonstrated (Freidman, 2018). Capsaicin-mediated apoptosis and/or antiproliferative potential has been reported for numerous cancer cell line (Clarka, 2016; Ito, 2004; Premanik, 2011; Thoennissen, 2010)

In the present study, we used low and high doses of CAP on NSCLC, to determine the capsaicin-induced cytotoxicity. In future studies, we aim to examine the effects of combined capsaicin and chemotherapeutics on lung cancer.

Materials and Methods

Reagents

Capsaicin (M2028, analytical standard grade, ≥99%) was purchased from Sigma; DMSO (N182) was purchased from Ambresco, for CAP vehicle solution; ImmPRESS® HRP Anti-Rabbit IgG (Peroxidase) Polymer Detection Kit (MP7401) was purchased from Vector Lab. for immunocytochemistry; primary antibodies PCNA (7907) for cell proliferation marker and cleaved PARP (h215) for apoptosis marker were purchased from Santa Cruz Biotech.

Cell Culture

The NSCLC cell line A549 was purchased from the American Type Culture Collection (ATCC; Manassas, VA, USA). The cells were plated at a density4X104 cells/well in 24-well plates and grown on coverslips precoated with 10 % FBS and maintained in RPMI containing 10% FBS, 100 U/ml penicillin and 100 μg/ml streptomycin at 37 °C in an atmosphere containing 5% CO_2. The following day (day 0), the media were removed and replaced with fresh media for cell control (CC); media containing vehicle solution (0,01% DMSO; Ambresco; N182) for vehicle control (VC); and low and high doses (50, and 250 μM) of CAP. At 24 hour after treatment, the experiments were terminated.

Assessment of Cell Proliferation and Apoptosis Using Immunocytochemistry;

The cells on the cover slips were washed three times in PBS. The cells then were fixed in 4% paraformaldehyde at room temperature for 15 min and permeabilized with 0.1% Triton X-100 for 10 min.Then the cells were blocked for 20 min and followed by incubation with PCNA (1:200), and cleaved PARP (1:200) antibody at 4°C overnight, then incubation with seconder antibody for 30 min. Cells then treated with DAP for 5 min and counterstained with Harris Hematoxylin for 2 min and the images were observed under the Nikon Eclipse 80i microscope. Randomly five microscopic areas were counted and the % value of staining cells was calculated for each experiment groups.

Statistical Analysis;

The data were analyzed using the IBM SPSS Statistics 22. Statistical significance between the groups was analyzed by the Kruskal-Wallis Test and followed by Mann-Whitney U posthoc test. The level of significance was defined as $P \leq 0.05$.

Results

Capsaicin decreases of the viability of A549 cells at high concentration.

When the A549 cells were observed in the light microscope, the morphology of the cells was dramatically changed (Fig. 1). The cell-cell interactions were disrupted in high dose CAP group and regular epitheloid structure was deformed (Fig 1D). PCNA immunoreaction in cells' nuclei disappeared with the high dose treatment (Fig 1). The statistical differences were observed in all groups (Fig 2).

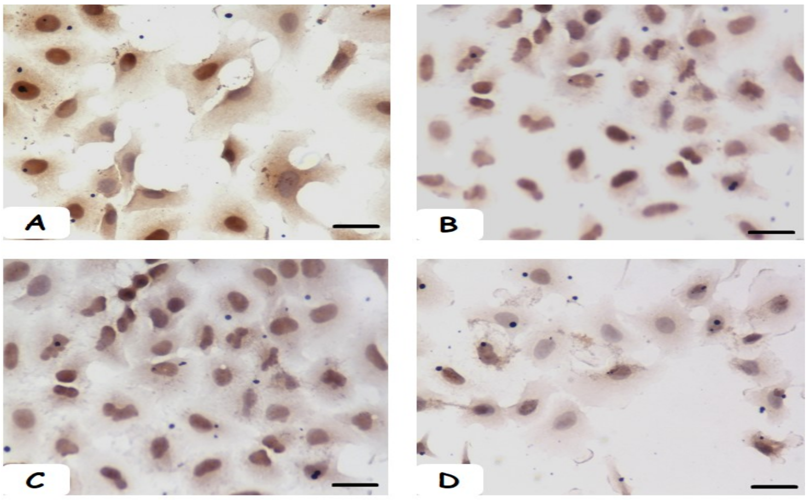


Fig. 1. A549 cell proliferation after 24 h CAP treatment. PCNA expression in **A.** Cell control group, (Bar: 25 µm); **B.** Vehicle Control group, (Bar: 25µm); **C.** 50 µM treatment, (Bar: 25µm); **D.** 250 µM treatment, (Bar: 25µm).

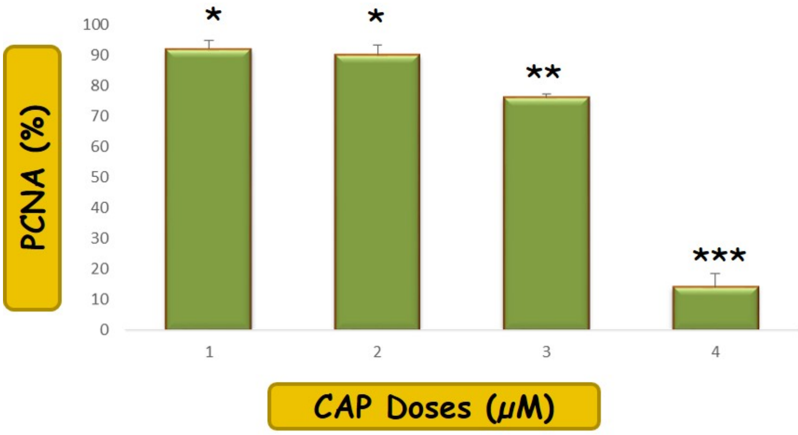


Fig. 2. PCNA immunopositive (%) expressions rates, *, ** and *** show the statistical difference in each dose group within 24 hours of treatment, p≤0,05).

Capsaicin induces apoptosis in A 549 cells at high concentration

Apoptosis was indicate by morphological results (Fig. 3D). Cleaved PARP immunoreactive cells observed when the CAP treatment increase (Fig 3). The increase in dose groups was significant compared to the control groups (p≤0.05) (Fig. 4.).

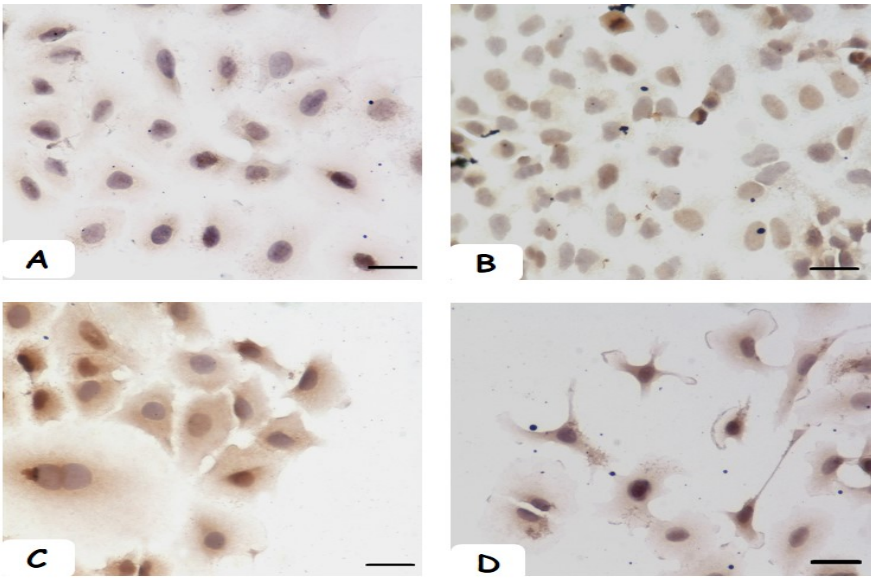


Fig. 3. Apoptosis in A549 after 24 h CAP treatment. Cleaved PARP expression in **A.** Cell control group, (Bar: 25 µm); **B.** Vehicle Control group, (Bar: 25µm); **C.** 50 µM treatment, (Bar: 25µm); **D.** 250 µM treatment, (Bar: 25µm).

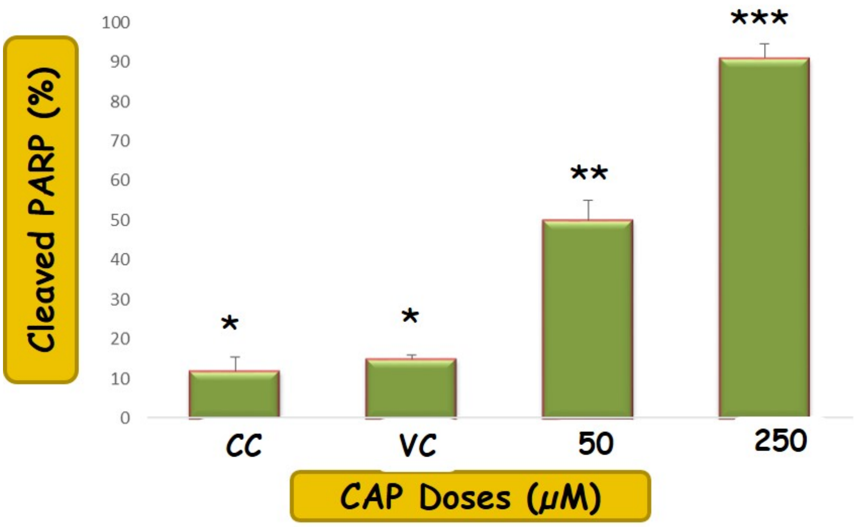


Fig. 4. Cleaved PARP immunopositive (%) expressions rates, *, ** and *** shows the statistical difference in each dose group within 24 hours of treatment, p≤0,05).

Discussion

In worldwide, highly resistant non-small cell lung cancer is one of the major causes of cancer death (Chakraborty, 2014). Side effects caused by intensive and long term treatment methods such as chemotherapy and radiotherapy adversely affect the quality of life (Yang, 2017). Therefore, it has become important to stimulate apoptosis in cancer cells in different ways. This alternatively supplementary treatment has been shown in many studies, especially using herbal extracts and food additives (Lewinska, 2015; Yang, 2017; Zhang, 2017). The extract of red hot pepper, capsaicin has been reported to been used in the treatment of different types of the clinical condition (Josse, 2010; Sharma, 2013). In recent years capsaicin based anticancer therapy is used because capsaicin cause of DNA breaks, chromosomal damage and apoptosis (Ciccia, 2010). The concentration- and time-dependent anticancer potential of capsaicin in vitro has been well-documented (Bley, 2012). The maximal antiproliferative activity of capsaicin has been observed at about 200–300M (Bley, 2012). Although studies are investigating the effects of capsaicin on small cell lung cancer, this is the first study to demonstrate cell proliferation and apoptosis with intracellular markers.

The response to capsaicin may also be cancer cell type-dependent (Bley, 2012). Zhang et al. (2017) evaluated the effects of capsaicin on proliferation, cell cycle arrest and apoptosis induction in osteocarcinoma cells. The cells were treated with various concentrations of capsaicin (0, 50, 100, 150, 200, 250 or 300 µM) for 24 h and they observed Capsaicin inhibits the proliferation and decreases the colony formation ability, cell cycle arrest at the G0/G1 phase and inhibits tumor growth in a xenograft model of human osteocarcinoma in vivo. Furthermore, Choi et al (2010) reported that capsaicin did not induce apoptosis in the breast cancer cell lines MCF7 and MDA-MB-231. Chien et al (2013) suggested that an anti-apoptotic pathway was activated in parallel with pro-apoptotic pathway and was mediated by autophagy in G292 OS cells. According to Patel et al. (2002), capsaicin treatment inhibited NFkB activation and cell proliferation in human malignant melanoma cells. Zhang et al. (2013) showed that apoptosis was triggered by the activation of mitochondrial pathway with the increased dose of CAP (0 µM to 300 µM) in primer pancreatic acinar cells and pancreatic cancer cell lines (AsPC and BxPC-3). Lewinska and et al (2015), were administrated different doses of capsaicin (5,10,50,100,150,200 and 250 µM) on A549 cell line and demonstrate at the highest concentration used, 250 µM, and 24-h incubation time, capsaicin caused a reduction of metabolic activity of about 65% in A549 cells compared with untreated control and induce DNA and chromosomal damage in A549 was shown. Also when they used up to 250M of capsaicin, was unable to provoke apoptotic cell death in cancer cells. In another study, 100M capsaicin was established to be IC50 value in A549 cells, whilst 200M capsaicin accounted for 90% inhibition of cell metabolic activity (Reilly, 2003).

In recent study, cell proliferation and apoptosis were evidenced by PCNA and cleaved PARP respectively. When the concentration of CAP and the time application increased, there was a decrease in the number of cells showing immunopositivity of PCNA and an increase in the number of cells showing immunopositivity of cleaved PARP. Our results are agreement with other studies.

In conclusion, it was observed that high doses of CAP induce apoptosis in A549, non-small lung cancer cells. Therefore, high dose CAP may have a positive effect on cancer alternatively treatment. As a result of the combined use of capsaicin with chemotherapeutics, the negative consequences and side effects of cancer treatment can be reduced. The combination of different doses of capsaicin and chemotherapeutic drug in non small cell lung cancer will be the focus of future research.

References

Bley, K., Boorman, G., B. Mohammad, McKenzie, D., Babbar, S (2012). A comprehensive review of the carcinogenic and anticarcinogenic potential of capsaicin. *Toxicol. Pathol.* 40 pp.847–873.

Bray, F., Ferlay, J., Soerjomataram, I., Siegel, RL., Torre, L., Jemal, A. (2018). Global cancer statistics GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *A Cancer Journal for Clinicians.* 68, pp.394-424.

Chakraborty, S., Adhikary, A., Mazumdar, M., Mukherjee, S., Bhattacharjee, P., Guha, D., Choudhuri, T., Chattopadhyay, S., Sa, G., Sen, A., Das, T. (2014). Capsaicin-induced activation of p53-SMAR1 auto-regulatory loop down-regulates VEGF in non-small cell lung cancer to restrain angiogenesis. *PLoS One.* 13;9(6):e99743.

Chien, CS., Ma, KH., Lee, HS., Liu, PS., Li, YH., Huang, YS., Chueh, SH. (2013). Dual effect of capsaicin on cell death in human osteosarcoma G292 cells. *Eur J Pharmacol* 718: pp. 350-360.

Choi, CH., Jung, YK., Oh, SH. (2010). Autophagy induction by capsaicin in malignant human breast cells is modulated by p38 and extra- cellular signal-regulated mitogen-activated protein kinases and retards cell death by suppressing endoplasmic reticulum stressmediated apoptosis. *Mol Pharmacol* 78 pp.114-125.

Ciccia, A. & Elledge, S.J. (2010). The DNA damage response: making it safe to play with knives, *Mol. Cell* 40 pp. 179–204.

Friedman, JR., Nolan, NA., Brown, KC, Miles, SL., Akers, AT., Colclough, KW., Seidler, JM., Rimoldi, JM., Valentovic, MA., Dasgupta, P. (2018) Anticancer Activity of Natural and Synthetic Capsaicin Analogs. J Pharmacol Exp Ther. 364(3) pp.462-473.

Ito, K., Nakazato, T., Yamato, K., Miyakawa, Y., Yamada, T., Hozumi, N., Segawa, K., Ikeda, Y., Kizaki, M. (2004). Induction of apoptosis in leukemic cells by homovanillic acid derivative, capsaicin, through oxidative stress: implication of phosphorylation of p53 at Ser-15 residue by reactive oxygen species. *Cancer Res.* 1;64(3) pp.1071-8.

Josse, AR., Sheerffs, SS., Holwerda, AM., Andrews, R., Staples, AW., Philips, SM. (2010). Effects of capsinoid digestion on energy expenditure and lipid oxidation at rest and during exercise. *Nutr Metab* 7 pp.65.

Lewinska, A., Jarosz, P., Czech, J., Rzeszutek, I., Bielak-Zmijewska, A., Grabowska, W., Wnuk, M. (2015). Capsaicin-induced genotoxic stress does not promote apoptosis in A549 human lung and DU145 prostate cancer cells. *Mutat Res Genet Toxicol Environ Mutagen.* 779: pp.23-34.

Minke, B., Chun-Fang, W., William, LP. (1975). Induction of photoreceptor voltage noise in the dark in Drosophila mutant. *Nature* 258 pp.84-87.

Nagy, I., Santha, P., Jancso, G., Urban, L. (2004). The role of the vanilloid (capsaicin) receptor (TRPV1) in physiology and pathology. *Eur J Pharmacol* 500 pp.351-369.

Nakagawa, H. & Hiura, A . (2006) Capsaicin, transient receptor potential (TRP) protein subfamilies and the particular relationship between capsaicin receptors and small primary sensory neurons. *Anat Sci Int* 81 pp.135-155.

Patel, PS., Yang, S., Li, A., Varney, ML., Singh, RK. (2002). Capsaicin regulates vascular endothelial cell growth factor expression by modulation of hypoxia inducing factor-1alpha in human malignant melanoma cells. *Journal of cancer research and clinical oncology* 128 pp. 461–468.

Pramanik, KC., Boreddy, SR., Srivastava, SK. (2011). Role of mitochondrial electron transport chain complexes in capsaicin mediated oxidative stress leading to apoptosis in pancreatic cancer cells. PLoS One. 2011;6(5):e20151.

Reilly, CA., Taylor, JL., Lanza, DL., Carr, BA., Crouch, DJ., Yost, GS. (2003) Capsaicinoids cause inflammation and epithelial cell death through activation of vanilloid receptors, *Toxicol. Sci.* 73 pp.170-181.

Sharma, SK., Vij, AS., Sharma, M. (2013). Mechanisms and clinical uses of capsaicin. *Eur J Pharmacol* 720(1-3): pp.55-62.

Surh, YJ & Lee, SS. (1996). Capsaicin in hot chili pepper: carcinogen, co-carcinogen or anticarcinogen? *Food Chem Toxicol* 34 pp.313-316.

Thoennissen, NH., O'Kelly, J., Lu, D., Iwanski, G.B., Lai DT., Abbasi, S., Leiter, A., Karlan, B., Mehta, R., Koeffler, HP. (2010).Capsaicin causes cell-cycle arrest and apoptosis in *ER*-positive and -negative breast cancer cells by modulating the *EGFR/HER-2* pathway. *Oncogene. 29 pp.* 285–296.

Yang, Y., Tantai, J., Sun, Y., Zhong, C., Li, Z (2017). Effect of hyperoside on the apoptosis of A549 human non-small cell lung cancer cells and the underlying mechanism. *Mol Med Rep.* 16(5): pp.6483–6488.

Zhang, JH., Lai, FJ., Chen, H., Luo, J., Zhang, RY., Bu, HQ., Wang, ZH., Lin, HH., Lin, SZ. (2013). Involvement of the phosphoinositide 3-kinase/Akt pathway in apoptosis induced by capsaicin in the human pancreatic cancer cell line PANC-1. *Oncol Lett* 5 pp.43-48.

Zhang, Y.,, Deng, X.,, Lei, T., Yu, C., Wang, Y., Zhao, G., Luo, X., Tang, K., Quan, Z., Jiang, D. (2017). Capsaicin inhibits proliferation and induces apoptosis in osteosarcoma cell lines via the mitogen-activated protein kinase pathway. *Oncol Rep.* 38(5): pp.2685-2696.

AUTOMOTIVE INSTRUMENT CLUSTER AND ITS VISUALIZATION USING MODULAR INSTRUMENTATION

Matus Danko, Peter Drgona, Branislav Hanko

Department of Mechatronics and Electronics, University of Zilina, Zilina
peter.drgona@fel.uniza.sk

Abstract— in modern cars, all communication and control is based on sensors, microprocessors and actuators. High speed signals from sensors, control units, and signals for actuators are transmitted through buses. Controller Area Network (CAN) is the most common of these automotive data buses which is also used in industry because of electromagnetic compatibility (EMC). For a demonstration of this communication for education purpose, the instrument panel and its visualization were created. Demonstration panel contains gateway which simulates signals from the electronic control unit (ECU), accelerator pedal and Skoda instrument cluster. This instrument cluster shows engine speed, vehicle speed, coolant temperature and position of servo drive in two turbochargers. For data acquisition from CAN BUS a modular system CompactRio with a module for CAN BUS from National Instruments is used. The whole application is created in visual programming language LabVIEW using FPGA module. For visualization, CAN BUS communication is filtered and processed, to obtain three message objects to observe required data for visualization instrument cluster and accelerator pedal position.

Keywords—CAN BUS; Škoda instrument cluster; Modular instrumentation; CompactRIO;

Introduction

To save material for cabling of the car and secure communication between sensors, electronic control units and actuators, a communication data bus called Controller Area Network, abbreviated CAN by German company Bosh GmbH at 80´s, was proposed. With the use of a large number of electronics in the modern car, the requirement to divide electronic system of the car to a specific section by usefulness and reliability arise. These electronic subsystems have different speed of the bus, according to the importance of messages.

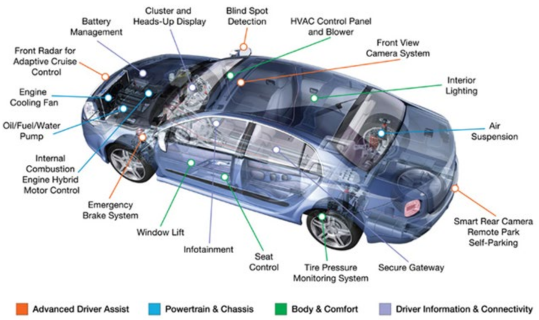


Fig. 1.CAN Bus in vehicle [1]

CAN BUS for powertrain systems has the highest speed and some of the messages are shorter to secure real-time control. On the other side, the comfort subsystem has the smallest speed of data flow, due to lower communication speeds.

Demonstration panel, which is used in teaching process of autotronics study program, contains gateway which simulates control unit, turbochargers with servo drive, accelerator pedal and instrument cluster which show engine speed, the speed of vehicle and coolant temperature.

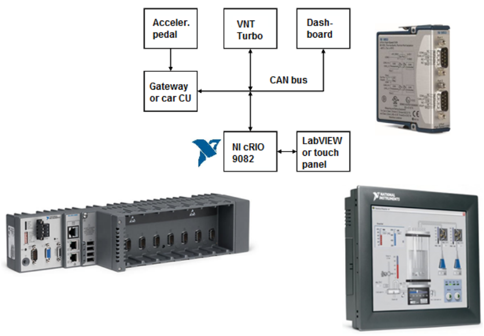


Fig. 2. Block diagram of communication

Messages sending through gateway contains engine speed, coolant temperature, the speed of vehicle and position of servo drive of the turbocharger, depends on the position of the accelerator pedal. These messages are acquired from CAN BUS by CompactRio and processed in LabVIEW for visualization of Skoda instrument cluster.

CAN BUS

A. Layered structure

The object layer of CAN BUS is concerned with message filtering as well as status and message handling [2].

The transfer layer represents the kernel of the CAN protocol. It represents messages received to the object layer and accepts messages to be transmitted by the object layer. The transfer layer is responsible for bit timing and synchronization, message framing, arbitration, acknowledgment, error detection and signaling, and fault confinement [2].

The physical layer defines how signals are transmitted. The physical layer is not defined here, as it will vary according to the requirements of individual applications (for example, transmission medium and signal level implementations) [2].

B. Message routing

The content of a message is described by an identifier. The Identifier does not indicate the destination of the message, but describes the meaning of the data, so that all nodes in the network are able to decide by message filtering whether the data is to be acted upon by them or not. Within a CAN network, it is guaranteed that a message is accepted simultaneously either by all nodes or by no node. Thus, data consistency is a property of the system achieved by the concepts of multicast and by error handling [2].

C. Arbitration

Whenever the bus is free, any node may start to transmit a message. If two or more nodes start transmitting messages at the same time, the bus access conflict is resolved by bit-wise arbitration using the Identifier. The mechanism of arbitration guarantees that neither information nor time is lost. If a Data frame and a Remote frame with the same Identifier are initiated at the same time, the Data frame prevails over the Remote frame. During arbitration, every transmitter compares the level of the bit transmitted with the level that is monitored on the bus. If these levels are equal the node may continue to send. When a recessive level is sent, but a dominant level is monitored, the node has lost arbitration and must withdraw without sending any further bits [2].

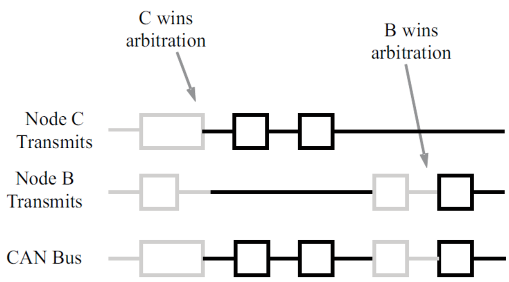


Fig. 3. Arbitration on a CAN Bus [3]

II. Frame types of CAN bus

Message transfer is manifested and controlled by four different frame types:

- A Data frame carries data from a transmitter to the receivers.
- A Remote frame is transmitted by a bus node to request the transmission of the Data frame with the same Identifier.
- An Error frame is transmitted by any node on detecting a bus error.
- An Overload frame is used to provide for an extra delay between the preceding and the succeeding Data or Remote frames [2].

A. Data frame

A Data frame is composed of seven different bit fields: Start of the frame, Arbitration field, Control field, Data field, CRC field, ACK field, End of the frame. The Data field can be of length zero [2].

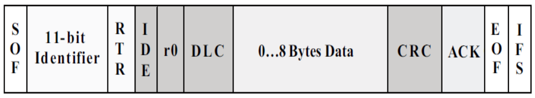


Fig. 4. Standard data frame [3]

The meanings of the bit fields of Figure 2 are:

- SOF–The single dominant start of frame (SOF) bit marks the start of a message, and is used to synchronize the nodes on a bus after being idle.
- Identifier-The Standard CAN 11-bit identifier establishes the priority of the message. The lower the binary value, the higher its priority.
- RTR–The single remote transmission request (RTR) bit is dominant when information is required from another node. All nodes receive the request, but the identifier determines the specified node. The responding data is also received by all nodes and used by any node interested. In this way, all data being used in a system is uniform.
- IDE–A dominant single identifier extension (IDE) bit means that a standard CAN identifier with no extension is being transmitted.
- r0–Reserved bit (for possible use by future standard amendment).
- DLC–The 4-bit data length code (DLC) contains the number of bytes of data being transmitted.
- Data–Up to 64 bits of application data may be transmitted.
- CRC–The 16-bit (15 bits plus delimiter) cyclic redundancy check (CRC) contains the checksum (number of bits transmitted) of the preceding application data for error detection.
- ACK–Every node receiving an accurate message overwrites this recessive bit in the original message with a dominate bit, indicating an error-free message has been sent. Should a receiving node detect an error and leave this bit recessive, it discards the message and the sending node repeats the message after rearbitration. In this way, each node acknowledges (ACK) the integrity of its data. ACK is 2 bits, one is the acknowledgment bit and the second one is a delimiter.
- EOF–This end-of-frame (EOF), 7-bit field marks the end of a CAN frame (message) and disables bit-stuffing, indicating a stuffing error when dominant. When 5 bits of the same logic level occur in succession during normal operation, a bit of the opposite logic level is stuffed into the data. bu
- IFS–This 7-bit interframe space (IFS) contains the time required by the controller to move a correctly received frame to its proper position in a message buffer area [3].

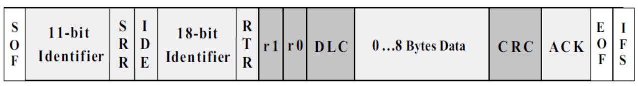


Fig. 5. Extended data frame [3]

As shown in Figure 3, the Extended CAN message is the same as the Standard message with the addition of:

- SRR–The substitute remote request (SRR) bit replaces the RTR bit in the standard message location as a placeholder in the extended format.
- IDE–A recessive bit in the identifier extension (IDE) indicates that more identifier bits follow. The 18-bit extension follows IDE.
- r1–Following the RTR and r0 bits, an additional reserve bit has been included ahead of the DLC bit [3].

B. Remote frame

The intended purpose of the remote frame is to solicit the transmission of data from another node. The remote frame is similar to the data frame, with two important differences. First, this type of message is explicitly marked as a remote frame by a recessive RTR bit in the arbitration field, and secondly, there is no data [3].

C. Error frame

The error frame is a special message that violates the formatting rules of a CAN message. It is transmitted when a node detects an error in a message and causes all other nodes in the network to send an error frame as well. The original transmitter then automatically retransmits the message. An elaborate system of error counters in the CAN controller ensures that a node cannot tie up a bus by repeatedly transmitting error frames [3].

D. Overload frame

The overload frame is mentioned for completeness. It is similar to the error frame with regard to the format, and it is transmitted by a node that becomes too busy. It is primarily used to provide an extra delay between messages [3].

III. USED HARDWARE

As hardware for visualization is used modular instrumentation from national instruments. For acquisition messages from CAN BUS is used module NI 9853. NI CompactRio take care of processing of these messages for visualization.

A. NI cRIO-90822

The high-performance multicore NI cRIO-9082 system provides advanced Intel Core i7 dual-core processing, built-in VGA display output for an integrated user interface, and the option to use a Microsoft Windows Embedded Standard 7 (WES7) or LabVIEW Real-Time OS. The increased processing power of the cRIO-9082 makes it well suited to perform the advanced processing tasks required by complex applications such as machine vision and rapid control prototyping. The high-performance multicore cRIO-9082 also offers the widest array of connectivity and expansion options available in the CompactRIO platform, including the high-bandwidth and low-latency MXI-Express bus for expansion using the 14-slot MXI-Express RIO chassis [4], [5].

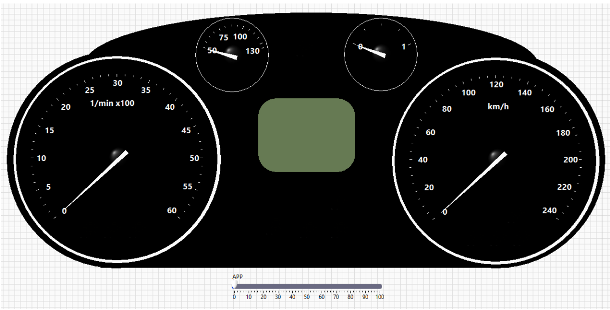
B. NI 9853

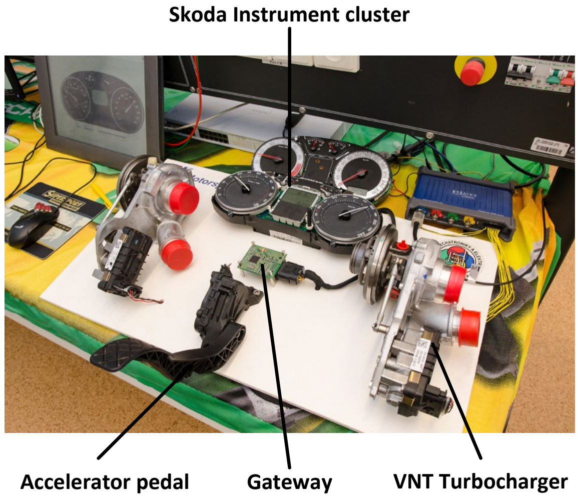
The NI 9853 has two 9-pin male D-Sub connectors that provide connections to a CAN bus. Each port on the NI 9853 has pins for CAN_H and CAN_L, to which you connect the CAN bus signals. Each port has two common pins (COM) that are internally connected to the module's isolated reference and serve as the reference ground for CAN_H and CAN_L. You can connect the CAN bus reference ground (sometimes referred to as CAN_V-) to one or both COM pins. The port also has an optional shield pin, SHLD, that you can connect to a shielded CAN cable. Connecting SHLD may improve signal integrity and EMC performance in a noisy environment. CAN0 of the NI 9853 is internally powered, and therefore requires no external power supply. CAN1 requires an external power supply of +8 to +25 V to operate. Supply power to the V_{SUP} pin of CAN1 from the CAN bus [6].

IV. CAN BUS DEMONSTRATION PANEL

The main part of demonstration panel is gateway which simulates CAN message transmitted from engine control unit. Simulated CAN messages contain data for processing engine revolutions, the speed of the vehicle, coolant temperature and accelerator pedal position and position of vanes of turbochargers.

The second element is accelerator pedal. The accelerator pedal position sensor detects the amount of travel of the accelerator pedal. This sensor outputs a voltage signal, which corresponds to the amount of pedal travel, to the A/D converter of the gateway. The accelerator-pedal module (APM) comprises an accelerator pedal and a potentiometer or a non-contacting Hall sensor as an angular-position sensor. This sensor registers the movement and the position of the accelerator pedal. From this information, the engine management calculates the required torque and accordingly addresses the throttle device and the injection system. The accelerator-pedal module can output analog or digital signals [7], [8].





Parts of demonstration panel

Fig. 6. Visualization of Škoda instrument cluster

Next section is two turbochargers with variable geometry. In a VNT turbo, the exhaust flow through the turbine wheel is controlled by a row of vanes that move to match the exact boost requirements of the engine. At low engine speed, the variable nozzle turbine vanes close to restrict the flow of exhaust gases through the turbine, thereby increasing boost pressure. At high engine speeds, the vanes open to maximize the exhaust gas flow, thereby avoiding turbo over-speed and maintaining the boost pressure required by the engine. The position of the vanes is controlling by servo engines directly through CAN bus [9], [10].

The last segment of the model is instrument cluster of Škoda Octavia. Instrument cluster (dashboard) shows only speed, rpm and coolant temperature. Messages of other indicators are not simulated and the fuel gauge is analog [11].

V. Visualization of Demonstration Panel

The whole application is created in visual programming language LabVIEW using FPGA module. The project has four programs, first is for data acquisition from CAN BUS. At the start of the program, it is necessary to set up delay for transmitter and receiver initialization and CAN BUS speed for each port. CAN BUS speed can be set in two different ways. The first way is by setting the speed in the configuration of NI 9853. The second way is the setting of the speed through constant for bit timing register. In the second program, received data from CAN BUS are saved as local variables for next process. The last two programs processing local variables for visualization and transferring data by TCP protocol on other devices such as touch panel. Visualization on other devices through TCP/IP has two extra controls, IP address of the source and port [10], [11], [12].

For visualization of instrument cluster from Skoda vehicle three messages of CAN communication are filtered, which are further processed. Compared to the physical cluster our visualization of the cluster does not display mileage and fuel gauge because these signals are not sent by CAN BUS [12], [13], [14].

The first CAN message contains data for speedometer and accelerator pedal position. As mentioned above, CAN BUS can transmit only eight-bit number, this means 255. If is there needed a value greater than this number, it is necessary to use more than one eight-bit number. For RPM, the second byte is used as lower eight bits and the third byte as upper eight bits. Real RPM is the result of division by four after joined of these upper and lower eight bits. The seventh byte is used for displaying accelerator position in percent.

Third CAN message is needed to get the speed of the vehicle. For data of RPM, two bytes, second and third are used. After joining, the result is divided by 100.

The first bit of the second CAN message contains information about the temperature of the coolant. To get the right range of temperature, division by ¾ and subtraction 48 is necessary, due to the fact, that the temperature of coolant can be below zero. Next step in data processing is nonlinearization of temperature gauge as a physical gauge so we can't see hysteresis of the thermostat.

Temperature displayed on gauge up to 90°C is real, range from 90°C to 110°C, which is operating temperature of the engine is displayed as 90°C, from 110°C is temperature curve nonlinearized as shown in figure 8.

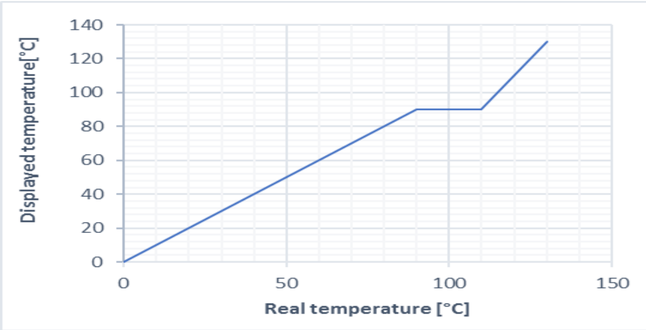


Fig. 7. The non-linearized curve of the temperature gauge.

Conclusion

The main purpose of this paper was a presentation of demonstration panel with highly sophisticated CAN BUS analyzer using powerful CompactRIO with dual-core processor and FPGA. This demonstration panel is used in teaching process in autotronics study program. Data from CAN BUS are acquired every 10ms and processed in LabVIEW and subsequently visualized in Skoda Octavia II instrument cluster. At the present, only engine speed, the speed of vehicle, coolant temperature and position of accelerator pedal are processed for visualization. Data processing for other indicators is possible except fuel gauge, because the signal of fuel level is transferred in analog form.

Acknowledgment

Results of this work are supported by grant APVV-15-0571 *Research of the optimum energy flow control in the electric vehicle system*, KEGA 073ŽU-4/2017 *Implementation of modern tools for teaching automotive electronics and electromobility*

References

[1] Walz, E.:Automotive Networking: CAN-bus Topology. [Online, cit. 2017.1.9]. Available at: https://www.linkedin.com/pulse/automotive-networking-can-bus-topology-eric-walz

[2] Freescale Semiconductor, Inc., Bosch Controller Area Network (CAN) Version 2.0, [Online, cit. 14.2.2017] Available at: https://www.nxp.com/docs/en/reference-manual/BCANPSV2.pdf

[3] Texas instrument, Introduction to the Controller Area Network (CAN), [Online, cit. 14.2.2017] Available at: http://www.ti.com/lit/an/sloa101b/sloa101b.pdf

[4] National Instruments, Getting started guide NI cRIO-9082, 2016, [Online, cit. 14.2.2017] Available at: http://www.ni.com/pdf/manuals/376904b.pdf

[5] National Instruments, User manual NI cRIO-9082, [Online, cit. 14.2.2017] Available at: 2016, [Online, cit. 14.2.2017] Available at: http://www.ni.com/pdf/manuals/376904a_03.pdf

[6] National Instruments, Getting started guide NI 9853, 2015, http://www.ni.com/pdf/manuals/371453f.pdf

[7] Robert Bosch mbH Ed.: Bosch Automotive Electrics and Automotive Electronics, Springer Vieweg, 2014, ISBN 978-3-658-01784-2

[8] Duchon, Frantisek; Hubinsky, Peter; Hanzel, Jaroslav; et al.: Intelligent vehicles as the robotic applications, In: 5th International Conference on Modelling of Mechanical and Mechatronics Systems (MMaMS) Location: SLOVAKIADate: NOV 06-08, 2012, MODELLING OF MECHANICAL AND MECHATRONICS SYSTEMS Book Series: Procedia Engineering Volume: 48 Pages: 105-114 Published: 2012

[9] Honeywell, Turbo Fundamentals, EMEA Aftermarket Press Event, June 17, 2009

[10] Johannes Kech, Ronald Hegner, Tobias Männle, Turbocharging: Key technology for high-performance engines, January 2014

[11] Hruska, Karel; Kindl, Vladimir; Pechanek, Roman: Concept, Design and Coupled Electro-Thermal Analysis of New Hybrid Drive Vehicle for Public Transport, In: 14th International Power Electronics and Motion Control Conference (EPE-PEMC), Published: 2010

[12] Koniar, D., Hargas, L., Simonova, A., Hrianka, M., Loncova, Z.: Virtual Instrumentation for Visual Inspection in Mechatronic Applications, In: Procedia Engineering (Modelling of Mechanical and Mechatronic Systems), Vol. 96, 2014, pp. 227 - 234, ISSN 1877-7058

[13] Spanik, P. – Hargas, L. – Hrianka, M. – Kozehuba, I.: Application of Virtual Instrumentation LabVIEW for Power Electronic System Analysis, In: Proceedings of the 12th international power electronics and motion control conference, EPE-PEMC 2006, Portoroz, Slovenia, 30th August – 1st September 2006, ISBN 1-4244-0121-6, pp. 1699-1702.

[14] HARGAŠ, L., KONIAR, D., ŠTOFAN, S.: Sophisticated Biomedical Tissue Measurement Using Image Analysis and Virtual Instrumentation, In: LabVIEW Practical Applications and Solutions, Edited by Silviu Folea, Published by InTech Janeza Trdine 9, 51000 Rijeka, Croatia July, 2011, Chapter 8 pp. 155-180 ISBN 978-953-307-650-8

BUILDING NEW REALITIES IN MALAYSIA: MULTI-PERSPECTIVE APPROACH THROUGH INTERACTIVE AND VIRTUAL LEARNING ENVIRONMENT IN HIGHER EDUCATION

Rachelle Guizella Salva Blas
rachelleguizellablas@gmail.com

Abstract: The need for a more advanced and equipped educational experiences is vastly growing. The use of internet, specifically using the Web is a wealth of resources and techniques that can be adopted by the teachers and students to keep pace with the unstoppable development of teaching and learning approaches towards building new realities in the new paradigm. To make the learning process interesting and engaging is getting more and more concerns from the educators. Nowadays, new media and technology bring the new ways of communication and collaboration, which provides an opportunity to promote more effective teaching and learning.

Virtual Learning Environment (VLE) uses software collaboration tool that allows the students to complete academic tasks at their own pace, time, and location where they can participate and contribute to an electronic communication discussions that will help develop their learning and enables the students and educators to develop their analytical skills, independent thinking, and encourage progressive thought.

Interactive and Virtual Learning environment are the necessitated tool towards building a more competitive and dynamic education system which facilitates a greater learning impact based on experiential and exploratory perspective. The objectives of this paper are:
(1) To unshackle the flexibility that interactive learning provides;
(2) To increase the learner's awareness of the effective bridging of virtual education in business practice; and,
(3) To reduce costs that it can bring to an education institution.

This paper is to examine the interactive and virtual learning and teaching methodology by developing new online tools to facilitate interdisciplinary learning. The objectives of this research were guided by the pedagogical principles that knowledge acquisition and learning are facilitated by interaction and collaboration with peers. To achieve this, the Virtual Learning Environment needed to offer a way of enhancing student interaction whilst providing an opportunity for peer-to-peer learning that offered unique motivational and cognitive benefits, whilst also enabling students from different background disciplines to grasp basic concept. At the same time, the interactive learning will strengthen the students' critical thinking and problem-solving skills using a much more holistic approach to learning.

This research will use quantitative method in the form for an e-questionnaire using Excel for analysis. The survey will be conducted amongst 500 STPM students and freshmen college/university students to establish a minimum representative sample size of 273 at a 95% confidence level to generate minimum representative results at response rate of 60%. Questions were set in 3 areas based on the research questions below:

1. Does Multi-perspective Approach through Interactive/Virtual Learning Environment have positive impact on student learning in higher education?
2. Does Multi-perspective Approach through Interactive/Virtual Learning Environment in higher education increases students' motivation to learn?
3. Does Multi-perspective Approach through Interactive/Virtual Learning Environment in teaching and learning in higher education develop students' independent learning?

This research will use both secondary and primary data collection methods to carry out the research. Secondary data will be collected from current research written in books, journal articles, newspapers, magazines and the Internet. These information will be used to write the literature review, while primary data will be used in discussing the research findings.

This study concludes that Interactive and Virtual learning is a strategic approach to improve quality of education since students of the present generation are conversant with internet technologies. In the same way, advancement of technology tailored to learning in higher education make a smooth transition from traditional classroom to a more experiential and heuristic student engagement, thus improving college retention rates as impacted by a more interesting and challenging learning mode.

CHANGE-POINT ANALYSIS

İsmet DOĞAN
idogan@aku.edu.tr

Nurhan DOĞAN
nurhandogan@hotmail.com

Objective:

The main purpose of this study is to introduce the most popular and uncomplicated three different change point detection methods (Cumulative Sum (CUSUM) method, Pettitt method and Mean Squared Error Minimization method). In the presence of time series data, the characteristics of the change point detection methods presented in this study have been investigated.

Method

The irregularity detection problem has an extremely wide range of applications that varies from vital critical to completely scientific. Statistically testing structural change problems is an important subject. In recent years, the change-point analysis method has proven to be a useful analytic tool in analyzing time series data sets and identifying underlying trends. Most of the results presented in previous studies show that change-point analysis is capable of revealing the existence of hidden change points in time series or sequence datasets. The change point problems have been much scrutinized in the statistical literatures. Change point detection can be defined as the problem of hypothesis testing between two alternatives. In general the problem concerns detecting whether or not a change has taken place. Formally, the problem is that of hypothesis testing: where is a sample of independent observations, and are distribution functions with corresponding density functions and , respectively. The unknown parameter , is called a change point.

Results and Conclusion

Despite its numerous advantages, change point analysis has two shortcomings. First, CPA can not detect isolated and abnormal points that are critical in explaining the emergence of the underlying mechanisms behind a particular event or process in a process. Second, the bootstrapping approach will not produce the same results every time it is performed. When the basic process is Gaussian, the CUSUM test has good properties. However, the CUSUM test is not robust against possible outliers in the data, because the sum can vary greatly when there are outliers. It should be assumed that parametric methods should know the initial distribution functions of random variables that are not satisfied in practice. For this reason, Pettitt (1979) proposed a test statistic to determine the mean changes based on Mann-Whitney two sample test. The Pettitt method, a rank-based test method, has been widely used to determine the change point in the mean value of the observed series. As a result, it has come to the conclusion that these methods are simple and effective methods to detect significant changes over time.

ÇOCUK POLİKLİNİKLERİNDE KAN VERME İŞLEMİNDE SANAL GERÇEKLİK UYGULAMASINA KATILAN ÇOCUKLAR İLE KATILMAYANLARIN ANKSİYETE DUYARLILIK DÜZEYLERİNİN İNCELENMESİ

Şenay ÇETİNKAYA, Emel YÜRÜK BAL

Çukurova University, Faculty of Health Sciences
Head of the Department of Pediatric Nursing, ADANA,TURKEY

scetinkaya@cu.edu.tr

Özet

Amaç: Bu çalışma, çocuk polikliniklerinde tıbbı tedavi ve/veya tanı amaçlı kan verecek olan 6-15 yaş grubu çocuklara, kan verme işlemini basit bir dille bilgilendiren video ve 3D videoların sanal gerçeklik gözlüğüyle izletildiği deney grubu ile sanal gerçeklik uygulamasına katılmayan kontrol grubundaki çocukların, anksiyete duyarlılıklarının incelenmesi amacıyla yapıldı.

Metot: Araştırma, Çukurova Üniversitesi Tıp Fakültesi Balcalı Hastanesi Çocuk polikliniklerinde, 15 Şubat-15 Mayıs 2019'da, deney grubu (n=30) ve kontrol grubuyla (n=30) yürütülen, randomize kontrollü deneysel bir çalışmadır. Araştırmada Everest VR-0022 VR BOX sanal gerçeklik gözlüğü, akıllı telefon, Sony MDR-EX650AP kulaklık kullanıldı. Veri toplamada anket formları olarak, kişisel bilgi formu, Çocuklarda Anksiyete Duyarlılık Ölçeği kullanıldı. Deney grubundaki çocuklar, kan verme işlemi sırasında, 3-10 dakikalık, dans, su parkı, hayvan belgeseli, keşif gezisi ve uzay belgeseli içerikli videolardan istediğini seçerek sanal gerçeklik gözlüğü ile izledi. Çocuklara izletilen 3D videolar, çocuk sağlığı ve hastalıkları hemşireliği alanında uzman araştırmacı tarafından, gelişimsel yaş dönemleri dikkate alınarak bilgi ve içerik düzenlemeleri incelerek seçildi. Videolar, web 2.0 aracı olan Powtoon uygulamasıyla hazırlandı. Verilerin analizinde SPSS programı kullanıldı.

Bulgular: Sanal gerçeklik uygulamasına katılan çocukların fiziksel, psikolojik ve sosyal anksiyete duyarlılık ölçek puanı ile toplam ölçek puanı (47.93±12.72, min=30, max=75) uygulamaya katılmayan (34.43±13.03, min=15, max=75) gruba göre düşük ve istatistiksel olarak anlamlıydı ($p<0.001$).

Sonuç: İnvaziv girişim olan kan verme işleminde, sanal gerçeklik uygulaması, çocukların anksiyete düzeylerini azalttığından kullanılması önerilmektedir.

Anahtar Kelimeler: Çocuk, Çocuk Sağlığı ve Hastalıkları Hemşireliği, Sanal gerçeklik, Anksiyete duyarlılık düzeyi.

Giriş

Sanal gerçeklik, bireyin duyularını yanıltarak fiziksel olarak sanal ortamın içindeymiş gibi hissetmesine olanak sağlayan üç boyutlu bilgisayar grafikleri temelli teknolojilerin kullanıldığı görece yeni bir maruz bırakma aracıdır. Sanal gerçeklik çalışmalarının son yıllarda klinik psikoloji alanında da yaygınlaştığı; sanal gerçekliğe dayalı terapilerin başta anksiyete bozuklukları olmak üzere geniş bir yelpazede uygulama alanına sahip olduğu görülmektedir (1,2).

Sanal gerçeklik (SG), bilgisayar yazılımlarının ve donanımlarının kombine edilmesi ile çeşitli boyutta ve duyusal uyaranlar oluşan sanal çevrede uygulanır (3).

Sağlık hizmetleri, yeni teknolojilerden çok hızlı şekilde etkilenen alanlardan biridir. Sağlık hizmetlerinin sunumunda kullanılan teknolojiler doktorlara, hemşirelere ve diğer sağlık çalışanlarına daha az hatayla işlerini yapma şansı verirken hastaların da daha kısa sürede iyileşmelerini sağlamaktadır. Bunlara ek olarak kullanılan teknolojiler, hizmet verimliliğini arttırmada ve kalitenin yükseltilmesinde önemli etkenler arasında yer almaktadır. Bu teknolojiler arasındaki sanal gerçeklik teknolojilerinin, gelecekte sağlık hizmetlerinde önemli derecede etkili olacağı düşünülmektedir (4).

Sağlık hizmetlerinin sunumunda genel olarak teknolojiler, sağlıklılık halinin devam ettirilmesi, hastalıkların başlangıç safhasının geciktirilmesi ya da engellenmesi ve sağlık problemlerine çözümler getirmek için kullanılmaktadır (5).

Hastaneye yatmanın çocuğun gelişimi üzerinde çeşitli olumsuz etkileri vardır. Çocuk için hastalık ve buna bağlı olarak hastanede yapılan işlemsel çocuğu korkutan, rahatsız eden ve hoş olmayan bir deneyimdir. Hastanede girişim uygulanan çocuk hastalık ile mücadele ederken tedavilerin yan etkileri, acı verici işlemler, ailesinden, oyun arkadaşlarından, okul çevresinden ayrılmanın verdiği anksiyete ile mücadele etmek zorundadır (6,7).

Kan alma, enjeksiyon uygulama gibi tıbbi işlemler çocukların en büyük ağrı kaynaklarından biridir.

Ağrıya bağlı yaşadığı anksiyete çocukların iğneden korkmasına, aşı uygulaması, enjeksiyon ve kan alma uygulaması gibi bazı tıbbi işlemlere karşı gönülsüzlüğü hatta tedavinin ihmal edilmesine ya da gecikmesine neden olabilmektedir.

SG üç boyutlu, interaktif ve eğlenceli bir tedavi yöntemidir. Görsel bir performans geri bildirimi sağlayan SG, kişilerin aktif katılımını destekleyen güçlü bir araçtır. Başarılı bir sanal deneyim, kullanıcıların fiziksel olarak sanal ortamın içindeymiş gibi hissetmelerine olanak sağlamaktadır. Bu his ancak dış ortam uyaranı dışarıda bırakılarak sadece bilgisayarın ürettiği uyaranın duyulması ve görülmesiyle sağlanabilir. Bu teknolojinin bazı sürümlerinde kullanıcıya ses, koku, dokunma gibi duyusal geri beslemeler de yapılabilmektedir (8).

Sanal gerçeklik uygulamaların da kişi gizliliğini sağlayarak kişinin utangaçlığını azaltmaktadır. Bunun dışında kişiler "sıkıcı" geleneksel tedavi yöntemlerine kıyasla "eğlenceli" buldukları sanal gerçeklik uygulamalarını tercih edebilmektedir. Böylelikle kişilerin tedavi paketine yönelik düşük motivasyonlarının ve yüksek yarıda bırakma oranlarının önüne geçilebilmektedir (1,2).

Sanal gerçeklik terapisinden 1990'ların ortalarından itibaren klinik alanda da yararlanılmaya başlanmıştır ve son yıllarda kullanım alanının genişlediği görülmektedir. Sanal gerçekliğe dayalı uygulamalar anksiyete bozukluklarında, yeme bozukluklarında, obezitede, cinsel bozukluklarda, süreğen ağrıda ve stresle baş etmede yaygın olarak kullanılmaya başlanmıştır. Sanal gerçekliğin en yaygın kullanımı ise anksiyete bozukluklarında (özgül fobiler, agorafobi, panik bozukluk, yaygın anksiyete bozukluğu, sosyal fobi), travma sonrası stres bozukluğunda ve obsesif-kompulsif bozuklukta (OKB) görülmektedir (9,10,11). Serabral palsili çocuklarda sanal gerçeklik terapisinin ruhsal uyuma etkileri, rehabilitasyonda oyun konsolları ile sanal gerçeklik uygulamaları araştırılmıştır (12,13,14).

Çocuk hemşireliğinde amaç; aile ve toplum içinde çocuğun fiziksel, zihinsel, ruhsal ve sosyal yönden sağlık ve esenliğini koruma, geliştirme, hastalık durumunda ise iyileştirmeye yönelik kapsamlı hemşirelik bakımı vermektir. Çocuk hemşiresi; çocuğun erişkinden farklı fiziksel, fizyolojik ve psikolojik özellikleri bulunduğunu, algılama sürecinin henüz tam gelişmemiş olduğunu fakat devamlı bir gelişme gösterdiğini, hastalığı algılama ve hastalığa tepkisinin, kronolojik yaş ve gelişimsel özelliklerine göre farklılık gösterdiğini bilmelidir. Çocuğa aile merkezli bakım verilmesi gerektiğini bilmeli, yaş ve gelişim düzeyine göre sözel ve sözel olamayan iletişim tekniklerini kullanabilmelidir (6,7).

Bu çalışma ile çocuk polikliniklerinde tıbbı tedavi ve tanı amaçlı kan verecek olan 6-15 yaş çocuklara, bazı tıbbi işlemler (kan verme) hakkında basit bir dille bilgilendirmeyi sunan video ve 3D videoların, sanal gerçeklik gözlüğü ile izletilmesi sonucu anksiyete duyarlılıklarının incelenmesidir.

Yöntem

Araştırma, Çukurova Üniversitesi Tıp Fakültesi Balcalı Hastanesi Çocuk polikliniklerinde, 15 Şubat-15 Mayıs 2019'da, deney grubu (n=30) ve kontrol grubuyla (n=30) yürütülen, randomize kontrollü deneysel bir çalışmadır. Araştırmada Everest VR-0022 VR BOX sanal gerçeklik gözlüğü, akıllı telefon, Sony MDR-EX650AP kulaklık kullanıldı. Veri toplamada anket formları olarak, kişisel bilgi formu, Çocuklarda Anksiyete Duyarlılık Ölçeği kullanıldı. Deney grubundaki çocuklar, kan verme işlemi sırasında, 3-10 dakikalık, dans, su parkı, hayvan belgeseli, keşif gezisi ve uzay belgeseli içerikli videolardan istediğini seçerek sanal gerçeklik gözlüğü ile izledi. Çocuklara izletilen 3D videolar, çocuk sağlığı ve hastalıkları hemşireliği alanında uzman araştırmacı tarafından, gelişimsel yaş dönemleri dikkate alınarak bilgi ve içerik düzenlemeleri incelerek seçildi. Videolar, web 2.0 aracı olan Powtoon uygulamasıyla hazırlandı. Verilerin analizinde SPSS programı kullanıldı.

Bulgular

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Sonuç

Sanal gerçeklik tedavisi birçok alanda kullanılabilmekte ve büyük yararlar sağlamaktadır. Sanal gerçeklik uygulamasına katılan çocukların fiziksel, psikolojik ve sosyal anksiyete duyarlılık ölçek puanı ile toplam ölçek puanı uygulamaya katılmayan gruba göre düşük bulunmuştur.

Son yıllarda hemşirelik araştırmaları çocuklarda işlemsel ağrının ve anksiyetenin azaltılmasında ilaç dışı yöntemlerin kullanılmasına odaklanmıştır.

Çocuklar duygularını anlatmada çoğu zaman zorlanırlar. Çocuklara kolaylıkla uygulanabilecek olan sanal gerçeklik tedavisi, çocukla çalışan sağlık personeli tarafından kullanılarak hastanede uygulanan işlemsel girişimlerde ve hastane yatmaya bağlı anksiyete, agresyon ve depresyon gibi bulguların erken belirlenip ve hastane algısı anlaşılarak belirlenecek yaklaşımın çocuklar ve sağlık personeli için daha yararlı olacağı düşünülmektedir.

Sanal gerçeklik tedavisi birçok alanda kullanılabilmekte ve büyük yararlar sağlamaktadır. Bunun yanı sıra tedavi sürecinde çocukların uyumunu sağlamakta da yararlı olduğu görülmüştür.

Sanal gerçeklik gözlüğünün invaziv işlem uygulamasını gerektirmemesi, acısız, ağrısız, güvenli, etkili, kolay uygulanabilmesi, yan etkisinin olmaması, anksiyete düzeyini ve kan verme sırasında geçen zamanın kısa algılanmasını sağladığından dolayı çocukların tedavi süreçlerini kolaylaştırması, hızlandırması, daha zevkli hale getirmesi sağlık çalışanları tarafından kullanılması önerilmektedir.

Uluslararası literatürde sanal gerçekliğin sağlıkla ilişkisi hakkında çok sayıda çalışma bulunmasına karşın, Türkçe literatürde çok az sayıda çalışma bulunmaktadır. Bu çalışmanın literatüre önemli katkılar sağlayacağı düşünülmektedir.

Kaynaklar

1- Kim K, Kim CH, Kim SY, Roh D, Kim S Virtual reality for obsessive-compulsive disorder: past and the future. Psychiatry Investig, 2009: (6) 115-121.

2- Kim K, Kim SI, Cha KR, Park J, Rosenthal MZ, Kim JJ et al. Development of a computer-based behavioral assessment of checking behavior in obsessive-compulsive disorder. Compr Psychiatry, 2010, 51:86-93.

3- Zhang, Z. Microsoft kinect sensor and its effect. MultiMedia, IEEE, 2012,19 (2), 4-10.

4- Seçim H, Pekelman T. Hastanelerde Verimliliği Yükseltici Uygulamalar: Biyomedikal Mühendislik Hizmetleri, 2017; http://www.merih.net/m1/hastane6.htm Erişim Tarihi: 21.11.2018

5- National Center for Health Statistics. Health, United States, 2009: With Special Feature on Medical Technology. National Center for Health Statistics (US), Hyattsville (MD), 2010.

6- Çavuşoğlu H.Çocuk Sağlığı Hemşireliği , 8. Baskı, Ankara, 2004; (1-24)

7- Conk Z, Başbakkal Z, Bal Yılmaz H, Bolışık B. Pediatri Hemşireliği, Akadesmisyen Tıp Kitabevi, Ankara 2013;(4-35)

8- Gregg L, Tarrier N. Virtual reality in mental health: a review. Soc Psychiatry Psychiatr Epidemiol, 2007, (42) 343-354.

9- Emmelkamp PM. Technological innovations in clinical assessment and psychotherapy. Psychother Psychosom, 2005, 74:336-343.

10- Botella C, Villa H, García-Palacios A, Baños RM, Quero S, Alcañiz M et al. Virtual reality exposure in the treatment of panic disorder and agoraphobia: a controlled study. Clin Psychol Psychother, 2007, 14:164–175.

11- Gorini A, Riva G. Virtual reality in anxiety disorders: the past and the future. Expert Rev Neurother, 2008, 8:215-233.

12- Tarakcı D. Pediatrik Rehabilitasyonda Oyun Konsolları ile Sanal Gerçeklik Uygulamaları. Turkiye Klinikleri J Physiother Rehabil-Special Topics 2015;1(1).

13- Metin Ökmen B, Doğan Aslan M ve ark. Serebral Palsili Cocuklarda Sanal Gerceklik Terapisinin Ruhsal Uyuma Etkisi. The Effect of Virtual Reality Therapy on Psychological Adaptation in Children with Cerebral Palsy. Noropsikiyatri Arşivi Dergisi, DOI: 10.4274/npa.y 6046.

14- Özkan F, Zincir H. Serebral Palsili Çocukların Rehabilitasyonunda Sanal Gerçeklik Tedavisi: Sistematik Derleme Treatment Of Vırtual Realıty In Rehabılıtıon Of Chıldren Wıth Cerebral Palsy: A Systematıc Revıew. Sağlık Bilimleri Dergisi (Journal of Health Sciences) 2017 ; 26 (2).

15- Seçer İ, Gülbahçe A. Adaptation of the Anxiety Sensitivity Index for Children to Turkish: The Study of Validity and ReliabilityMiddle Eastern & African Journal of Educational Research, 2013;(3):16- 93.

ÇOCUK YOĞUN BAKIM ÜNİTESİNDE YATAN HASTALARDA SEDASYONUN ÖNEMİ VE HEMŞİRELİK BAKIMI

Selin SEVİNÇ, Şenay ÇETİNKAYA

Çukurova University, Faculty of Health Sciences,
Head of the Department of Pediatric Nursing
scetinkaya@cu.edu.tr

Özet

Yoğun Bakım Üniteleri kritik hastalığa sahip, ileri tedavi ve bakım gereksinimi olan hastalara, tıbbi ekipmanlarla destek verilen ortamlardır. Çocuk Yoğun Bakım Üniteleri'nde solunum destek cihazlarının kullanımı, invazif girişimler nedeniyle çocuğun ağrılı işlemlere maruz kalmasının yanısıra ailelerinden uzak kalması, kendilerini yeterince ifade edememeleri gibi psikososyal etkiler de ağrı ve ajitasyon nedenleridir.

Holistik hasta bakımı çerçevesinde, çocuğun ağrı ve anksiyetesini gidermek Çocuk Sağlığı ve Hastalıkları Hemşirelerinin temel bakım hedefleridir. Hastaların konforunu sağlamak sedoral ajanların kullanımıyla mümkün olabilmektedir. Ancak uygulanan sedasyonun azlığı ya da fazlalığı komplikasyonlara sebebiyet verebilmektedir. Hastayı optimal sedasyon düzeyinde tutmak için hemşirelerin sedasyon değerlendirmesi yapması ve sedasyon skalalarını efektif olarak kullanabilmeleri gerekmektedir.

Anahtar Kelimeler: Ambuel konfor skalası, Çocuk Yoğun Bakım Ünitesi, Hemşire, Ramsay sedasyon ölçeği, Sedasyon.

IMPORTANCE OF SEDATION AND NURSING CARE IN PEDIATRIC INTENSIVE CARE UNIT

Abstract

Intensive Care Units are environments that are supported by medical equipment for patients that have critical disease and in need of advaanced treartment and care. Psychosocial effects are the causes of pain and agitation, such as the use of respiratory support devices in children's intensive care units, the child's being exposed to painful procedures as well as being away from their families, being unable to express themselves adequately.

Within the framework of holistic patient care, the child's pain and anxiety are the main care objectives of Child Health and Disease Nurses. Ensuring the comfort of patients is possible with the use of sedoral agents. However, exiguity or excessive sedation may lead to complications. In order to keep the patient at the level of optimal sedation, the nurses should be able to perform sedation evaluations and use the sedation scales effectively.

Key Words: Ambuel comfort scale, Pediatric Intensive Care Unit, Nurse, Ramsay sedation scale, Sedation.

DESIGN OF A TEACHING-LEARNING SEQUENCE TO FACILITATE TRANSITION BETWEEN QUALITATIVE AND QUANTITATIVE REASONING ABOUT KINEMATICS PHENOMENA

Louis TRUDEL
Université d'Ottawa, Faculté d'éducation, Ontario. Canada
ltrudel@uottawa.ca

Abdeljalil MÉTIOUI
Université du Québec à Montréal, département de didactique, Québec, Canada
metioui.abdeljalil@uqam.ca

Gilbert ARBEZ
Université d'Ottawa, Faculté de génie, Ontario, Canada
garbez@uottawa.ca

Abstract : Science experiments offered to the pupils in physics classrooms generally do not take into account their alternative conceptions in relation to physical phenomena so that they can encounter difficulties in identifying pertinent factors and expressing it in the form of quantitative equations (Ploetzner & Spada, 1998). Our research aims to specify the transition process between an understanding of an intuitive nature of the properties of phenomena, centered on the qualitative reasoning, and a more definite understanding, centered on the quantitative reasoning such as it is used in problem solving. To favour the understanding of physical phenomena, qualitative as well as quantitative reasoning must be mobilized and used in pedagogic contexts allowing exchanges between the pupils and favouring interaction with phenomena (Trudel, 2005). When combined with activities of exploration of physical phenomena, the resulting approach used feedbacks from the results of manipulations to limit the number of issued hypotheses, which is a prerequisite to their practical verification (Gunstone & Mitchell, 1998; Trudel, 2005). Moreover, the use of software, making easier the collection of data and their organization in form of tables and graphs, allowed the pupils to test their hypotheses much faster than with the traditional laboratory equipment so that pupils can change progressively the parameters of physical situations studied to explore relations between the physical variables (Riopel, 2005). As a conclusion, we draw the limits of the study and offer suggestions to teachers to improve the integration of qualitative and quantitative reasoning in the physics classrooms.

Keywords : Computer-assisted laboratory, kinematic, qualitative reasoning, model, understanding, problem-solving

Introduction

In response to what some have called traditional science teaching, consisting of lectures, exercises, and laboratories, Anderson (2002) recommends that pupils take a more active role in developing their knowledge under the supervision of the teacher. In this approach, called guided discovery, learning results from activities of testing pupils' ideas about the phenomena of their environment. By studying a phenomenon, the pupil is led to identify its properties, propose hypotheses to explain them and develop an experimental protocol to verify them. In doing so, he develops a better understanding of the scientific concepts and methods used by scientists to study the natural world (Llelewyn 2002, Someren & Tabbers 1998).

According to de Jong and van Jooligen (1998), pupils have difficulties in the various phases of the experimental process: hypothesis generation, experimental protocol design, data interpretation and the regulation of the experiment itself. Since these phases, although distinct, are interrelated, these difficulties can only be solved by teaching methods that take into account the cyclical and iterative nature of this approach (Acher & al., 2007, Llelewyn, 2002, Toplis, 2007). Thus, the formulation of hypotheses depends on the interaction between, on the one hand, the pupil's ideas about the phenomena studied and, on the other hand, the characteristics of the phenomena themselves (Trudel, 2005). Among the physical phenomena studied in high school, the learning of motion phenomena, or kinematics, is important for pupils for several reasons: 1) mastery of kinematic concepts is a prerequisite for learning subsequent physical concepts; 2) in kinematics, the pupil learns new methods, such as the construction of Cartesian graphs, the systematic measurement and collection of data, problem solving, etc., which will be useful in more advanced physics courses.

However, if there is one area that causes many difficulties for pupils, it is kinematics, defined as the study of the motion of objects without worrying about its causes (Champagne, Gunstone & Klopfer, 1985, Arons, 1990). There are several reasons advanced by researchers. First, before entering in physics classes, pupils have a wealth of experience about the properties of the motion acquired in their interactions with everyday events (Forbus and Gentner, 1986). This experience enabled them to construct a set of schemas to interpret the phenomena of motion (Champagne, Gunstone & Klopfer, 1985, Forbus & Gentner, 1986).

These schemas are perfectly adapted to the tasks of everyday life: riding a bicycle, catching an object, etc. On the other hand, these patterns differ markedly from scientific concepts. In some cases, these patterns may even interfere with learning, especially if the teacher ignores them. In this case, there is a great danger that pupils will distinguish school knowledge, which functions at school (for example, in the laboratory), from everyday knowledge, which enables them to react effectively to everyday events (Legendre, 1994).

A second reason for the difficulty of kinematics is the way it is taught in introductory courses in physics. Indeed, kinematics are often approached using a mathematization to which the pupils are not accustomed (Arons, 1990). For example, a common pedagogical procedure involves bringing pupils, at the beginning of the kinematics study, to the laboratory where they measure different properties of the motion they then carry on graphs. Back in class, they analyze the results obtained and perform calculations using formulas to obtain the values of speed and acceleration. However, it appears that pupils perform these various operations without a real understanding of what they do (Trempe, 1989, De Vecchi, 2006).

Finally, pupils' kinematic difficulties may also come from the way they process information. For example, pupils are inclined to make global judgments of comparison without taking into account the initial or final conditions of the motion studied. (Trowbridge, 1979, Trowbridge & McDermott, 1980, 1981, Feltovich al., 1993, Marshall & Carrejo, 2008). Often, even the concepts of speed and acceleration coincide with each other (Dekkers, 1997). These difficulties may prevent pupils from establishing appropriate links between concepts and, as a result, make it difficult for them to understand these (Stavy & Tirosh, 2000). These concepts may be inadequate and differ from the laws that form the conceptual framework of physics (Ploetzner & Spada, 1998).

To facilitate pupils' understanding, it is preferable that the concepts be presented concretely, in the form of physical models (Marshall & Carrejo, 2008). A physical model describes the simplifications, the links, the constraints and the internal structures of the studied phenomena (Greca & Moreira, 2002, Halloun, 1996). By studying various phenomena grouped in the form of physical models, the pupil comes to develop an internal representation of this situation, consisting of the elements chosen to interpret it and the perceived or imagined relationships between these elements (Acher & al., 2007; Greca & Moreira 2002, Halloun 2004). The result of this modeling of phenomena, in which the pupil identifies the different components of the situation studied as well as their relationships, is systematized in the form of better structured and more adequate cognitive schemas to perform certain scientific functions, for example to explain a more varied range of phenomena (Anderson & Roth, 1989, Halloun, 1996, Marshall & Carrejo, 2008).

To make it easier for the pupil to handle the experimental process required for these modeling activities, it is preferable to introduce the study of phenomena in a qualitative form for several reasons: 1) qualitative reasoning is familiar to pupils because it is used in everyday life (Forbus & Gentner 1986, Legendre 2002); 2) qualitative reasoning allows pupils to better discern the links between concepts because they are not distracted by the need for extensive mathematization (Champagne & al., 1985); 3) qualitative reasoning facilitates the recognition of the limits of the solution found and the constraints of the physical situation (Mualem & Eylon 2007, Goffard 1992).

On the other hand, there are limits to qualitative reasoning: 1) in several situations, it remains indeterminate, since it is not possible to predict the outcome (Crepault, 1989, Parsons, 2001) ; 2) it does not discern the relationships between several variables because it remains limited to the comparison of changes between pairs of variables (Someren & Tabbers, 1998); 3) The units of the variables are not taken into account because these units are determined by the measurement process that refers to the existence of an operational definition of the concept (Arons, 1990, Mäntylä & Koponen, 2007).

On the other hand, quantitative reasoning makes it possible to specify the functional relations that the variables relevant to a phenomenon have between them. In addition, this reasoning makes it possible to consider the interactions between several variables. Finally, the formulation of a rule in the form of an equation makes it possible to explain the properties of a phenomenon in the form of a system of relations of great generality (Mäntilä & Koponen, 2007, Safayeni & al., 2005).

Nevertheless, this type of reasoning is unfamiliar to the pupil so that he may have difficulty connecting various quantities together. Indeed, in order to solve problems requiring quantitative reasoning, pupils often resort to superficial methods of solving the problem of choosing a procedure on the basis of indices provided in the statement (Goffard 1992, Mestre & al., 1993). To overcome these shortcomings, the combination of qualitative and quantitative reasoning in a problem-solving strategy allows pupils to better understand physical concepts and improve their problem-solving skills (Gaigher & al., 2007).

Nevertheless, if this combination seems to improve physics learning, the way how to coordinate them still needs to be determined. To this end, different approaches have been suggested (Parsons, 2001). Among these, two approaches have been used in physics teaching. A first approach is to apply them one after the other. In this approach, qualitative reasoning favors the expression of a small group of plausible hypotheses about the properties of a phenomenon from a set of possible hypotheses (Parsons, 2001). Subsequently, the formulation of these hypotheses in a quantitative form makes it possible to specify among this small group the few hypotheses to be verified (Someren & Tabbers, 1998). The second approach, which integrates qualitative and quantitative reasoning, begins with the qualitative description of the properties of the phenomena and their classification in the form of relationships. The experiments are designed to transform the identified qualities into measurable quantities (allowing, for example, the operational definition of temperature) and qualitative relationships into quantitative laws (Koponen & Mäntylä, 2006). Nevertheless, these two approaches do not take into account alternative conceptions that pupils may have about the phenomenon being studied so that pupils may find it difficult to identify the relevant factors and to express them in a form that facilitates the quantitative formulation by pupils (Ploetzner & Spada, 1998).

To establish links between understanding and reasoning, both qualitative and quantitative, these processes must be mobilized and used in pedagogical contexts that allow exchanges between pupils and favor interaction with phenomena (Trudel, 2005). In this respect, it seems that pupils, in the Someren and Tabbers (1998) study, worked alone. Working in groups, especially when sharing information and exchanging points of view, such as in a small group discussion, allows pupils to access many sources of information and information. to open up to a diversity of points of view, which can favor the formulation of hypotheses (Trudel & Métioui, 2008). When combined with the exploration of phenomena, this approach provides feedback from the results of manipulations that limit the number of assumptions made, which is a prerequisite for the practical verification of these (Gunstone & Mitchell, 1998 Trudel, 2005).

However, it seems that, with regard to the study of phenomena, pupils have little opportunity to propose their own hypotheses in science laboratories (Nonon & Métioui, 2003, Trudel & Métioui, 2008). In addition, a study of the protocols proposed by the laboratory manuals in Quebec shows that pupils are seldom offered the opportunity to engage in an authentic research approach, the steps proposed by these manuals focusing on procedures for data collection and analysis (Métioui & Trudel, 2007). This high degree of structure of the tasks proposed in the laboratory can be explained in different ways: 1) a certain "pragmatic" conception of science leads teachers to prefer laboratories to guide pupils to the correct answer using proven methods and the pupils to be satisfied with having obtained the desired answer (Legendre, 1994, Toplis, 2007); 2) autonomous research would require mastery of several scientific skills, including identification of variables, quantification, coordination of facts and assumptions, etc. (de Jong & van Jooligen, 1998); 3) time and equipment constraints do not permit the repetition and modification of experiments (Toplis, 2007); 4) experience is seen more as a means of testing a hypothesis rather than discovering it (Koponen & Mäntylä, 2006).

To overcome these drawbacks and thus facilitate a more authentic investigation of scientific phenomena, the use of technology would facilitate and increase both the quantity and the quality of the data collected on the phenomena while supporting the pupil in his approach (Jonassen, Strobel & Gottdenker 2005, Hofstein & Lunetta 2004).

Such an approach, called a computer-assisted laboratory, has several advantages: 1) it allows the pupil to focus on the generation of hypotheses and the interpretation of results, two skills that are not well developed in traditional laboratories (Gianono, 2008); 2) it allows the pupil to quickly generate and verify several hypotheses, by facilitating in the latter the strategies of variation of parameters necessary to formulate hypotheses about the properties of phenomena (Riopel, 2005); 3) in physical situations where it is necessary to revisit the results of an experiment to verify its quality or possibly to modify the original hypothesis, computer-assisted experimentation may allow the traditional laboratory's approach to become iterative despite the constraints of the school environment. Indeed, it is often necessary for pupils to look back at the results of an experiment to study the causes of the gap between their ideas and the results obtained, thus promoting conceptual change in science (Trudel, 2005).

In light of the above, a learning approach aimed at facilitating the transition from qualitative reasoning to the discovery of quantitative laws should include provisions to promote the expression and comparison of pupils' ideas with each other (eg small groups) and provide pupils with the opportunity to quickly and easily test their ideas using experiments supported by data collection and analysis software (Riopel, 2005, Trudel, Parent & Métioui, 1989). The iterative nature of this approach, which mobilizes both qualitative and quantitative reasoning, should enable pupils to gradually build a scientific model of observed phenomena (Acher & al., 2007, Schwarz & White, 2007).

Our research objective is therefore to develop a learning approach to facilitate the induction of quantitative rules on motion through the prior use by pupils of qualitative reasoning in a discussion among pupils about the kinematic phenomena studied in the framework of a computer-assisted experimentation.

Design Of The Teaching-Learning Sequence

In order to study the transition (or coordination) between qualitative and quantitative reasoning, we need to design a learning process that can produce the desired changes (Siegler, 2006). To this end, we have designed a scenario of the activities as described in the previous section. This scenario specifies the different pathways that pupils can take to develop a better understanding by taking into account the particular difficulties they may encounter in their learning. This scenario includes the goals of the activities, the structure of the content of the field studied, the pathways followed by the pupils to reach their goals, taking into account the misconceptions they harbor and the activities offered to the pupils. The purpose of the activities is to help pupils develop a better understanding of kinematic concepts and problem-solving skills through an approach combining qualitative and quantitative reasoning about the properties of motion phenomena. The suggested approach aims to help pupils modify their schemas in stages so that they move progressively closer to kinematic concepts.

To represent the kinematic phenomena, we organized them into physical models. In kinematics, there are three models (Halloun, 2004): the constant speed motion in a straight line, the uniformly accelerated motion and the mixed motion that combines the first two. These models assisted us in designing specific activities to help pupils understand the different aspects of the motion. To facilitate the modeling of kinematic phenomena by pupils, we must determine the different ways pupils understand motion and consequently the different routes they can take in their learning.

To this end, we have designed networks of understanding the concepts of kinematics. These networks of understanding consist of two types of information: 1) the main concepts of kinematics, such as speed or acceleration, and their interrelationships; 2) indications of pupils' misunderstanding of these concepts (Klir, 2001, Trudel, Parent & Métioui, 2009). Once the conceptual structure of the domain and the misunderstandings identified, we organized learning activities to support the different routes that pupils can take by developing a better understanding of the properties of the motion (Méheut & Psillos, 2004).

With regard to modeling of kinematic phenomena, we have designed activities to meet the characteristics of the different models previously described: uniform rectilinear motion, uniformly accelerated motion, and mixed motion. To allow pupils to work in small groups (about four pupils), we have designed an activity guide to guide the pupil's approach. The guide contains cases to study different aspects of motion grouped in the three kinematic models described above. Each case includes activities (questions, graphs to complete, etc.) that guide the process of modeling pupils. The modeling process is structured according to a POE task (Prediction> Observation> Explanation) (Gunstone & Mitchell, 1998).

Each POE task runs as follows. A physical situation, represented in concrete form by a physical set-up, is explained to the pupils in the guide. Questions associated with this case ask the pupil to predict what will happen if the experiment is done. They then write down their predictions in their notebook. Pupils in groups of four then assembled the set-up associated with this case according to the guide's instructions. They observe the properties of the targeted motion and write their observations in their notebook. They then try to explain the gap, if any, between their predictions and their observations. In doing so, they can modify the set-up to study other aspects of the motion or to check alternative hypotheses emitted during their exchanges.

The verification of pupils' hypotheses is done in small groups at the computer-assisted laboratory. First, the videos of the balls rolling on rails at different inclinations are captured with a digital camera in the video recording position. The contents of the sequences filmed by the camera are transferred to the computer and transformed into a video file by the Quick Time software. Once in this form, the image sequences can be viewed as in a movie. Having inserted these sequences of images in the REGAVI software, the pupil can use the mouse with a cursor to take measurements of the successive positions of the ball as a function of time. These measurements are immediately tabulated by the REGAVI software. In addition, this software contains features for choosing reference axes, tracking the motion of multiple objects at a time, and matching the position and time intervals in the video with the positions and times measured at the experiment itself. Subsequently, the data tables provided by the REGAVI software can be transferred to the REGRESSI analysis software for analysis. The latter software has features that allow the user to make different graphs of position, speed and acceleration as a function of time. In addition, the REGRESSI software facilitates the discovery of relationships between variables by providing means for comparing the fit of different curves (linear, quadratic, exponential, etc.) to the data obtained.

Unfolding of the activities

We have implemented various aspects of the approach described in the previous section in several classes of high school pupils and the training of future science teachers (Trudel, 2005, Trudel and Métioui, 2010). We were inspired by the logbook information from this research and the results of the analysis of pupil responses in the pupil handbook to specify, based on the characteristics of the samples, the progress of the proposed approach in the classroom (Altrichter & Hollly, 2005). For the sake of clarity, we have chosen the three most significant cases in our case among those constituting the proposed approach (Trudel, 2005).

First case
The first case submitted to pupils consists of a POE task (see Figure 1) shows an excerpt from the description of this case in the pupil's guide (Trudel, 2005):
"A ball is thrown on a horizontal rail. The gray circle indicates its initial position at launch. The circle with the symbol 1 inside indicates the position of the ball after 1 second."

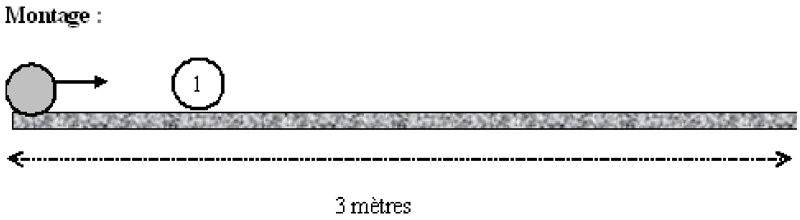


Figure 1 Motion of ball rolling on an horizontal track.

The POE task then consists in predicting what will be the successive positions of the ball every second, knowing the distance traveled in the first second. From these predictions, the teacher asks his pupils to draw a graph of what the position of the ball would be as a function of time. Indeed, it is important to encourage pupils to specify their prediction in a concrete way in order to compare it more easily to experimental results (White and Gunstone, 1992).

The teacher then proceeds to carry out the experiment. Then he asks them to explain any discrepancies, if any, between their predictions and their observations of the motion of the ball. It should be noted that the conceptions of pupils appeared similar from one group to another, and from one level of teaching to another (Trowbridge and McDermott, 1980, 1981):

1) The speed of the ball increases in the first part of the path, remains constant in the middle part, then slows down thereafter. It should be noted here that among the pupils who attribute an acceleration to the ball initially, some tend to confuse the initial time with that when the ball is set in motion by the experimenter.
2) The speed of the ball remains constant until the end, without noticeable slowdown. Some explain that the length of the rail is too short or that the slowdown is too slow to be detected.
3) The speed of the ball decreases gradually until it stops. Pupils who maintain this conception invoke friction as the cause of slowing down.

During classroom discussions, some pupils justified their choice of a conception based on visual evidences such as the ball appears or does not seem to slow down. At this stage, the pupils themselves propose to measure the velocities over intervals of time and distance chosen using stopwatch and meter. It is then possible to turn the discussion into experimentation in small groups. During the experiment, the sequences of the motion of the ball are collected using a digital camera and subsequently transferred to the REGAVI software and then to the REGRESSI software for measurement and analysis of the position and speed of the ball according to time.

The positions and times obtained are then tabulated and then plotted on position-time and speed-time graphs. In general, the computer system allows the pupil to measure the motions of the ball in the different successive time intervals and thus establish the constancy or not of the speed. In addition, the study of the shape of the curve of the position as a function of time makes it possible to compare it to the expectations of the pupils as to the form of this motion established in the prediction part of the POE task.

By providing various feedbacks, whether in pupils' exchanges or comparison of expectations with the results of experiments, such an approach is likely to facilitate a better understanding of kinematic concepts. Indeed, by comparing the shape of the two curves, pupils realize that, contrary to their expectations, the motion between successive time intervals is identical and that friction plays a negligible role. For pupils at higher levels, whose mathematics training is more advanced, it is possible with the REGRESSI software to compare the fit of the curve to different functions, whether they are linear, quadratic or other. So in this case, the curve obtained by the REGRESSI software is as follows:

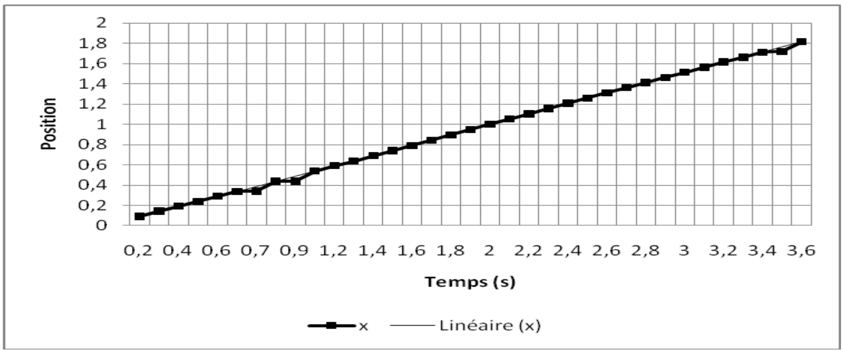


Fig. 2 Position-time graph in case of uniform rectilinear motion

Second case

In addition, it is possible to consider complex physical situations (see Figure 3).

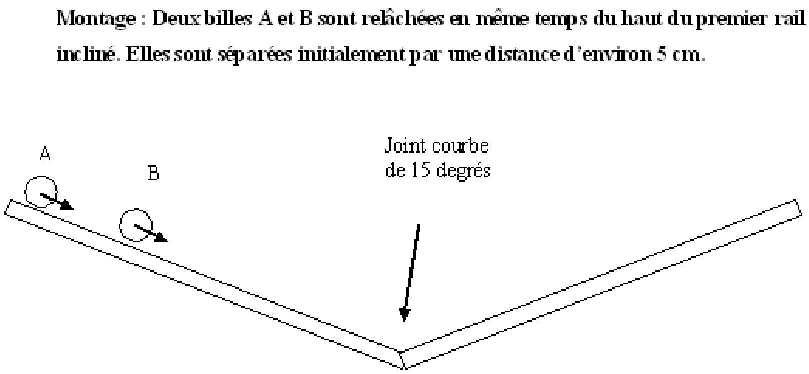


Figure 3 Motion of two balls separated by an initial distance down a system of two tracks making an angle

The teacher then asks the pupils if Ball A will eventually catch Ball B. In the Prediction section, he asks pupils to predict the respective positions of Balls A and B over time. In addition, he asks them from their predictions to plot the position-time and speed-time graphs of the two balls. In general, if the pupils have understood the previous cases concerning the acceleration of balls going down or down an inclined rail, they can study this situation and contribute to classroom exchanges. The debates that result from this scenario can be lively because it is a complex situation that includes an interesting issue, the prediction of the properties of a motion familiar to pupils.

In particular, the prediction of the position-time graph presents a particular difficulty because it consists of an upward parabola (acceleration) followed by a downward parabola (deceleration) (see Fig. 4). In this respect, the continuity of the speed, represented by the tangent to the position-time curve, allows that there is a point of inflexion between the two trajectory segments. As a result, this is a challenging situation for pupils of all levels. Nevertheless, the familiar nature of this motion situation makes it possible for everyone to participate in the discussion by making assumptions. In particular, some pupils may argue that the distance between the balls will not vary in the first segment, as the acceleration along the inclined plane is the same as well as their initial velocity (which is zero). Only when they go back does the motion become asymmetrical. Indeed, the ball A having descended the first part over a greater distance will start the second part with an initial speed greater than the ball B. In certain conditions which depend mainly on the initial distance between the two balls, the ball A will be able to catch ball B before it has reached the top of its trajectory.

This situation involves many concepts and we lack space to describe the different strategies adopted by the pupils. Even if it is possible by reasoning to provide convincing arguments in support of any of the ideas expressed by the pupils, the possibility of quickly taking data from the positions of the two marbles as well as amkinf readily position-time and speed-time graphs allow pupils to sort out various opinions and move toward a deeper understanding of the concepts involved.

Figure 4 shows that the position as a function of time corresponds to the juxtaposition of two parabolas, one upwardly downward and the other downward upward. As expected, the point of inflexion between the two parables is halfway.

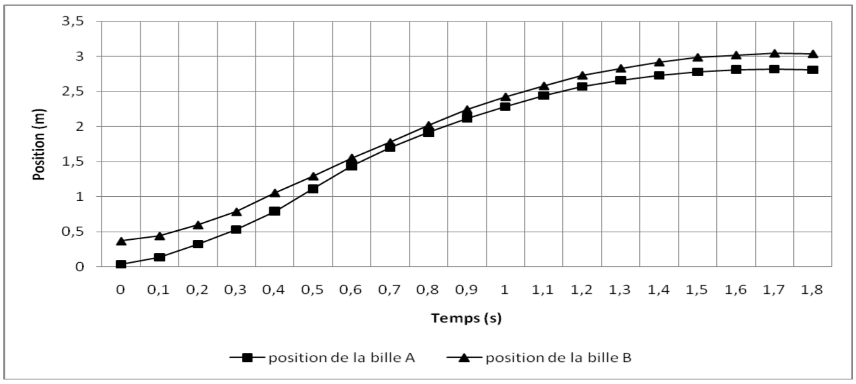


Figure 4 Position-time graph of the two balls in pursuit

Figure 5 below shows the speeds as a function of time of the balls A and B of this case of pursuit. It is noted in the first part of the path that the speeds of the two balls increase regularly with the same acceleration (the slopes of the lines are substantially the same). The two balls reach their maximum speed then decrease to zero. It is interesting to note that the final speed of the ball A is greater than the speed of the ball B (which could be predicted taking into account that the ball A is accelerated over a greater distance than the ball B). On the other hand, it is also curious to note that, in the second part of its trajectory, the speed of the ball A is lower than that of the ball B. This inversion takes place after the speeds of the balls A and B have become equal, at a time of about 7 seconds. A plausible explanation would be that the balls A and B then collided and some of the impact contributed to the decrease in the speed of the ball A.

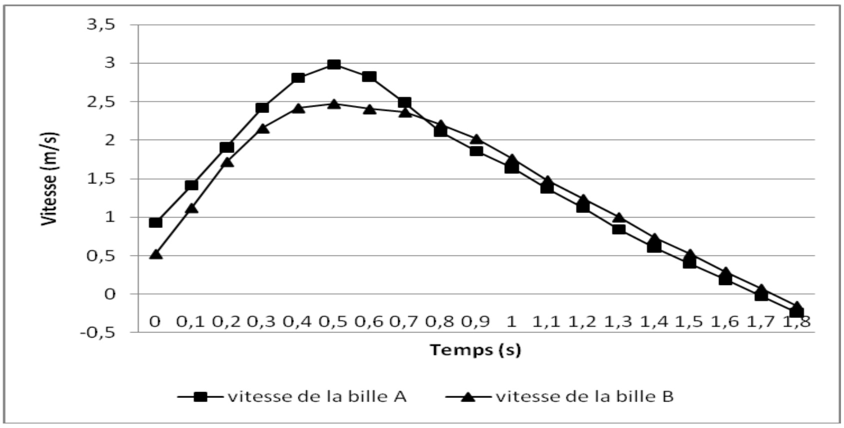


Figure 5 Speed-time graph of the two balls in pursuit

Third case

The third case is an example of a single ball whose segments of the trajectory have different motions (see Fig. 6):

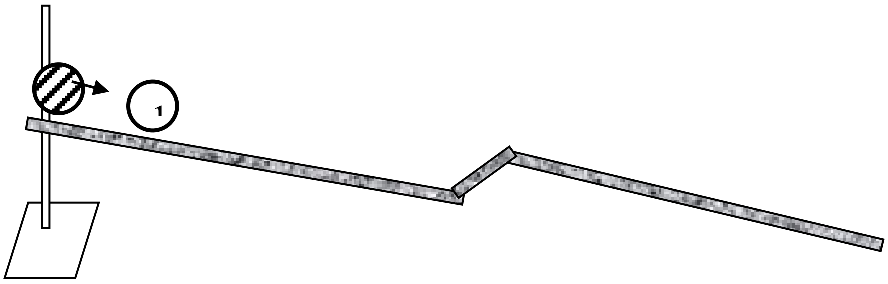


Fig 6 Ball rolling down an inclined track with a bump

In this case, the teacher asks the pupil to predict the different positions of the ball as a function of time. This case is an application of the concept of instantaneous speed and should be presented to pupils after they have studied the characteristics of accelerated motion and those of decelerated motion. To solve this problem, the pupil must juxtapose several parabolic motions in order to respect the continuity of the speed at the junction points. In Some pupils went so far as to invoke considerations of energy conservation. So, depending on where the ball is dropped, she might or might not have the energy to overcome the "bump".

The following graph shows the position of the ball as a function of time (see Fig. 7). We note that the first part of the motion is represented by a parabola directed upward (downhill) followed by a parabola section pointing downwards (raising of the hump) and finally again with a parabola facing upwards (descent again). It should be noted that the "mechanical" use of the regression could give us a line as a best curve, whereas by the discussion, most pupils can easily juxtapose the curves corresponding to each segment of the trajectory.

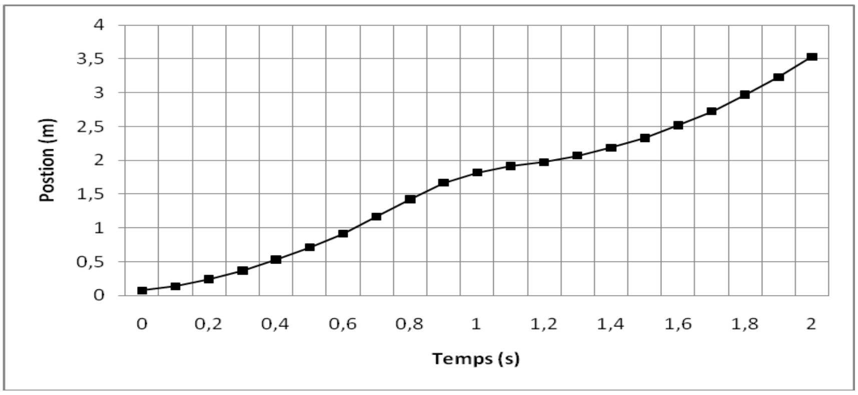


Figure 7 Position-time graph of the ball undergoing successive accelerated and decelerated motions

Discussion and Conclusion

The use of computers in the physics laboratory is revolutionizing the teaching of this discipline. Nevertheless, computer-assisted experimentation is too often devoted to the technical side of automated data acquisition and its organization in the form of tables and graphs. This emphasis on the technical accuracy of the measures, despite its rigor, may obscure the need for judgment.

It is one of the essential characteristics of common sense to be able to understand the physical phenomena that surround us without having to go through advanced mathematization, which is not very effective in solving everyday problems. Nevertheless, it is not a question of abandoning the mathematization of the properties of the phenomena but of approaching it when the essential elements of the problem have been understood by the pupils.

The approach presented here proposes to use the capacities of the computer so that the pupil can, from a representation of common sense, of qualitative nature, of the properties of the phenomena, to pass to a mathematical representation in the form of position-time and speed-time graphs. Our semi-quantitative approach allows, through reasoning, pupil-to-pupil exchanges and the use of various modes of representation, for high school pupils to study kinematic phenomena of a complex nature, previously reserved for postgraduate education, college and university in particular. These still embryonic results seem promising.

In particular, studies involving groups of pupils under controlled conditions, difficult to reproduce in the heat of the teacher's daily action, would make it possible to follow the progress of pupils when they make the transition between their common sense representations and scientific representations. To date, research in science didactics has studied pupils 'understanding of simple phenomena in which pupils' conceptions have mostly been acquired through the observation of everyday phenomena. However, studying pupils' alternative conceptions when they are experimenting with the properties of complex motion phenomena would allow us to better understand how these pupils relate the various kinematics concepts needed to solve them.

References

Acher, A., Arca, M., et Sanmarti, N. (2007). Modeling as a Teaching Learning Process for Understanding Materials : A case study in primary education. Science Education, publié en ligne au site www.interscience.wiley.com DOI 10.1002/sce.20196.

Altrichter, H. et Hollly, M.L. (2005) : "Research Diaries", In B. Somekh et C. Lewin (Eds.), *Research Methods in the Social Sciences*, chap. 2. Thousand Oaks (Californie) : Éditions SAGE.

Anderson, R. E. (2002). "Reforming science teaching: What research says about inquiry". Journal of Science Teacher Education, 13(1), 1-12.

Anderson, C. W., et Roth, K. J. (1989). "Teaching for meaningfull and self-regulated learning of science". Advances in Research on Teaching, 1, 265-309.

Arons, A. B. (1990). A guide to introductory physics teaching. Toronto: John Wiley & Sons.

Champagne, A. B., Gunstone, R. F. et Klopfer, L. E. (1985). "Instructional consequences of pupils' knowledge about physical phenomena". In L.T. West et A.L. Pines (Eds), Cognitive structures and conceptual change (pp. 61-89). Montréal: Academic Press.

Crépault, J. (1989) «Temps et raisonnement: Développement cognitif de l'enfant à l'adulte». Presses Universitaires de Lille, 558 p.

De Jong, T., et van Joolingen, R. (1998). "Scientific discovery learning with computer simulations of conceptual domains". Review of Educational Research, 68(2), 179-201.

Dekkers, P. J. J. M. (1997). "Making productive use of pupil conceptions in physics education: Developing the concept of force through practical work". Thèse de doctorat, Amsterdam, Université de Vrije.

De Vecchi, G. (2006). Enseigner l'expérimental en classe: Pour une véritable éducation scientifique. Paris: Hachette.

Feltovitch, P. J., Spiro, R. J. et Coulson, R. L. (1993). "Learning, teaching, and testing for complex conceptual understanding". In N. Frederiksen, R.J. Mislevy et I.I. Bejaar (Eds.), Test theory for a new generation of tests, sous la dir. de, p. 181-217. Hillsdale, NJ: Lawrence Erlbaum Associates.

Forbus, K. D. et Gentner, D. (1986). "Learning physical domains: Toward a theoretical framework". In T.2 de R. Michalski, J. G. Carbonell et T. M. Mitchell (Eds.), Machine learning: An artificial intelligence approach (pp. 311-348). Los Altos (Californie): Morgan Kaufman Publishers.

Gaigher, E., Rogan, J. M., et Braun, M. W. (2007). "Exploring the development of conceptual understanding through structured problem-solving physics». International Journal of Science Education, 29(9), 1089-1110.

Gianino, C. (2008). « Microcomputer-based laboratory for Archimedes' principle and density of liquids ». *The Physics Teacher*, 46, 52-54.

Goffard, M. (1992). «Partager le savoir, partager le pouvoir». Science et Vie, no 180 (septembre), p. 84-89.
Greca, I. M., et Moreira, M. A. (2002). "Mental, physical, and mathematical models in the teaching and learning of physics". Science Education, 86(1), 106-121.
Gunstone, R. F., et Mitchell, I. J. (1998). "Metacognition and conceptual change". In J. J. Mintzes, J. H. Wandersee et J. D. Novak (Eds.), Teaching science for understanding: A human constructivist view (pp. 133-163), San Diego, CA: Academic Press.
Halloun, I. (1996). "Schematic modeling for meaningfull learning of physics". Journal of Research in Science Teaching, 33(9), 1019-1041.
Halloun, I. A. (2004). Modeling theory in science education. Boston: Kluwer Academic Publishers.
Hofstein, A., et Lunetta, N. (2004). The laboratory in science education : Foundations for the twenty-first century. Science Education, 88(1), 28-54.
Jonassen, D., Strobel, J., et Gottdenker, J. (2005). Model building for conceptual change. Interactive Learning Environments, 13(1-2), 15-37.
Klir, G. J. (2001). "Conceptual frameworks". Chap. In Facets of systems science (2ème éd., p. 41-69). New York: Kluwer Academic/Plenum Publishers.
Koponen, I. T., et Mäntylä, T. (2006). "Generative role of experiments in physics and in teaching physics: A suggestion for epistemological reconstruction". Science & Education, 15, 31-54.
Legendre, M.-F. (1994). «Problématique de l'apprentissage et de l'enseignement des sciences au secondaire: Un état de la question». Revue des sciences de l'éducation, 20, (4), 657-677.
Legendre, M.-F. (2002). «Le rôle du raisonnement qualitatif dans les processus de changement conceptuel et ses implications pour l'enseignement et la formation des enseignants ». In R. M. J. Toussaint (Éd.), Changement conceptuel et apprentissage des sciences : Recherches et pratiques (pp. 177-201). Outremont, Québec: Les Éditions LOGIQUES.
Llelewyn, D. (2002). Inquiry within : Implementing inquiry-based science standards. Thousands Oaks (Californie): Corwin Press.
Mäntylä, T., et Koponen, I. (2007). "Understanding the role of measurements in creating physical quantities : A case study of learning to quantify temperature in physics teacher education". Science & Education, 16, 91-311.
Marshall, J. A. et Carrejo, D. J. (2008). "Pupils' mathematical modeling of motion". Journal of Research in Science Teaching, 45(2), 153-173.
Méheut, M. et Psillos, D. (2004). "Teaching-learning sequences: Aims and tools for science education research". International Journal of Science Education, 26(5), 515-535.
Mestre, J. P., Dufrene, R. J., Gerace, W. J., et Hardiman, P. T. (1993). "Promoting skilled problem solving behavior among beginning physics pupils". Journal of Research in Science Teaching, 30(3), 303-317.
Métioui, A. et Trudel, L. (2007). Analyse critique des expériences proposées dans les manuels destinés aux jeunes de 8 à 12 ans: Magnétisme, électrostatique et circuits électriques. Cédérom : Critical Analysis of School Science Textbooks, 12 pages, sous la direction de P. Clément, IOSTE International Meeting Tunisia Hammamet, 7 to 10, February, 12 pages.
Mualem, R. et Eylon, B.-S.. (2007). ""Physics with a smile"-Explaining phenomena with a qualitative problem-solving strategy". The Physics Teacher, 45, 158-163.
Nonnon, P., & Métioui, A. (2003). «L'appropriation du processus de vérification expérimentale par des étudiants en formation des maîtres au secondaire : exemple de la diffusion de la chaleur dans un liquide». RES (Revue de l'Enseignement Supérieur), Academica, 21(1), 39-61.
Parsons, Simon. (2001). Qualitative methods for reasoning under uncertainty. Cambridge (Massachusetts): The MIT Press.
Ploetzner, R., et Spada, H. (1998). "Constructing quantitative problem representations on the basis of qualitative reasoning". Interactive Learning Environment, 5, 95-107.
Riopel, M. (2005). Conception et mise à l'essai d'un environnement d'apprentissage intégrant l'expérimentation assistée par ordinateur et la simulation assistée par ordinateur. Thèse de doctorat, Montréal, Université de Montréal.
Safayeni, F., Derbentseva, N., et Canas, A. J. (2005). "A theoretical note on concepts and the need for cyclic concept maps". Journal of Research in Science Teaching, 42(7), 741-766.
Schwarz, C. et White, B. Y. (2005). "Metamodeling knowledge : Developing pupils' understanding of scientific modeling". Cognition and Instruction, 23(2), 165-205.
Siegler, R.S. (2006). "Microgenetic analyses of learning". In W. Damon & R.M. Lerner (Series Eds.), D. Khun et R. S. Siegler (Vol. Eds.), Handbook of child psychology: Volume 2: Cognition, perception, and language (6th ed., pp. 464-510). Hoboken, NJ: Wiley.

Someren, M., et Tabbers, H. (1998). "The role of prior qualitative knowledge in inductive learning". In M. W. Someren, P. Reimann, H. P.A. Boshuizen et T. de Jong (Eds.), Learning with multiple representations (pp. 102-119). New York: Pergamon.

Stavy, R., Tirosh, P. (2000). How pupils (mis-) understand science and mathematics: intuitive rules. New York: Teachers College Press.

Toplis, R. (2007). "Evaluating science investigations at ages 14-16: Dealing with anomalous results". International Journal of Science Education, 29(2), 127-150.

Trempe, P.-L. (1989). «L’enseignement des sciences au quotidien : Six études de cas au primaire et au secondaire (problématique, méthodologie, interprétation, synthèse générale de l’information)». Monographies des sciences de l’éducation, vol. 1, no 1. Trois-Rivières, Université du Québec à Trois-Rivières, 204 p.

Trowbridge, D. E. (1979). "An investigation of understanding of kinematical concepts among introductory physics pupils". Thèse de doctorat, University of Washington.

Trowbridge, D. E., McDermott, L. C. (1980). "Investigation of pupil understanding of the concept of velocity in one dimension". American Journal of Physics, 48(12), 1020-1028.

Trowbridge, D. E., McDermott, L. A. (1981). "Investigation of pupil understanding of the concept of acceleration in one dimension". American Journal of Physics, 49(3), 242-253.

Trudel, L. (2005). Impact d’une méthode de discussion sur la compréhension des concepts de la cinématique chez les élèves de cinquième secondaire. Thèse de doctorat, Montréal, Université du Québec à Montréal.

Trudel, L. et Métioui, A. (2008) . Influence d’une discussion préalable sur la participation des élèves dans un laboratoire de physique du secondaire. Conférence Internationale Éducation, Économie et Société Novotel Paris Tour Eiffel, 17-19 Juillet 2008, CD-ROM, pp. 410-424.

Trudel, L., et Métioui, A. (2010). « Étude exploratoire d’une démarche de formation et de ses effets sur la planification d’une stratégie d’enquête scientifique en physique par de futurs enseignants ». In C. Couture et L. Dionne (Dir.), *La formation et le développement professionnel des enseignants en sciences, technologie et mathématiques* (pp. 151-179). Ottawa : Les Presses de l’Université d’Ottawa.

Trudel, L., Parent, C., & Métioui, A. (2009). Démarche, cheminement et stratégies : une approche en trois phases pour favoriser la compréhension des concepts scientifiques. *Revue des sciences de l’éducation*, 35(3), 149-172.

White, R., et Gunstone, R. (1992). Probing understanding. London : The Falmer Press.

DETERMINING UNMANNED AERIAL VEHICLE DESIGN PARAMETERS FOR AIR POLLUTION DETECTION SYSTEM

Sezgin Ersoy, Mehmet Erdem Taş

Marmara University, Technology Faculty Mechatronics Engineering, Istanbul,Turkey

sersoy@marmara.edu.tr, mehmet.erdem@marun.edu.tr

Abstract: The expansion of the use of unmanned aerial vehicles has developed new ideas and applications. The use of unmanned aerial vehicles has a wide target range from postal distribution to agricultural land inspection. The aim of this study is to design unmanned aircraft systems that can analyze air pollution from specific points, transfer instant pollution information to computer and transfer images to desired points. The important point in the design is that the aerodynamics of the mechanical structure give the most effective results at high altitudes and changing wind speeds. In this study, a quadcopter was designed to be used in instant air measurements. In the computational flow analysis applied on the design, for air flow values of 10m / sec, 15m / sec, 20m / sec and 25m / sec; The effect of pressure, turbulence and velocity variables were investigated. As a result of the analysis, no results were found to affect the vehicle's ability to move in these parameters. As a consequence of the studies and analyzes, it is concluded that this design is suitable for instant air pollution measurements.

Keywords: Unmanned Aerial Vehicles , Air Pollution, Computational Analysis of Quadrotor, Aerodynamics

Introduction

A multicopter is a helicopter with multiple propellers. It may have 2, 3, or more propellers. The most used multicopter versions are:
T Copter (2 engines), Y Copter (3 engines), QuadCopter (4 engines), HexaCopter (6 engines).
These systems are powered by rechargeable lithium polymer batteries. Multicopters need a flight controller to stabilize in the air. These controllers contain various sensors. There are several types of sensors depending on the controller to be used such as gyro, acceleration sensor, magnetic field sensor, global positioning system, ultrasonic sensor, and pressure sensor.
The quadcopter, which is a more stable and symmetrical unmanned aerial vehicle, is a 4-rotor vehicle that meets the definition of a VTOL (vertical take-off and landing). Unlike normal helicopters, the quadcopter does not have a tail rotor to correct the inertia created by the engine, instead, coaxial pairs of propellers provide stability by rotating in opposite directions to each other and adjusting the RPM (revolutions per minute) every second.
Quadcopters have some advantages over the helicopters in similar size.
First, Quadcopters do not need mechanical connections to change the propeller angle. This simplifies its design and maintenance. Secondly, the diameter of the engines is small since four engines are used, which means that they have less kinetic energy during flight so that the engines get less damage in the event of a possible collision. Quadcopter chassis is frequently used in amateur model flight projects thanks to ease of construction and control. Another advantage of the quadcopter is that it is more efficient and lighter than real helicopters and other people-carrying vehicles because it works with electrical energy. However, it is a disadvantage that the mechanically full-scale model is quite difficult to construct and fly (Göl,2019).

Materials and Methods

First of all, if we examine the assembly of the components and electronics of the mechanics to be analyzed;
it is produced with carbon fiber structure with a front surface which will slow down the speed of the fluid in dense airflow.

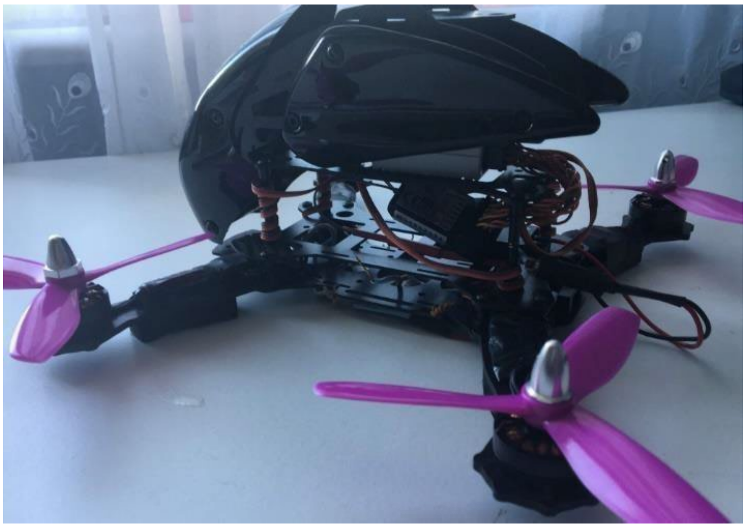


Figure-1: Image of our quadcopter after its assembled

We used drawing in the design stage and Solidworks software for CFD analysis and tensile stress analysis.

Quantity	Hardware
4	Readytosky 2212 920KV Brushless Motor
4	Emax 12A ESC
1	Profuse 25C 2250mAH 3S Battery
1	Flysky FS-R6B Receiver
1	Flysky FS-I6 Transmitter
1	Carbonfiber Frame Parts

Table-1: Hardware Equipments

Quantity	Software
1	DJI NAZA M-LITE
1	SOLIDWORKS
1	ANSYS

Table-2: Software Equipments

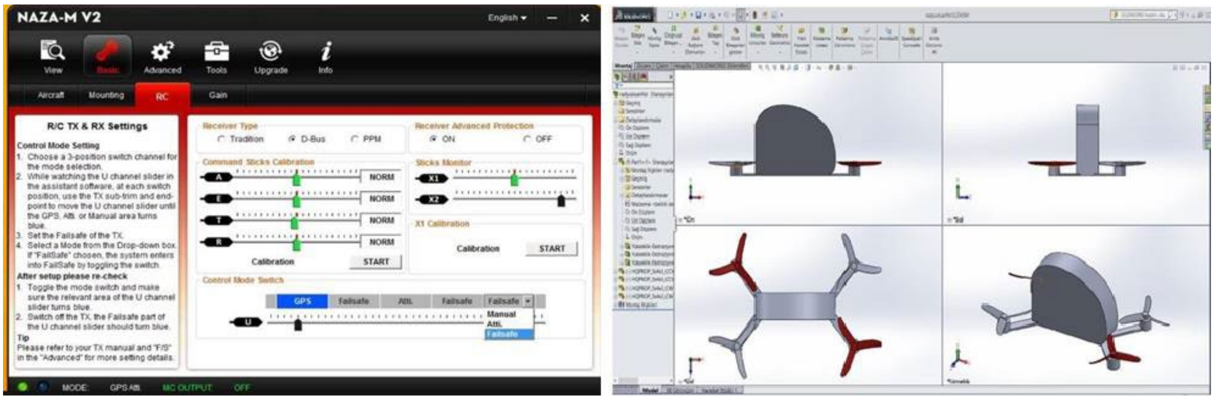


Figure-2: Using softwares

DJI Naza M-Lite Assistant software was used to configure the Quadcopter's flight control .
The propeller converts the mechanical energy generated by the engine into a propulsion force by accelerating the air mass in front of it in the opposite direction to the aircraft's movement direction. The force that pulls the quadcopter forward/backward and right/left is obtained by increasing the fluid momentum backward according to the aimed direction. This momentum increase is usually achieved by accelerating the air backward using a

propeller. Quadcopters have 4 propellers; two clockwise (CW), and two counterclockwise (CCW). The direction of rotation of the engines and propellers facing each other are opposite at the quadcopter, which has a different structure from the helicopter.
The design with the most ideal dimensions for the propeller structure is called aerofoil (wing profile). Aerofoil is a 2D cross-section of objects moving through a fluid such as a propeller. These cross-sections are designed to provide the optimum drag ratio to the vehicle moving through any fluid such as air and water. We wanted to examine the difference in flow analysis by drawing 3 different propellers before the analysis.

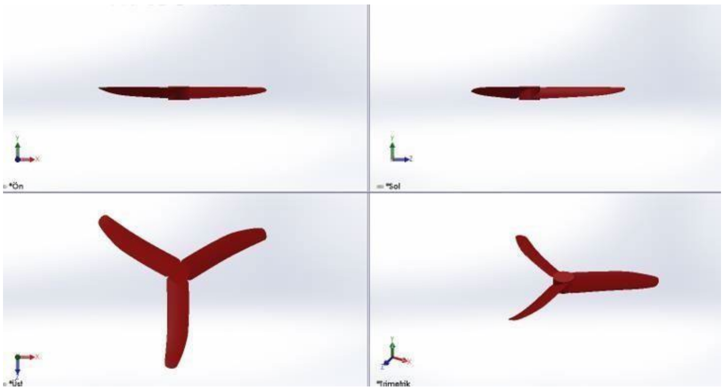


Figure-3: CCW Aerofoil Propeller

In the ideal disc theory developed by Froude, instead of a propeller, an infinitely thin disc of the same diameter is taken and the momentum gained by the air passing through it is examined. However, the following assumptions are made during this examination:
- The fluid passing through the disc gains energy in the form of static pressure increase. The energy gained is the same on all sides of the disc.
- The velocity of the air particles passing through the disc is the same. The flow is constant and irrotational. Vortexes at the propeller outlet are omitted.

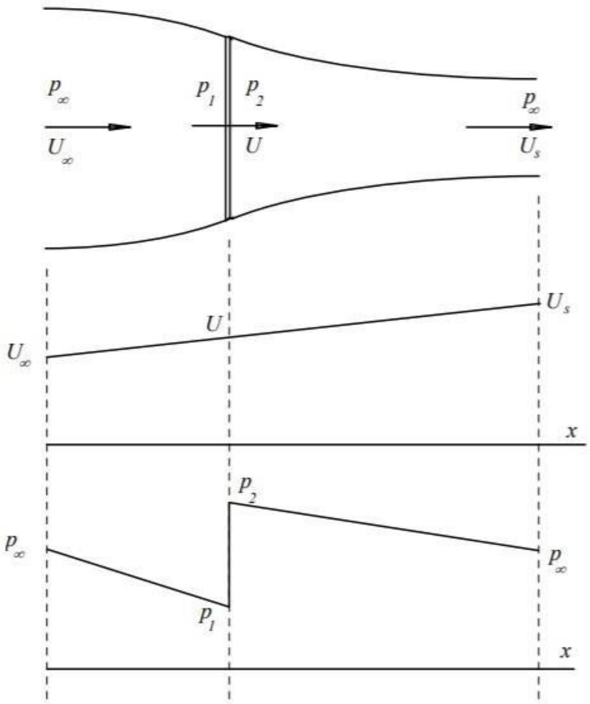


Figure-4: Bearing Disk

In front of the propeller and far enough away from it, the air comes to the propeller with a speed of U∞ equal to the speed of the aircraft and it accelerates as it approaches the propeller, reaching the speed of U on the disc. It continues to accelerate after the disc and reaches the speed of us far enough behind. Parallel to this speed increase, the static pressure of the air decreases as it approaches the propeller and decreases to the value of p1 in front of the disc, increases to the value of p2 behind the disc with the energy it gains from the disc and again decreases to the static pressure p∞ at infinity by gradually decreasing behind the disc. The velocity of the air passing over the disk is equal to the arithmetic mean of the free stream velocity and the advanced velocity of the propeller.

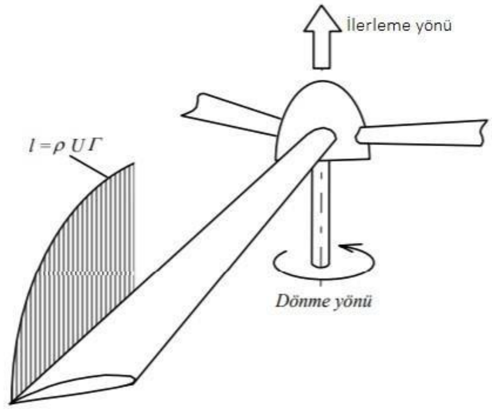


Figure-5: Load distribution through propeller pal[2]

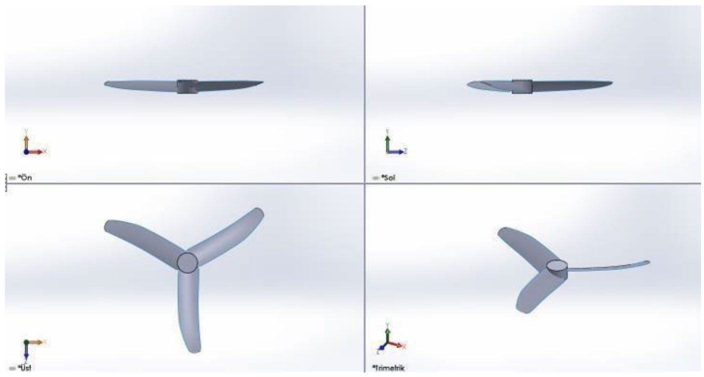


Figure-6: Slenderized Aerofil Propeller

It is possible to consider each blade of a propeller as a three-dimensional wing. However, this wing makes a rotational movement around the root and a propulsion motion in the direction of its trailing edge. Under the influence of these movements, a lift force is generally formed on the propeller blade in the direction of propeller's motion, however, due to tip effect, as in the three-dimensional wing, the lift force which is zero at the blade tip, shows a change along the blade

As a result, evacuation vortices are formed on the trailing edge of the blade, and these vortices roll over each other in the blade to form a tip vortex.Trailing edge vortices formed in the same manner on the track of a three-dimensional wing are spread behind the wing so that they remain in the plane of movement of the wing while they are spread along helical trajectories, due to the common effect of the propeller's rotational and propulsion movements in the footsteps of a propeller.

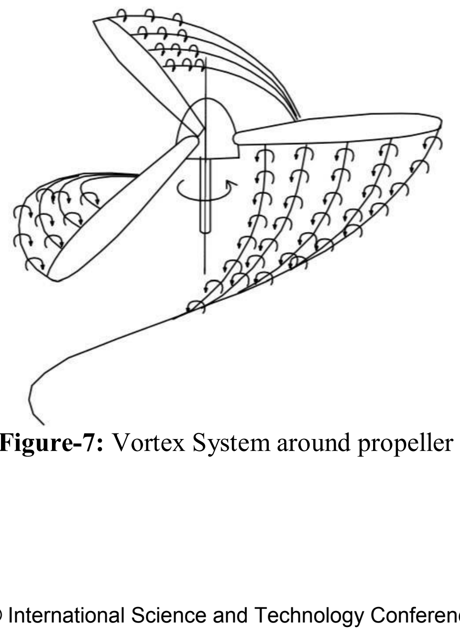


Figure-7: Vortex System around propeller

When the close track of a blade is examined, it is seen that the trailing edge vortices are propagated along the helical trajectories towards the back of the propeller as indicated above, rather than within the blade's rotational plane behind the blade.
In order to better examine the effect of these vortex lines on the stream area around the blade, it is useful to divide them into two components in the plane of rotation and in the direction of propulsion.

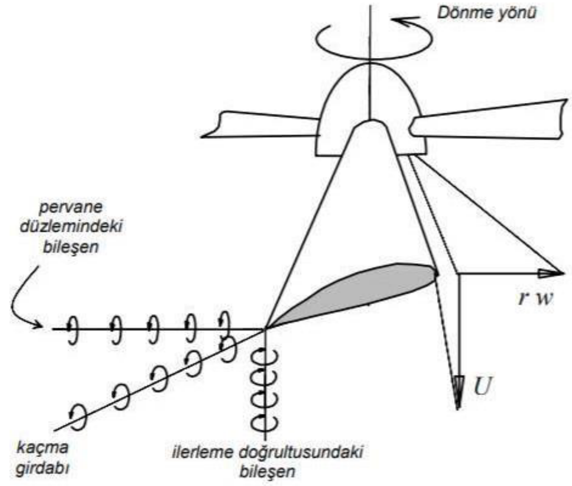


Figure-8: Components of vortex lines(Yükselen,2019)

The vortex lines of the component in the rotation plane induce velocities in the same direction as in the three-dimensional wing in the direction of the blade belly, i.e. in the direction opposite to the propulsion direction of the propeller. These induced velocities are the increase in the flow velocity in the disc plane in Froude momentum theory. It is known that the induced velocity decreases as the wingspan increases in the three-dimensional wing. On the other hand, according to Froude's theory, the faster the stream passing through the disc is, the higher the ideal efficiency is. As a result of Froude's theory, the dependence of the ideal yield on the propeller area and the speed in the track, it is stated that increasing the diameter of the propeller instead of increasing the speed in the track will positively affect the ideal efficiency (Yükselen,2019).

Results and Discussion

Fluid analysis of propellers was examined before the general mechanical structure. After the compatibility of the propellers, the entire structure is examined.
The simulation of the propellers exposed to the air in a closed system was carried out using Flow Simulation extension of Solidworks.
If the steps of computational fluid analysis of the counterclockwise aerofoil propeller are examined;

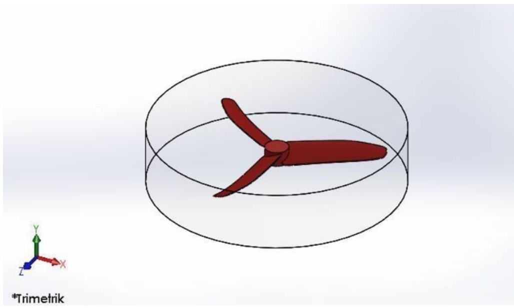


Figure-9: Propeller in the Cylindirical Flow Area

First, the boundaries of the rotating cylindrical field are determined to ensure that the propeller becomes independent of external factors. And the propeller was placed in the cylindrical structure with a volume of 85 cm^3 (h=15 mm, r=75 mm) [Figure 9]. The speed of this rotating cylindrical field is set to (-)1100 rad/sec. The reason is that the angular speed is proportional to the RPM of the engine we proposed to use. The faces to be examined are selected. On each face of the propeller, the effect of airflow on velocity was examined. When we examine the airflow that we sent from the Z-axis;

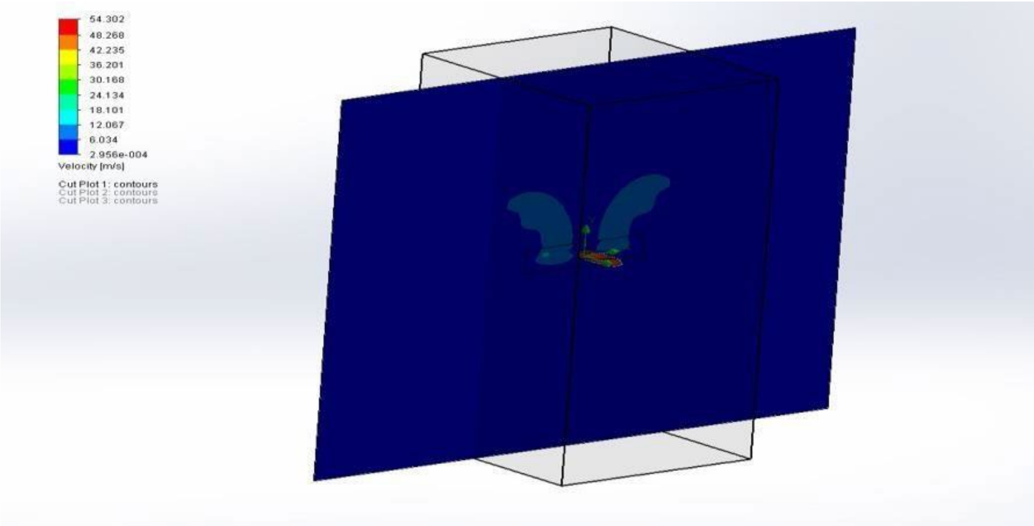


Figure-10: Z axis of the air flow simulation.

When we examine the propeller's reaction to the airflow that we sent from all three axes;

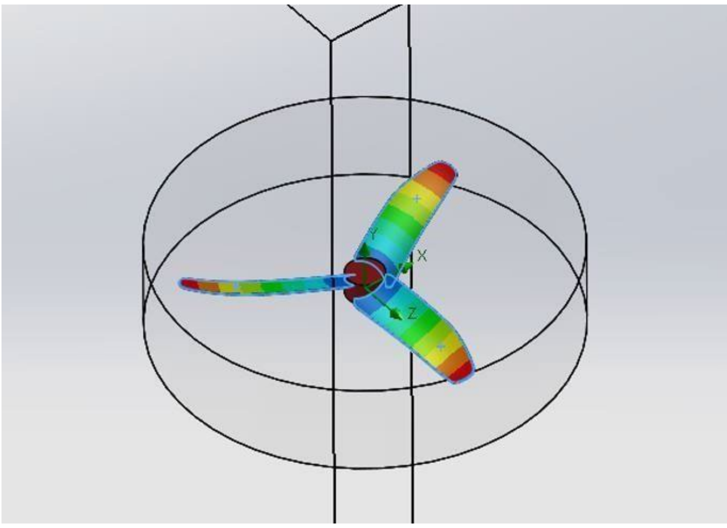


Figure-11: Propeller in the Cylindirical Flow Area

Thus, the hub and the radius points of the propeller are more affected by the airflow. We said that airflow does not occur in one direction in propellers, unlike the airplane wings. Airflow in various directions according to the direction of each blade of the propeller will be monitored. When we observe the airflow direction from a general angle for the counter-clockwise propeller;

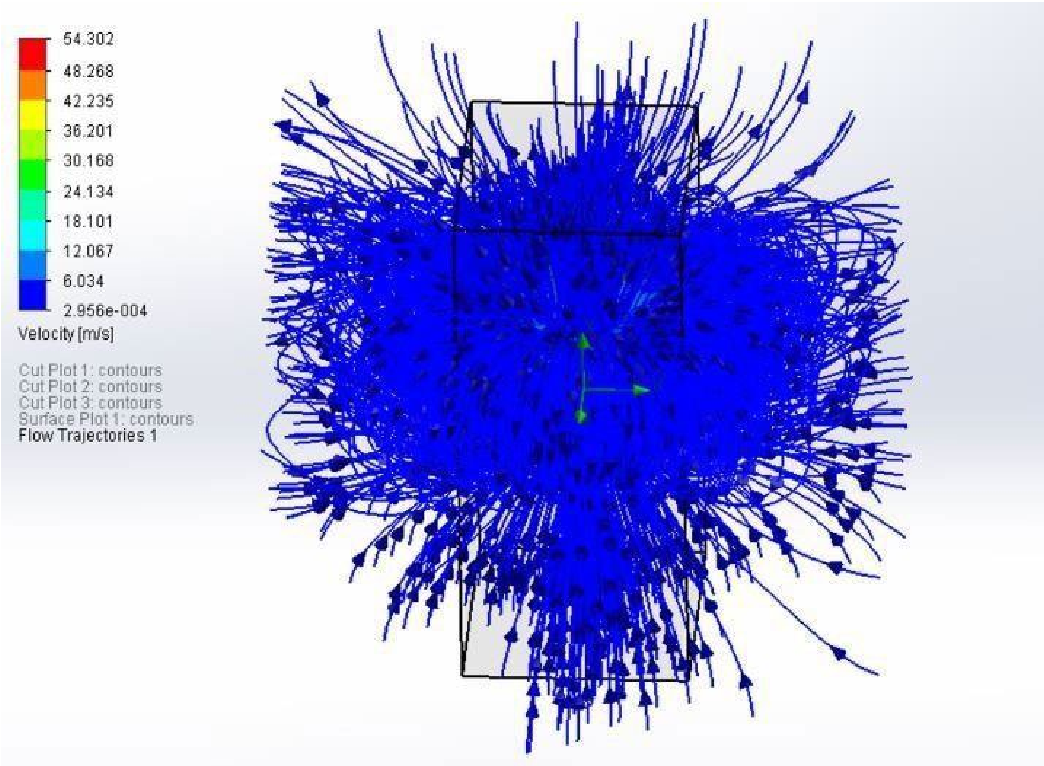


Figure-12: Impulse Force Directions

Usually, we see that the air entering from the (-) Y-axis disperses and move towards the (+) Y-axis, and the air coming from the (+)X direction led towards (-)X direction.

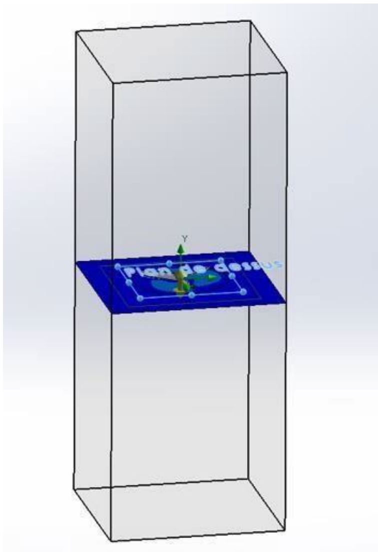


Figure-13: Y-axis air flow at CW propeller

If we examine the flow analysis of the clockwise propeller, we see that there is no change in the flow velocity graph acting on the surface, but only the propulsion forces will be different.

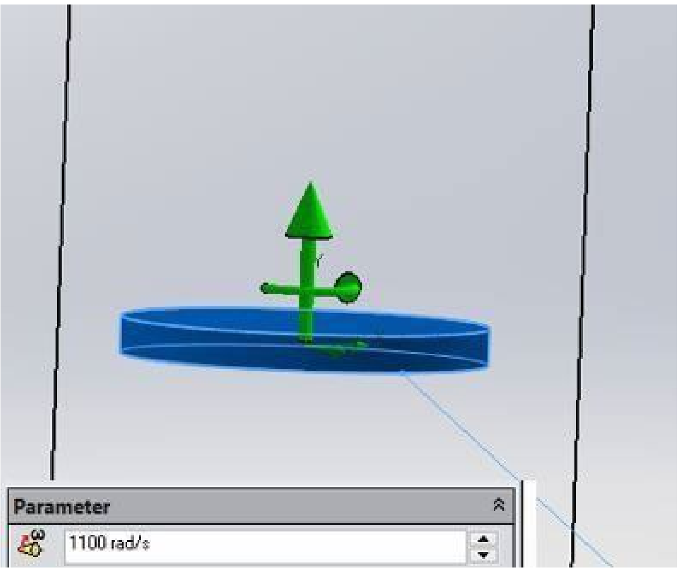


Figure-14: A figure that shows angular velocity is in the (+)Y direction at CW

Computational fluid analysis of the vehicle which was drawn in three-dimensions was carried out using Ansys software. First of all, the drawing was imported into the program and the vehicle was placed in a rectangular closed system of 2x5x2 m3. Airflow was sent to the system at speeds of 10m/sec, 15m/sec, 20m/sec, and 25m/sec respectively.

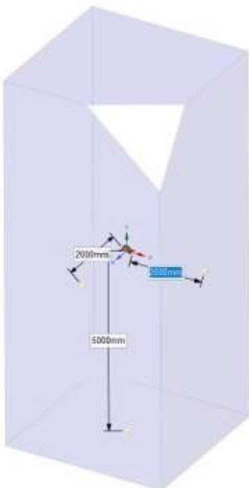


Figure-15: Isolated system that is simulated

3 reference points are taken from the quadcopter placed in the isolated system. These points, which are expected to be the most efficient points in the analysis, are the center of the front right propeller, center of the front left propeller, and the center of the vehicle body.

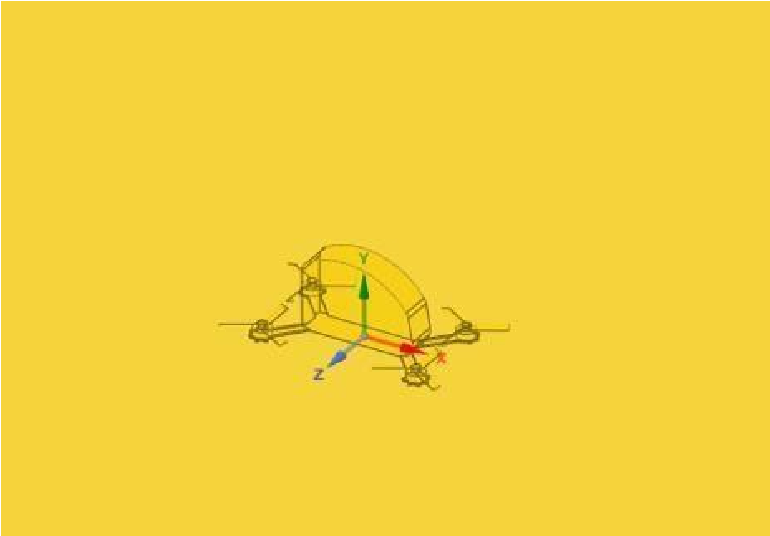


Figure-16: Quadcopter that is in the isolated system

After defining the reference points of the vehicle and selecting the fluid material as air, the simulation is advanced and the network structure of the model is formed. The reference coordinates are entered as indicated in Figure 17.

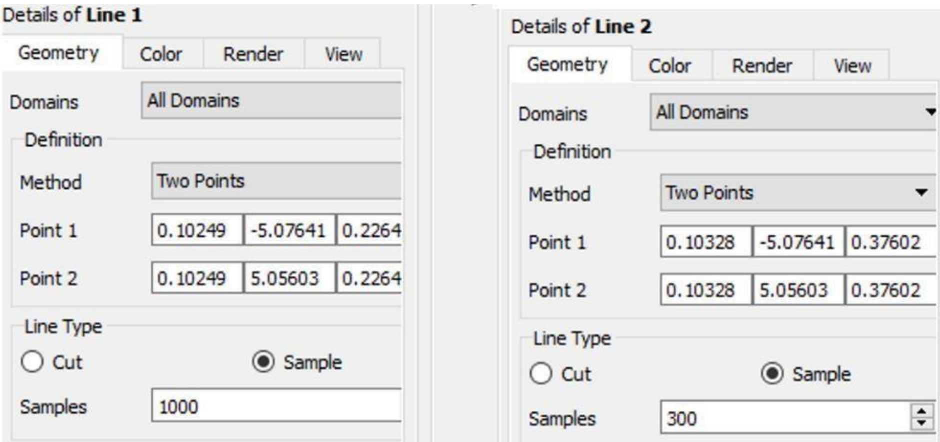


Figure-17: Reference coordinates

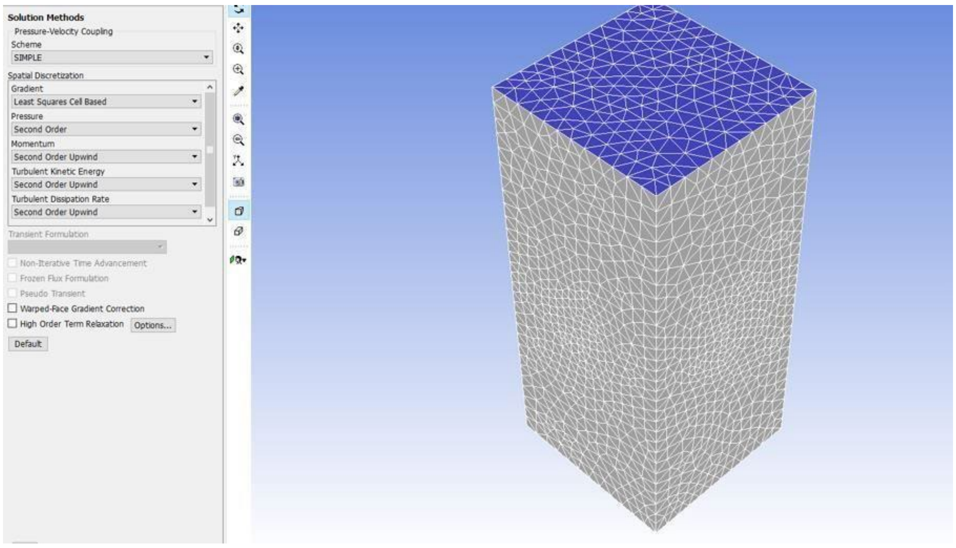


Figure-18: Network Topology of the model

The number of nodes, the number of elements in the model, and the number of network structures divided into tetrahedral are indicated in Table-3.

Domain	Nodes	Elements	Tetrahedra
Model	155572	909851	909851

Table-3: Model's spefications

Three variables were defined to analyze the model. As a result of the analysis, the effects of airflow on velocity, pressure, and turbulence kinetic energy is observed.

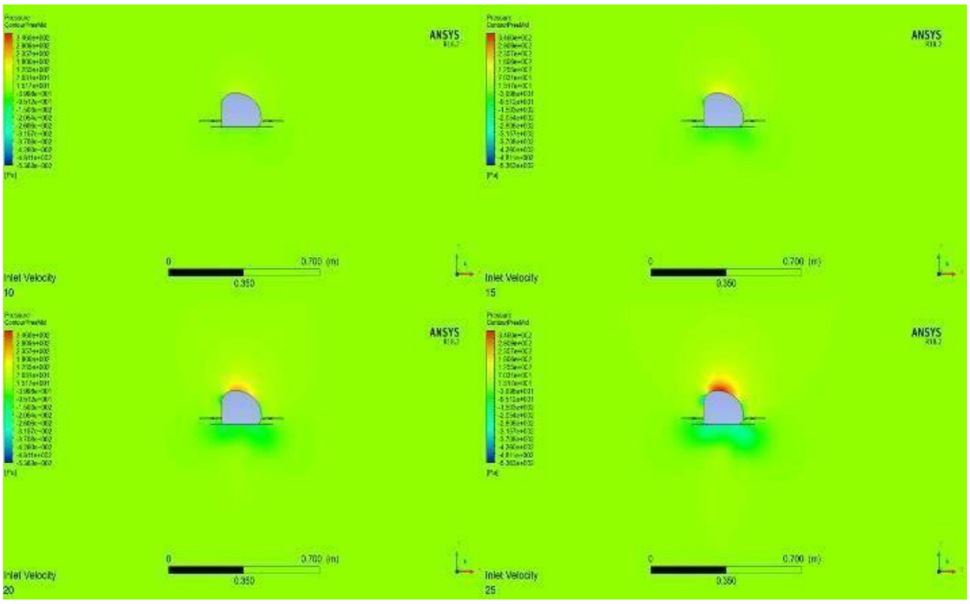


Figure-19: Pressure effect through the center of aircraft

When the above figure is examined, the effect of pressure on the center of the vehicle is increased when airflow rates are increased. However, this pressure level is not enough to prevent the mobility of the system. Only the upper part of the vehicle that is exposed to the air flow of 25m/sec is affected.

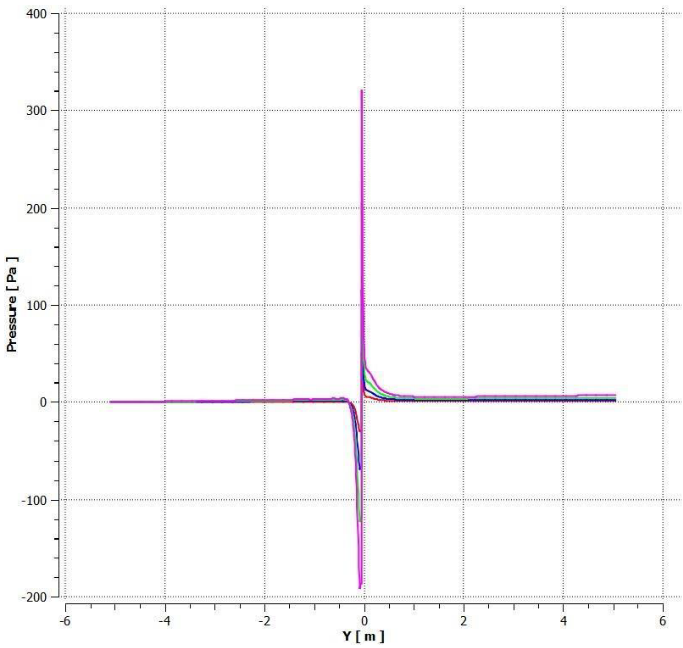


Figure-20: Pressure effect on front-left propeller

When the result in Figure-20 is examined, the increase in the airflow rate does not create a pressure effect at a level that would have a negative effect on the surface of the propeller.

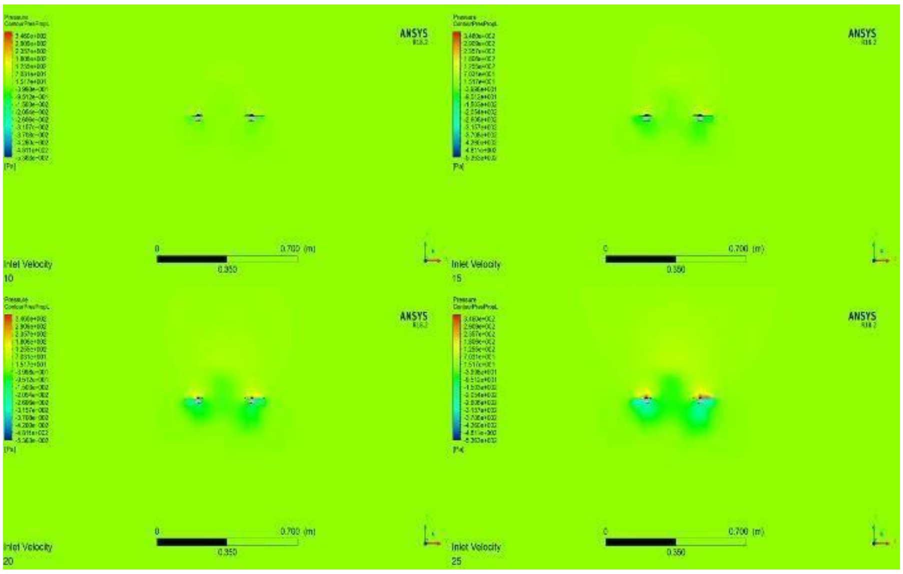


Figure-21: Pressure change for four different velocity values

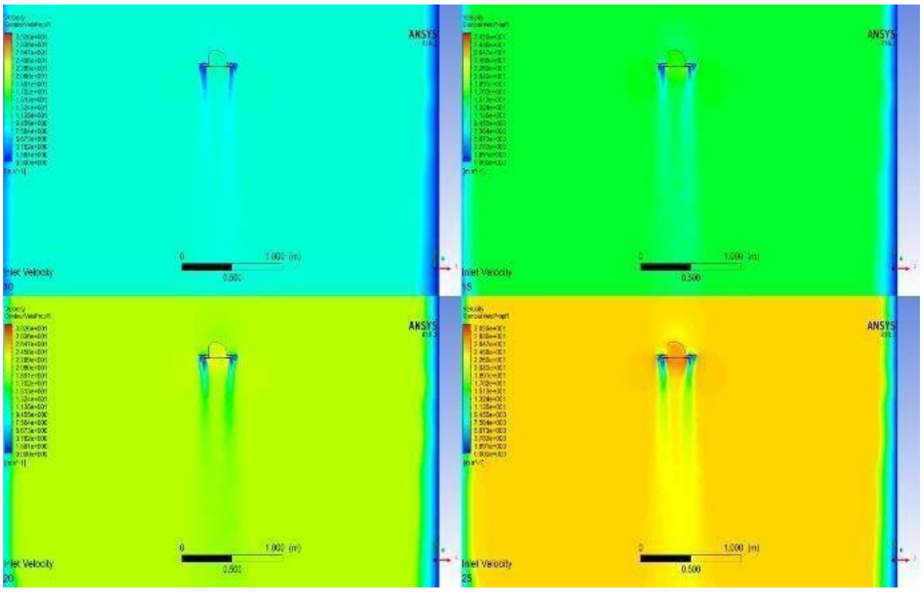


Figure-22: Velocity effect on the center of aircraft

The pressure value reaches its maximum level when the vehicle meets the airflow coming from +Y direction. The airflow, which is not in contact with the vehicle, regains its former stability.

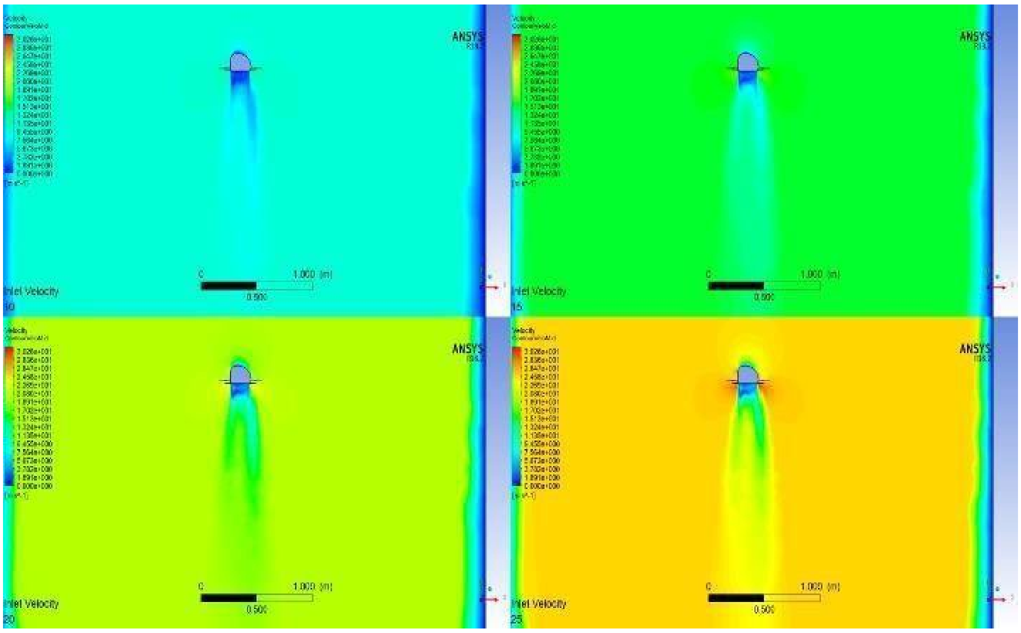


Figure-23: Velocity effect on front-right propeller

When we examine airflow with four different velocity values that effects the center of the body,it is observed that while velocity values increase,reaction of body increases too. The maximum value for this reaction is observed under the body of the vehicle exposed to the wind of 96 km/h.

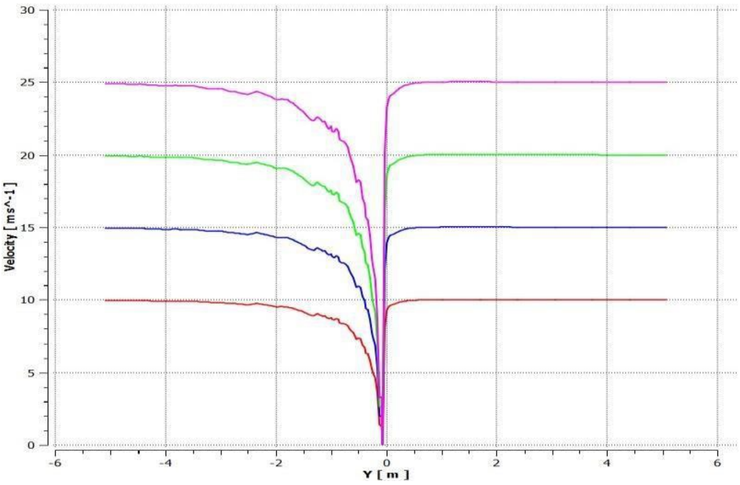


Figure-24: Effect of the four different velocity to the aircraft’s velocity

The velocity of the air sent in the +Y direction is damped by the vehicle as soon as it meets the vehicle. After the air contact with the vehicle ceased, it decayed for approximately 4 m and then became stable (Figure-24).
In other words, the vehicle has an immediate damping effect on the air when it contacts with the air. The velocity of the air became exponentially stable after the contact was stopped.

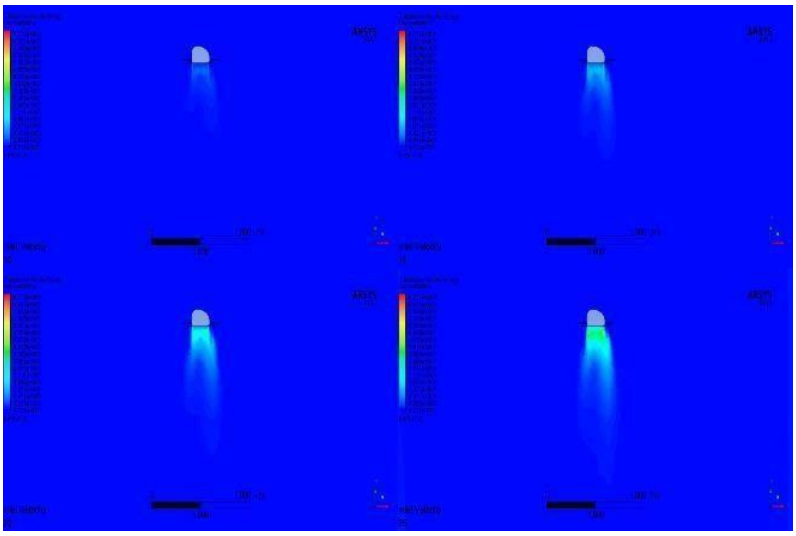


Figure-25: Effect of the kinetic energy on the center of aircraft

The turbulence kinetic energy acting on the vehicle is shown in Figure-25. When the graph is examined, turbulence kinetic energy is increased in direct proportion with increasing velocity values of airflow. This energy is observed starting from the bottom of the vehicle body to an average distance of 2 meters from the lower body. As the airflow moves away from the vehicle, the turbulence kinetic energy becomes zero again. It was observed that the turbulence kinetic energy generated in the vehicle was not at a level that would prevent the movement of the vehicle at the simulated speed values.

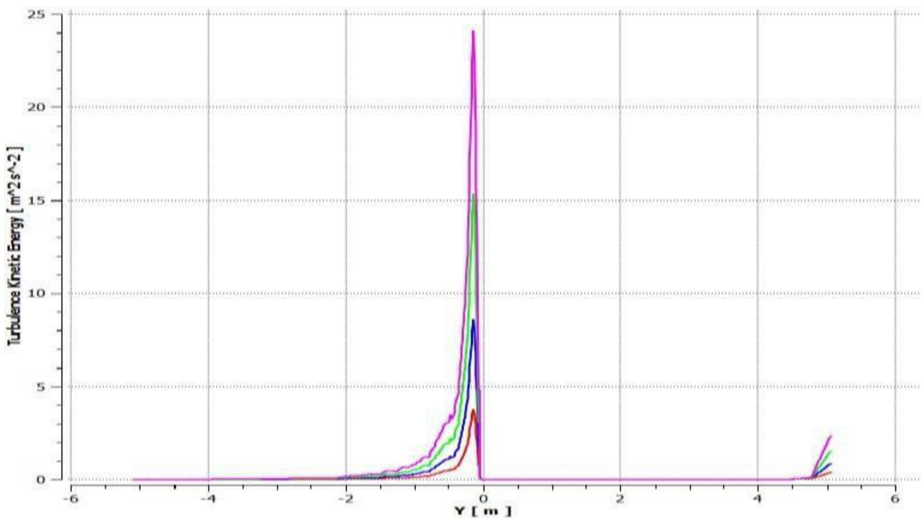


Figure-26: Effect of the four different velocity to the aircraft's turbulence kinetic energy

Conclusion

In this study, a quadcopter was designed to be used in instantaneous air pollution measurements. In the computational flow analysis applied on the design for airflow values of 10 m/sec, 15 m/sec, 20 m/sec and 25 m/sec, the effect of pressure, turbulence, and velocity variables were examined. No results were found to affect the vehicle's mobility in these parameters at the end of the analysis.

As a result of the studies and analyzes, it is concluded that this design is suitable to be used in instantaneous air pollution measurements. The production of the designed vehicle was realized.

Acknowledgments:

This work has been supported by "The Scientific Research Project Program of Marmara University (Project no: FEN-C-YLP-090518-0255)

References

Göl,G.,*Quadcopter Nedir Nasıl Uçar*?, Retrieved March 24,2019, from http://www.academia.edu/10150955.

Yükselen, M. A., *Pervane Teorisi*, Retrieved May 18,2019, from https://web.itu.edu.tr/yukselen/Uck351/11-%20Pervane%20teorisi.pdf.

DFT CALCULATION AND MOLECULAR DOCKING STUDY OF 2-([1,1'-BIPHENYL]-4-YL)-N'-HYDROXY-2-OXO-N-(PYRIDIN-2-YL)ACETIMIDAMIDE AS A POTENTIAL ANTI-TUMOR AGENT

Bülent Dede

bulentdede@sdu.edu.tr

Betül Ulu

betul8ulu@gmail.com

Abstract

Malignant tumors that appear by irregular division and proliferation of cells in an organ or tissue are called cancer. In general, cancer is a group of more than 100 diseases that occur in uncontrolled proliferation of cells in various parts of the body. Although there are many types of cancers, they all begin with uncontrolled proliferation of abnormal cells. If left untreated, it can cause serious discomfort and even death. Cancer cells can spread to other parts of the body through blood and lymph systems. Angiogenesis is defined as neovascularization and tumor angiogenesis is primarily thought to be mediated by vascular endothelial growth factor receptor-2 (VEGFR-2).

In this study, optimized geometry, molecular geometric parameters and molecular electrostatic potential (MEP) diagram of the previously synthesized 2-([1,1'-biphenyl]-4-yl)-N'-hydroxy-2-oxo-N-(pyridin-2-yl)acetimidamide (aminoketooxime) were calculated using DFT/B3LYP level with the 6-311G(d,p) basis set. The electronic property calculations such as HOMO-LUMO energies were performed by the time-dependent DFT approach. Furthermore, anti-tumor activity simulation of the aminoketooxime molecule was carried out by molecular docking study. High resolution crystal structure of VEGFR-2 (PDB ID: 2XIR) were obtained from protein data bank. Molecular docking study was performed on SwissDock web server using EADock DSS algorithm. Studied aminoketooxime ligand was found to inhibit VEGFR-2 according to the binding energy and full fitness score. The results of this study are thought to be useful in the development of drugs that can be used in the treatment of cancer.

ENVIRONMENTAL AWARENESS AND BEHAVIOR OF PEOPLE IN TURKEY'S MEDITERRANEAN

Fadime Özkan, Dilek Bostan Budak

Cukurova University, Faculty of Agriculture, Department of Agricultural Economics, Adana-TURKEY

fadimeozkan84@gmail.com; dbostanbudak@gmail.com

Abstract: The environment is a biological, physical, social, economic and cultural environment in which living and lifeless beings live, maintain and interact (Cepel, 1995). Therefore, the environment is vital for all living creatures. It should be noted that the sooner the environmental hazards are recognized and the sooner solution can be reached, the more secure and healthy the future social life will be.
In this study it was investigated, how the people living in Turkey's Mediterranean region think about the environment, how they usually behave to their environment, and their awareness. This study was conducted by face to face questionnaire survey method with 370 randomly selected people. 201 of them were female, 169 of them were male and the average age was 36.
71 % of them have high school and lower education level. It was determined that 70,7% of the individuals used an energy saving tools and 64.3% of these do not run the washing machine before it is filled to save water. 52.4 % of the participants do not believe that changing their way of the life would solve the environmental problems. 33.2 % of individuals emphasized that environmental problems affect their health. While 50.5% of the individuals stated that they would welcome the increase in the water bill to be taken against water pollution, 49.5% did not respond positively, even if it prevents water pollution.

Key Words: Turkey's Mediterranean, Environment, Economy, Behavior

Introduction

Human and nature have interacted with each other throughout history. In the beginning while nature directs humans, in the later ages human has started to direct the nature. The rapid, distorted and unhealthy development of cities, as well as the problems of urban identity created by urbanization causes the loss of historical, cultural, and natural values and all this make it impossible to sustain these values (Keleş, 2007: 45-46, Mengi, 2007: 47-49). It is also the person who harms the environment and protects and develops it and humans can do many things to protect and keep available resources as they continue to advance in science and technology. Respect for the environment should be perceived as a result of human respect for himself and his humanity. Hence environmental awareness should be institutionalized within the framework of culture as it is an expression of the sense of solidarity and responsibility towards future generations (Keleş, 1987:87).

Although it is very new to deal with the impact of human activities on the natural environment, the problem of the environment is increasingly being of interest to international and national organizations (Meadows ve ark., 1990; Beck, 1990). In order to prevent environmental pollution, each country should participate in environmental protection policies.
Efforts to prevent pollution, national and international efforts to protect resources aims to human beiing as well as the rational use of resources and natural life aims to not lose balance.

The protection of degraded and polluted resources will be ensured through awareness and the awareness and understanding will be provided only through research and education (Asmaz, 1995).

In light of the growing environmental problems, the need to tackle these problems is becoming a great importance. Therefore "The solution of environmental problem" is only possible when people become sensitive to these problems. In other words people's knowledge and awareness needs to be increased to focus more on environmental protection. It can be said that people can contribute to the protection of the environment through their environmentally friendliness behaviors and environmental awareness. Environmental awareness is to be aware of the importance of urban and environmental resources. In other words, environmental awareness means to being able to evaluate the effect of the bad use of natural sources to environment to itself and to future generations, and to have knowledge about it.

Mankind should avoid actions that can be considered a crime against the city, stone, nature, and the cultural accumulation of society (Keleş, 2005:16), and be aware of its responsibility towards nature and other living things.

In summary, environmental awareness means that the individual should respect both himself/herself and nature without forgetting the past, present and future. (Türküm, 1998:172).

In this study it was investigated, how the people living in Turkey's Mediterranean region think about the environment, how they usually behave to their environment, and their awareness.

Materıal and Method

The main material of the study consists of data obtained from face-to-face surveys with randomly selected individuals who living in Turkey's Mediterranean region in Izmir, Manisa and Aydin provinces, in urban areas.
In this study was investigated, how the people living in Turkey's Mediterranean region, think about environment, how they usually behave to their environment and their awareness.

This study was conducted by face to face questionnaire survey method with 370 randomly selected people. For the data obtained from the study, a database was created in the appropriate package program and data entry was provided. Afterwards, various analyzes such as frequency tables, percentage calculations, average, and standard deviation were performed.

Research Findings

Socio-Economic Factors

The data showing the socio-economic and socio-cultural characteristics of the individuals participating in this research study are given in Table 1.

In this study, 169 of the individuals were male and 201 were female and the average age was 36.08. Beside this, 71 % of the individuals participating in this research have high school and lower education level. According to the data obtained, 71% of the individuals who participated in this study has high school or less education level.

The distribution of the number of family members of the individuals is divided into 6 groups and is shown in Table 1.

While 31 of the participants (8,4%) were living alone, 86 participants (23,2%) has 2, 93 participants (25,1%) has 3, 101 participants (27,3%) has 4, 32 participants (8,6%) has 5 and 27 participants (6,5%) has 6 or more family members. The average number of family members living in the household is 3.27, this value is a close value to the average (3.4) of Turkey (TUİK, 2017). When the monthly income of the participants was examined, 143 (38,6%) of them stated that they were low, 222 (60%) of them were middle and only 5 (1,4%) of them were high incomes (Table 1).

Table 1. Socio-Economic Characteristics of Individuals

Features	n	%
Gender		
Female	201	54,3
Male	169	45,7
Total	370	100,0
Age Groups		
18-24	90	24,3
25-34	106	28,6
35-44	78	21,1
45 and above	96	25,9
Total	370	100,0
Education level		
Literate	3	0,8
Primary school	76	20,5
Middle School	9	6,8
High school	164	44,3
University and above	107	29
Total	370	100,0
Number of Family Individuals		
1	31	8,4
2	86	23,2
3	93	25,1
4	101	27,3
5	32	8,6
6 and above	27	6,5
Total	370	100,0
Level of Income		
Low	143	38,6
Middle	222	60
High	5	1,4
Total	370	100,0

Energy-Saving

In order to understand the attitudes of the participants about energy saving, they were asked whether they use energy saving bulbs and low consumption devices. It was determined that 63.5% of individuals use energy saving bulbs and 70,7% of the inviduals used an energy saving tools that would save energy in order not to harm the environment.

In addition, when 370 people are asked if you are running your washing machine before it is full to save water, 64.3% of them stated that they do not run the washing machine before it is filled to save water. While 50.5% of the individuals stated that they would welcome the increase in the water bill to be taken against water pollution, 49.5% did not respond positively, even if it prevents water pollution.

Individuals Perceptions on Environmental Issues

In this study, to reveal the attitudes about the environmental issue of the individuals living in the Turkey´s Mediterranean region and their thoughts about the environment some questions such as impact of environmental problems on health, the compatibility of food and products for health and environment, about believing that environmental problems will be solved without changing the way of life etc. were asked and the findings obtained are given in Table 2. While 33.2% of the participants stated that environmental problems affect their health very much, 6.8% stated that they did not. The average is 2.01 and the standard deviation is 0.900. When the health of food and products were asked to the individuals, 4 (1,1%) of them stated they are very suitable, 24 (6,5%) stated suitable, 65 (17,6%) stated middle, 140 (37,8%) stated tolerable and 137 (37%) participants stated they are not suitable. The average is 4.03 and the standard deviation is 0.951.

On the other hand, to the question 'the suitability of food and products to the environment' 28 (7,6%) participants stated they are very suitable and appropriate 140 (37,8%) participants stated tolerable and 137 (37%) participants stated they are not suitable. The average is 4.04 and the standard deviation is 0.899. Whereas 52,4 % of the participants do not believe changing their way of the life would solve the environmental problems. On the other hand, when we asked how much they agree with the sentence 'if we continue like now, we are going to environmental disaster', 78 of participants (21.1%) completely agreed, 126 participants (34.1%) agreed, 98 participants (26.5%) partially agreed , 41 participants disagreed (11.1%) and 27 (7.3%) of the respondents strongly disagreed. The average is 2.49 and the standard deviation is 1.155 (Table 2).

Table 2. Perspectives of Interviewed Individuals on Environmental Issues

Impact of environmental problems on Health (average) 2,01 (0,900)[a]	**n**	**%**
Very effective	123	33,2
Effective	146	39,5
Low Effective	76	20,5
ineffective	25	6,8
Total	370	100,0
The health of food and products (average) 4,03 (0,951)[a]	**n**	**%**
Very suitable	4	1,1
Suitable	24	6,5
Middle	65	17,6
Tolerable	140	37,8
Not Suitable	137	37
Total	370	100,0
The suitability of food and products to the environment (average) 4,04 (0,899)[a]	**n**	**%**
Very suitable	3	0,8
Suitable	18	4,9
Middle	71	19,2
Tolerable	149	40,3
Not Suitable	129	34,9
Total	370	100,0
If we continue like now, we are going to environmental disaster (average) 2,49 (1,155)[a]	**n**	**%**
Totally agree	78	21,1
Greatly agree	126	34,1
Partially agree	98	26,5
Disagree	41	11,1
Strongly disagreed	27	7,3
Total	370	100,0
Changing the way of the life would solve the environmental problems (average) 3,37 (1,295)[a]	**n**	**%**
Totally agree	34	9,2
Greatly agree	67	18,1
Partially agree	93	25,1
Disagree	79	21,4
Strongly disagreed	97	26,2
Total	370	100,0

[a] Standard deviations are given in parentheses.

Conclusions and Recommendations

As the number of human species in the world increases their needs have also increased. The main human damages to nature are; advanced technology productions, destroying places where previously used as agricultural areas, polluting the areas they live in and consume natural resources (Türküm, 1998). This caused deterioration in the harmony of the natural environment.
Mankind has used unlimited the opportunities offered by nature during the struggle for existence in the universe (Şimşek, 2004). Again, people will be able to find solutions to various environmental problems caused by humans.

In recent years, people have become more sensitive to both the environment and the products they consume. People have begun to pay attention to the use of electricity, water consumption, energy-saving bulbs, low-consumption tools and to the use of environmentally and health-friendly products. They have started to contribute to the solution of the problems by using the complaint lines in consumer arbitration committees and municipalities.

In addition, in order to increase environmental awareness and environmental awareness, it is recommended to include applied environmental education in the curriculum of the Ministry of National Education. Other individuals in the society should be made aware. If necessary, perception of environmental sensitivity should be created by using mass media.

Acknowledgements

This study is based on the preliminary data of the newly started doctoral dissertation and the project is supported by the Ç.U. BAP unit. Proje No: 10625. Thank to Çukurova University.

References

ASMAZ, H. (1995). Türkiye'de Çevre Eğitim (Environmental Education in Turkey). Yeni Türkiye, 5: 669-674.

BECK, J. M. (1990). Environment and Third World. (Transl. Kadir Canatan). İstanbul: Endülüs Publications.

KELEŞ, R. (1987). Kentleşme ve Çevre Politikaları (Urbanization and Environmental Policies), Urbanization and Environment Conference, Publications of Turkey Foundation for Environmental Problems .

KELEŞ, R. (2005). Kent ve Kültür Üzerine (City and Culture), Mülkiye, Volume: 29, Issue: 246, p. 9-18.

KELEŞ, R. (2007). Kente Karşı Suç (Crime Against The City)", File 06: Kent ve Suç (City and Crime), TMMOB Chamber of Architects Ankara Branch, Journal 55, (November- December), p. 45-46.

MEADOWS & all. (1990). Limits of Economic Growth. (Transl. Kemal Tosun). Istanbul: Faculty of Business Publication No:217.

MENGI, A. (2007). Kente Karşı Suç ((Crime Against The City)- Reconstruction Crime, File 06: Kent ve Suç(City and Crime), TMMOB Chamber of Architects Ankara Branch, Journal 55, (November- December), p. 47-49.

ŞİMŞEK H. & YILDIRIM, A. (2011). Sosyal Bilimlerde Nitel Araştırma Yöntemleri (Qualitative research methods in the social sciences), 3th Edition, Seçkin Publication, Ankara.

TÜRKÜM, A. S. (1998). Environmental Problems and Environmental Awareness in Contemporary Society, Editör: ISBN, Contemporary Life Contemporary Human, 1. Edition, Anadolu University Distance Education Faculty Elementary Education Undergraduate Program, Eskişehir, p. 165-181.

ETKİNLIK DESTEKLİ TERS YÜZ SINIF MODELİNE VE BU MODELİN PROBLEM ÇÖZME BECERİLERİ ÜZERİNE ETKİSİNE İLİŞKİN ÖĞRENCİ GÖRÜŞLERİ[A]

Mehmet Nuri GÖMLEKSİZ[b] , Hacer KOÇ DENİZ[c]

Fırat Üniversitesi MEB

nurigomleksiz@yahoo.com hacerr.58@hotmail.com

Özet: Öğrencilerin matematiği öğrenmeleri, bilişsel giriş davranışları ile duyuşsal özellikleri içeren birçok faktörden etkilenmektedir. Özellikle günümüz eğitim sistemlerinde çok önemli yeri olan öğrencinin derste aktif hale gelebilmesi için sadece sınıfta dersi dinlemesi yetmemektedir. Etkinlik temelli sınıf içi uygulamalar öğrencinin derste aktif hale gelmesini sağlamakta ve problem çözme becerilerini geliştirmesine katkıda bulunmaktadır. Bu araştırmanın amacı, ortaokul 6. sınıf öğrencilerinin matematik dersinde etkinlik destekli ters yüz sınıf uygulamalarına ve bu uygulamaların problem çözme becerilerine etkisine ilişkin görüşlerini belirlemektir. Araştırmada, nitel araştırma desenlerinden biri olan durum çalışması kullanılmıştır. Araştırmanın çalışma grubu 8 hafta boyunca etkinlik destekli ters yüz sınıf uygulamaları ile öğretim yapılan ortaokul 6. sınıf öğrencilerinden oluşmaktadır. Araştırmada toplam 25 öğrenci bulunmaktadır. Çalışmada veri toplama aracı olarak 7 yarı yapılandırılmış sorudan oluşan bir görüşme formu kullanılmıştır. Görüşme formu öğrencilerin matematik dersinde ters yüz sınıf uygulamalarına ve bu uygulamaların problem çözme becerileri üzerine etkilerine ilişkin görüşlerini belirlemeye dönük sorulardan oluşmaktadır. Araştırma verilerinin değerlendirilmesinde nitel araştırma desenine uygun olarak içerik analizi yönteminden yararlanılmıştır. Öğrenciler ters yüz sınıf modeli ile ders işlemeyi eğlenceli bulmuşlar ve kendilerine tekrar imkânı sağladığı için Matematiği daha iyi anladıklarını belirtmişlerdir. Fakat bazı öğrenciler evde video izlerken ev halkından ve bilgisayarlarından kaynaklı sorunlarla karşılaştığını ifade etmişlerdir. Ayrıca ters yüz sınıf modelinin problem üzerine düşünme, problemi anlama, sorgulama ve yorumlama becerilerini geliştirdiğini vurgulamışlardır. Öğrencilerin birçoğu etkinliklerle ders işlemeni arkadaşlarıyla iletişimlerini arttırdığını belirtmiştir. Bazı öğrenciler fazla gürültü ve ödevlerini yapmadan gelen arkadaşlarından rahatsız olduklarını ifade etmişlerdir. Öğrenciler başka derslerde de daha iyi anlayabilmek ve eğlenerek öğrenmek amacıyla etkinlik temelli ters yüz sınıf modeli ile dersleri işlemek istediklerini ifade etmişlerdir. Araştırma bulgularına dayalı olarak öğretmenlerin derslerde ters yüz sınıf modelini kullanmaları önerilmektedir.

Anahtar kelimeler: Matematik, Ters Yüz Sınıf Modeli, Problem Çözme Becerisi

Abstract: Learning mathematics is influenced by many factors including cognitive input behaviors and affective features. It is not accepted sufficient for the students only to listen to the teacher to make him/her active in a classroom setting which has an important place in today's educational systems. Activity-based classroom practices enable the student to become active in the classroom and contribute them to develop problem solving skills. The aim of this study is to determine the opinions of the 6th grade secondary school students on the effects of flipped classroom activities supported by the activities in mathematics course and their effect on problem solving skills. In this study, case study which is one of the qualitative research designs was used. The study group consisted of 6th grade secondary school students who were instructed in flipped classroom practices supported with activities during 8 weeks. The sample includes 25 students. In the study, an interview form including seven semi-structured questions was used as data collection tool. The interview form consisted of questions to determine the students' views on flipped classroom practices in mathematics course and their effects on problem solving skills. Content analysis method was utilized in accordance with the qualitative research design. The students found flipped classroom model entertaining and stated that they understood Mathematics better as they had the opportunity of repeating the subjects. However, some students pointed out some problems dealing with households and their computers while they were watching video. In addition, they stressed that flipped classroom model helped them develop thinking about the problem, understanding problem, inquiring and interpreting skills. Most of the students stated that activity-based courses contributed them to increase their communication with their friends. Some students determined that they were disturbed by noise and by their friends coming to the class without making their homework. The students expressed that they wanted to use other courses with activity-based flipped classroom model in order to learn better and learn with fun. Based on the research findings, it is recommended that teachers use the flipped classroom model in their classrooms.

Keywords: Mathematics, Flipped Classroom Model, Problem Solving Skill

Giriş

Geleneksel eğitim yaklaşımlarının reddedildiği günümüz bilgi ve teknoloji çağında, teknoloji destekli ve öğrenciyi aktif kılmayı amaçlayan eğitim yaklaşımları ön plana çıkmaktadır. Öyle ki artık bireylerden, var olan bilgiyi almaktan ziyade yeni bilgiler üretmeleri beklenmektedir. Günümüz dünyasının istediği birey profilinde, bilgiyi aynen kabul edip biçimlendirmesi değil, bilgiyi yorumlayarak anlamın yaratılması sürecine etkin olarak katılması istenmektedir (Yıldırım ve Şimşek, 2006). Bireylerin bu becerileri kazanması ise analitik düşünme becerilerini geliştirmeleri ile doğru orantılıdır. Matematik öğretimi ile bu analitik düşünme becerilerini kazanacak olan bireylerin doğru ve çağdaş matematik öğretim yöntemleri ile desteklenmesi gerekmektedir. Özellikle günümüz eğitim sistemlerinde çok önemli yeri olan öğrencinin matematik dersinde aktif hale gelebilmesi için sadece sınıfta dersi dinlemesi yetmemektedir. Bu doğrultuda öğrencinin kazanması hedeflenen matematiksel becerileri tüm hayatına yayması ve karşılaştığı problemleri bu doğrultuda rahatlıkla çözebilmesi gerekmektedir.

Etkinlik temelli sınıf içi uygulamalar öğrencinin matematik dersinde aktif hale gelmesini sağlamakta ve problem çözme becerilerini geliştirmesine katkıda bulunmaktadır. Yeni düzenlenen matematik dersi öğretim programında etkinliklere daha çok yer verilmeye çalışılmış ve program bu hususta etkinlik temelli ve problem çözme becerilerini geliştirici nitelikte hazırlanmıştır (MEB, 2018). Fakat matematik öğretim programlarında var olan kazanımların kazandırılması sürecinde sınıf içi uygulamalarda yeterince etkinlik yapılabilmesi için gerekli zaman kısıtlıdır. Bu durum farklı öğretim yöntemlerinin denemesini gerekli kılmıştır. Bu noktada ters yüz sınıf modeli, sınıf içerisinde yaşanan bu zaman sorununu çözmesi ve daha fazla etkinlik yapma imkanı sağlaması nedeniyle son zamanlarda öğretim yöntemleri literatüründe yer edinmektedir.

Ters-Yüz sınıf uygulamaları, ilk olarak Miami Üniversitesi ekonomi profesörleri tarafından iş, hukuk, sosyoloji, psikoloji ve felsefe alanlarında okuma ödevlerinin fazla olmasından dolayı kullanılmaya başlanmıştır (Lage, Platt & Treglia, 2000). İlk uygulayıcıları onlar olmasına rağmen Jonathan Bergmann ve Aaron Sams bu modelin savunucuları haline gelmiştir. Model sayesinde dersi kaçıran öğrencilerin sonradan dersi izleyebilmeleri, derse gelenlerin ise tekrar dersi izleyerek tekrar etme şansı bulmaları sağlanmıştır (Bergmann ve Sams, 2012). Modelin daha fazla kişi tarafından bilinmesine ise Khan akademisinin kurucusu Salman Khan tarafından gerçekleştirilen TED (Technology, Entertainment, Design) konuşmaları öncülük etmiştir.

Ters-Yüz sınıf modeli, geleneksel öğretim yöntemlerinin aksine öğrenciye teorik bilgiyi evde kendi başına öğrenip, öğrendiklerini okulda uygulama fırsatı sunan bir metot olarak tanımlanmaktadır (Zownorega, 2013). Mevcut öğretim modellerinin ve geleneksel sınıf yaklaşımının kurallarının aksine bu modelde; video, film ve ses kayıtları ile öğrencilerin derste sınıf içinde öğrenmeleri planlanan kavramları sınıf dışında öğrenmeleri sağlanır (Bergmann ve Sams, 2012). Bu sayede öğrenme sınıf içiyle sınırlı kalmayacağı gibi öğrencilere her ortamda öğrenme ve öğrendiğini tekrar etme imkanı tanınmış olur. Dahası öğrenciler daha alt düzey bilgileri sınıf dışında bu teknolojik eğitim araçlarıyla (video, film ve ses kaydı vs.) edinirken, sınıf içerisinde öğretmen ve akranlarıyla üst düzey düşünme becerilerini kullanır (Herreid ve Schiller, 2013). Son olarak gelinen noktada tüm öğrenciler bu sisteme dâhil olduğu için artık derslerde uzun anlatımların yerini problem çözme ve modelleme gibi çeşitli etkinlikler almaya başlamıştır (Tucker, 2012). Öyle ki "NMC Horizon 2014: Yüksek Öğretim Raporu"nda da belirtildiği üzere ters yüz sınıf modelinin gelecek yıllarda da hızla yayılmaya devam edeceği göz önüne bulundurularak bu modelin sınıflara taşınması ve matematik öğretimine katkısının arttırılması amacıyla etkinliklerle desteklenerek ortaokul öğrencilerinin öğrenmelerine katkı sağlamak büyük önem arz etmektedir. Bu doğrultuda araştırmanın amacı, ortaokul 6. sınıf öğrencilerinin matematik dersinde etkinlik destekli ters yüz sınıf uygulamalarına ve bu uygulamaların problem çözme becerilerine etkisine ilişkin görüşlerini belirlemektir.

Araştırmanın Amacı

Bu araştırmanın amacı, ortaokul 6. sınıf öğrencilerinin matematik dersinde etkinlik destekli ters yüz sınıf uygulamalarına ve bu uygulamaların problem çözme becerilerine etkisine ilişkin görüşlerini belirlemektir.

Araştırmanın Alt Amaçları

1. Matematik dersinde evde video izleyip okulda etkinliklerle ders işlemeye ilişkin olumlu ve olumsuz öğrenci görüşleri nelerdir?
2. Matematik dersinde işlenecek konuları önceden sınıf dışında video ile dinlerken/izlerken öğrencilerin karşılaştığı sorunlara ilişkin görüşleri nelerdir?
3. Matematik konularını evde video ile izleyip okulda etkinliklerle işlemek öğrencilerin matematik dersine ilişkin problem çözme becerilerinde neleri değiştirdi?
4. Matematik derslerinde okulda etkinliklerle ders işlerken öğrencilerin grup arkadaşları ile yaşadığı olumlu ve olumsuz durumlara ilişkin görüşleri nelerdir?
5. Matematik derslerinde okulda etkinliklerle ders işlerken öğrencilerin öğretmen ile yaşadığı olumlu ve olumsuz durumlara ilişkin görüşleri nelerdir?
6. Matematik konularını evde video ile izleyip okulda etkinliklerle işlemek öğrencilerin matematik dersindeki problem çözmeye yönelik duygularını nasıl etkiledi?
7. Bu şekilde evde video ile izleyip okulda etkinliklerle ders işlemeyi başka derslerde de yapmak isteyip istemediklerine ilişkin öğrenci görüşleri nelerdir?

Yöntem

Bu bölümde; araştırmanın modeli, çalışma grubu, verilerin toplanması, verilerin analizi ve geçerlik ve güvenirlik ile ilgili bilgiler yer almaktadır.

Araştırmanın Amacı

Bu araştırmanın amacı, ortaokul 6. sınıf öğrencilerinin matematik dersinde etkinlik destekli ters yüz sınıf uygulamalarına ve bu uygulamaların problem çözme becerilerine etkisine ilişkin görüşlerini belirlemektir. Belirlenen bu genel amaç doğrultusunda öğrencilerin ters yüz sınıf modelinin etkinliklerle desteklenerek sınıfta uygulanmasına ve bu modelin problem çözme becerileri üzerine etkisine ilişkin görüşleri belirlenmeye çalışılmıştır.

Araştırma Modeli

Nitel araştırma yönteminin kullanıldığı bu çalışmada durum çalışması deseni dikkate alınmıştır. Durum çalışmasının en önemli özelliği bir ya da birkaç durumun derinliğine incelenmesidir. Bir duruma etki eden faktörler bütüncül bir yaklaşımla incelenir ve ilgili duruma olan etkileri ve ilgili durumdan nasıl etkilendikleri üzerinde ayrıntılı bir şekilde ele alınır (Yıldırım ve Şimşek, 2006).

Araştırmanın Çalışma Grubu

Araştırmanın çalışma grubu 8 hafta boyunca etkinlik destekli ters yüz sınıf uygulamaları ile öğretim yapılan ortaokul 6. sınıf öğrencilerinden oluşmaktadır. Araştırmada toplam 25 öğrenci bulunmaktadır. Tablo 1'de seçilen öğrencilere ilişkin bilgiler yer almaktadır.

Tablo 1: Öğrencilere Ilişkin Kişisel Bilgiler

Cinsiyet	***f***	**%**
Kız	12	48
Erkek	13	72
Toplam	**25**	**100**

Tablo 1 incelendiğinde; öğrencilerin 12'sinin kız, 13'ünün erkek olduğu görülmektedir. Bu doğrultuda öğrenciler arasında cinsiyet bazında dengeli bir dağılım olduğunu söylemek mümkündür.

Veri Toplama Aracı ve Verilerin Toplanması

Çalışmada veri toplama aracı olarak 7 yarı yapılandırılmış sorudan oluşan bir görüşme formu kullanılmıştır. Görüşme formu öğrencilerin matematik dersinde ters yüz sınıf uygulamalarına ve bu uygulamaların problem çözme becerileri üzerine etkilerine ilişkin görüşlerini belirlemeye dönük sorulardan oluşmaktadır. Görüşme formuna yönelik olarak da 3 matematik öğretmenin görüşleri alınarak düzenlemeler yapılmıştır. Böylece görüşme formunun amaca hizmet edip etmediği değerlendirilmiştir. Yarı yapılandırılmış görüşme formunun son hali açık uçlu 7 sorudan oluşmaktadır. Bu sorular ile öğrencilerin matematik dersinde etkinlik destekli ters yüz sınıf uygulamalarına ve bu uygulamaların problem çözme becerilerine etkisine ilişkin görüşlerinin belirlenmesi amaçlanmıştır. Görüşme formunda yer alan açık uçlu sorular aşağıda belirtilmiştir:

1. Matematik dersinde evde video izleyip okulda etkinliklerle ders işlemeye ilişkin olumlu ve olumsuz görüşleriniz nelerdir?

2. Matematik dersinde işleyeceğiniz konuları önceden sınıf dışında video ile dinlerken/izlerken karşılaştığınız sorunlar nelerdir?

3. Matematik konularını evde video ile izleyip okulda etkinliklerle işlemek matematik dersine ilişkin problem çözme becerilerinizde neleri değiştirdi?

4. Matematik derslerinde okulda etkinliklerle ders işlerken grup arkadaşlarınız ile yaşadığınız olumlu ve olumsuz durumlar nelerdir?

5. Matematik derslerinde okulda etkinliklerle ders işlerken öğretmeninizle yaşadığınız olumlu ve olumsuz durumlar nelerdir?

6. Matematik konularını evde video ile izleyip okulda etkinliklerle işlemek matematik dersindeki problem çözmeye yönelik duygularınızı nasıl etkiledi?

7. Bu şekilde evde video ile izleyip okulda etkinliklerle ders işlemeyi başka derslerde de yapmak ister misiniz?

Verilerin Analizi

Araştırmada öğretmenlerin görüşlerine dayalı olarak elde edilen verilerin değerlendirilmesinde nitel araştırma desenine uygun olarak içerik analizi yönteminden yararlanılmıştır. İçerik analizinin ilk aşaması, verilerin kodlanmasıdır. Bu aşamada araştırmacı, elde ettiği verileri inceler, anlamlı bölümlere ayırır ve bu bölümleri açıklayıcı küçük veri parçalarını bulmaya çalışır. Kendi içinde anlamlı bir bütün oluşturan bu bölümler, isimlendirilir yani kodlanır (McMillan ve Schumacher, 2006; Yıldırım ve Şimşek, 2006). İkinci aşamada, kodlanan bu verileri belirli kategoriler altında toplayabilen ve genel düzeyde açıklayabilen temalar bulunur. Burada temalar altında yer alan verilerin anlamlı bir bütün oluşturup oluşturmadığı yani iç tutarlığını, temaların tümünün elde edilen verileri anlamlı bir şekilde açıklayıp açıklamadığı yani dış tutarlılığını yansıtır. Üçüncü aşamada, elde edilen veriler düzenlenir ve okuyucunun anlayabileceği bir dille tanımlanır. Son aşamada ise araştırmacı tarafından ayrıntılı olarak tanımlanan ve sunulan veriler yorumlanır. Araştırmacı bu aşamada; topladığı verilere anlam kazandırmalı, ilişkileri açıklamalı, neden-sonuç ilişkileri kurmalı, bulgulardan sonuç çıkarmalı ve sonuçların önemine ilişkin açıklamalar yapmalıdır (Yıldırım ve Şimşek, 2006). Bu aşamalar doğrultusunda, mevcut araştırmada da ilk olarak elde edilen veriler kodlanmış ve anlamlı bölümlere ayrılarak açıklayıcı küçük veri parçaları oluşturulmuştur. Daha sonra verilere ait iç ve dış tutarlık belirlenerek analize devam edilmiştir. Son olarak elde edilen veriler okuyucuların anlayabileceği şekilde düzenlenip yorumlanarak analiz sonlandırılmıştır.

Bulgular

Etkinlik destekli ters yüz modeline ilişkin öğrenci görüşlerinden oluşturulan bulgular, tablolar ve şekiller aşağıda sunulmuştur.

Matematik dersinin etkinlik destekli ters yüz sınıf modeli ile işlenmesine ilişkin bulgular

Öğrencilere "Matematik dersinde evde video izleyip okulda etkinliklerle ders işlemeye ilişkin olumlu ve olumsuz görüşleriniz nelerdir?" sorusu yöneltilmiştir. Elde edilen veriler incelendiğinde, öğrencilerin matematik dersinde evde video izleyip okulda etkinliklerle ders işlemeye ilişkin olumlu ve olumsuz görüşlerine ilişkin kodlamalar tespit edilmiştir. Böylece "Matematik dersinde evde video izleyip okulda etkinliklerle ders işlemeye ilişkin olumlu ve olumsuz görüşler" ana teması oluşturulmuştur. Yapılan detaylı incelemeler sonucu; bu temaya ait davranışları içeren alt temalar belirlemiştir ve ulaşılan sonuçlara Tablo 2'de yer verilmiştir.

Tablo 2: Matematik dersinde evde video izleyip okulda etkinliklerle ders işlemeye ilişkin olumlu ve olumsuz görüşlere ilişkin kodlamalar ve yükleme sayıları

Alt Temalar	f
Olumlu Görüşler	
➢ Derslerin daha eğlenceli geçmesi	15
➢ Konuların daha iyi anlaşılması	10
➢ Matematik dersine ilgi ve isteğin artması	10
➢ Tahta korkusu ve heyecanını yenme	4
➢ Sınıfta oyunlara çok vakit kalması	4
➢ Tekrar imkanı tanıması	2
➢ Derse katılımı arttırması	2
➢ Problem çözme becerisini geliştirmesi	1
Olumsuz Görüşler	
➢ Sınıfın kalabalık olması	10
➢ Ders saatinin yetersiz olması	6
➢ Olumsuz durum yok	5
➢ Oyunlarda heyecan yapılması	4
➢ Evde video izleyecek uygun ortamın olmaması	3
➢ Bazı öğrencilerin videoyu izlemeden gelmesi	2
➢ Daha az test çözülmesi	1
➢ Oyunlarda rakiplerin güçlü olması	1
TOPLAM	**80**

Tablo 2 incelendiğinde; bu ana temaya ait öğrenci görüşlerine ilişkin yapılan yüklemeler görülmektedir. Elde edilen kodlamalar ortak özellikleri bakımından değerlendirilmiş ve matematik dersinde evde video izleyip okulda etkinliklerle ders işlemeye ilişkin olumlu ve olumsuz görüşler temasına ait sekiz olumlu yedi olumsuz alt tema oluşturulmuştur. Olumlu görüşlere ilişkin oluşan alt temalara bakıldığında; en fazla yükleme yapılandan en az yükleme yapılana doğru ***"Tekrara tekrar izleme imkanı sunması" (f: 9), "Okulda etkinliklere ve soru çözümüne daha fazla zaman kalması" (f: 8), "Konuların daha iyi anlaşılması" (f: 7), "Eğlenceli ve heyecan verici olması" (f: 5), "Derse hazırlıklı ve istekli gelmeyi sağlaması" (f: 4), "Videoyu durdurabilme ve kolay not alma imkanı sağlaması" (f: 4), "Derse katılımı arttırması" (f: 2) ve "Problem üzerine düşünme isteğini arttırması" (f: 1***) şeklinde sıralanmıştır. Olumsuz görüşlere ilişkin oluşan alt temalara bakıldığında ise; en fazla yükleme yapılandan en az yükleme yapılana doğru ***"Videonun arkadaşlarım tarafından izlenmeden gelinmesi" (f: 7), "Bazen videoların açılmaması" (f:3), "Bilgisayar olmadığından televizyondan izlenmesi" (f: 3), "Evde dış kaynaklardan gürültü olması" (f: 3), "Video izlemeden derse gitmek" (f: 2), "Evde sınıf ortamının olmaması (yalnız olmak)" (f: 2) ve "Evde öğretmenden dönüt alamamak" (f: 1)*** şeklinde sıralanmıştır.

Araştırmaya katılan öğrencilerin bu alt temaya ilişkin olarak verdikleri cevaplardan bazıları aşağıda sıralanmıştır:

(Gr-Ö1-K) "Evde izleyip okula gelince böyle heyecanlanıyordum. Acaba hangi etkinliği yapacaktık ve bu nasıl bir etkinlik olacaktı merak ediyordum ve benim artık bu sayede videolar matematik hayatımı değiştirdi."

(Gr-Ö1-K) "Evimde bilgisayar yoktu o yüzden televizyondan yapmak zorunda kaldım."

(Gr-Ö5-E) "Yazıları yetiştiremiyordum evde yetiştiriyorum dersi daha iyi anlıyorum"

(Gr-Ö8-K) "Evde video izleyip daha iyi anlamaya başladım"

(Gr-Ö12-K) "Evde tekrar tekrar izleyerek anlamadığım yerleri anlıyorum. Okula gelince etkinlik yapıyoruz. Hoca önceden hazırlayıp etkinlikleri getirip bize veriyordu."

(Gr-Ö14-E) "Evde yazıp okulda daha çok zamanımız oluyor böylece etkinlik yapabiliyoruz."

(Gr-Ö14-E) "Videoyu izlerken tek başıma yazması sıkıcı oluyor"

(Gr-Ö18-E) "Videoyu izlemden geldiğimde etkinlikleri yapmakta zorlanıyordum"

(Gr-Ö19-K) "Kardeşim benim izlememe engel oluyordu bazen"

(Gr-Ö20-K) "Bazıları izlemeden geldiği için hocamız o konuyu tekrar anlatıyordu"

Matematik dersinde işlenecek konuları önceden sınıf dışında video ile dinlenirken/izlenirken karşılaşılan sorunlara ilişkin bulgular

Öğrencilere “Matematik dersinde işleyeceğiniz konuları önceden sınıf dışında video ile dinlerken/izlerken karşılaştığınız sorunlar nelerdir?” sorusu yöneltilmiştir. Elde edilen veriler incelendiğinde, öğrencilerin Matematik dersinde işlenecek konuları önceden sınıf dışında video ile dinlerken/izlerken karşılaşılan sorunlara ilişkin kodlamalar tespit edilmiştir. Böylece “Matematik dersinde işlenecek konuları önceden sınıf dışında video ile dinlenirken/izlenirken karşılaşılan sorunlar” ana teması oluşturulmuştur. Yapılan detaylı incelemeler sonucu; bu temaya ait davranışları içeren alt temalar belirlemiştir ve ulaşılan sonuçlara Tablo 3’de yer verilmiştir.

Tablo 3: Matematik dersinde işlenecek konuları önceden sınıf dışında video ile dinlenirken/izlenirken karşılaşılan sorunlara ilişkin öğrenci görüşler

Alt Temalar	**f**
Ev halkından kaynaklanan sorunlar	10
Sorun yok	7
Sınıf ortamının ve öğretmen dönütlerinin olmaması	3
Bilgisayarın olmaması ve videoyu açamama	3
Tekrar durdurup not almaya çalışmanın kafa karıştırması	2
Videoyu izlemeden gelen arkadaş	1
TOPLAM	**26**

Tablo 3 incelendiğinde; bu ana temaya ait öğrenci görüşlerine ilişkin yapılan yüklemeler görülmektedir. Elde edilen kodlamalar ortak özellikleri bakımından değerlendirilmiş ve Matematik dersinde işlenecek konuları önceden sınıf dışında video ile dinlenirken/izlenirken karşılaşılan sorunlar temasına ait altı alt tema oluşturulmuştur. Görüşlere ilişkin oluşan alt temalara bakıldığında; en fazla yükleme yapılandan en az yükleme yapılana ***doğru “Ev halkından kaynaklanan sorunlar” (f: 10), “Sorun yok” (f: 7), “Sınıf ortamının ve öğretmen dönütlerinin olmaması” (f: 3), “Bilgisayarın olmaması ve videoyu açamama” (f: 3), “Tekrar durdurup not almaya çalışmanın kafa karıştırması” (f: 2), ve “Videoyu izlemeden gelen arkadaş” (f: 1)*** şeklinde sıralanmıştır.

Araştırmaya katılan öğrencilerin bu alt temaya ilişkin olarak verdikleri cevaplardan bazıları aşağıda sıralanmıştır:

(Gr-Ö1-K) “Bilgisayarım olmadığı için televizyondan USB ile izlemek zorunda kaldım”

(Gr-Ö5-E) “Bazı anlayamadığım yerleri evde öğretmenime soramıyordum”

(Gr-Ö6-E) “Hocamız bazı yerleri yazarak dinlememizi istiyordu ama ben yazarken videoyu durdurduğumda kafam karışıyordu.”

(Gr-Ö8-K) “Ede ses olduğunda ve bazen kardeşim ödevlerini yaparken bilgisayarı kullanması”

(Gr-Ö22-K) “Benim kardeşim küçük olduğu için TV izleyip benim videolarımı izlemem izin vermiyordu çok zor ikna ediyordum. Videoyu izlerken de bu sefer oyun oynayarak çok ses çıkarıyor bu konuda da onu ikna ettim”

Matematik konularını evde video ile izleyip okulda etkinliklerle işlemenin matematik dersine ilişkin problem çözme becerilerinde neleri değiştirdiğine ilişkin öğrenci bulgular

Öğrencilere “Matematik konularını evde video ile izleyip okulda etkinliklerle işlemek matematik dersine ilişkin problem çözme becerilerinizde neleri değiştirdi?” sorusu yöneltilmiştir. Elde edilen veriler incelendiğinde, öğrencilerin Matematik konularını evde video ile izleyip okulda etkinliklerle işlemenin matematik dersine ilişkin problem çözme becerilerinde neleri değiştirdiğine ilişkin kodlamalar tespit edilmiştir. Böylece “Matematik konularını evde video ile izleyip okulda etkinliklerle işlemenin matematik dersine ilişkin problem çözme becerilerinde neleri değiştirdiğine ilişkin görüşler” ana teması oluşturulmuştur. Yapılan detaylı incelemeler sonucu; bu temaya ait davranışları içeren alt temalar belirlemiştir ve ulaşılan sonuçlara Tablo 4’de yer verilmiştir.

Tablo 4: Matematik konularını evde video ile izleyip okulda etkinliklerle işlemenin matematik dersine ilişkin problem çözme becerilerinde neleri değiştirdiğine ilişkin öğrenci görüşleri

Alt Temalar	**f**
Problem üzerine düşünme (kafa yorma) becerisini	13
Problemi anlama becerisini	9
Problemi sorgulama ve yorumlama becerisini	7
Problem çözümünde arkadaşlarla iletişim kurma becerisini	6
Kendine güven duyma ve buna bağlı derste aktifleşme	6
Problemi çözemeyince pes etmeme becerisi	5
Problem çözümünde hız kazanma becerisi	3
TOPLAM	**49**

Tablo 4 incelendiğinde; bu ana temaya ait öğrenci görüşlerine ilişkin yapılan yüklemeler görülmektedir. Elde edilen kodlamalar ortak özellikleri bakımından değerlendirilmiş ve matematik konularını evde video ile izleyip okulda etkinliklerle işlemenin matematik dersine ilişkin problem çözme becerilerinde neleri değiştirdiğine ilişkin öğrenci görüşleri temasına ait yedi alt tema oluşturulmuştur. Görüşlere ilişkin oluşan alt temalara bakıldığında; en fazla yükleme yapılandan en az yükleme yapılana doğru ***"Problem üzerine düşünme (kafa yorma) becerisini" (f: 13), "Problemi anlama becerisini" (f: 9), "Problemi sorgulama ve yorumlama becerisini" (f: 7), "Problem çözümünde arkadaşlarla iletişim kurma becerisini" (f: 6), "Kendine güven duyma ve buna bağlı derste aktifleşme" (f: 6), "Problemi çözemeyince pes etmeme becerisi" (f: 5) ve "Problem çözümünde hız kazanma becerisi" (f: 3)*** şeklinde sıralanmıştır.

Araştırmaya katılan öğrencilerin bu alt temaya ilişkin olarak verdikleri cevaplardan bazıları aşağıda sıralanmıştır:

(Gr-Ö1-K) "Artık problem çözerken mantıklı düşünüyorum, kafa yoruyorum bu problem çok zor deyip geçmiyorum."

(Gr-Ö3-K) "Hocam video çekmeden önce ben problemlere kafa yormuyordum ama hocamız video çekmeye başladığında problemlere kafa yormaya başladım."

(Gr-Ö4-K) "Eskiden problemleri anlamıyordum ama şimdi anlıyorum ödev ve testleri arkadaşları la karşılaştırıyorum ve anlamaya çalışıyorum evde öğretmen sanki evdeymiş gibi oluyordu"

(Gr-Ö10-K) "Benim düşünmem ve sorgulamam gelişti. Sorguluyorum ve arkadaşlarıma soruyorum"

(Gr-Ö19-K) "Ben etkinliklerden, videolardan önce problemleri anlamakta zorluk çekiyordum ama etkinlikler yapa yapa kendime güvenim arttı."

(Gr-Ö25-K) "O konularda başarılı olmak derste parmak kaldırmam arttı ve kendime güvenmem çünkü önceden konuları tekrar önemli bir iş bence"

Matematik derslerinde okulda etkinliklerle ders işlerken grup arkadaşları ile yaşanan olumlu ve olumsuz durumlara ilişkin bulgular

Öğrencilere "Matematik derslerinde okulda etkinliklerle ders işlerken grup arkadaşlarınız ile yaşadığınız olumlu ve olumsuz durumlar nelerdir?" sorusu yöneltilmiştir. Elde edilen veriler incelendiğinde, öğrencilerin Matematik derslerinde okulda etkinliklerle ders işlerken grup arkadaşları ile yaşanan olumlu ve olumsuz durumlara ilişkin kodlamalar tespit edilmiştir. Böylece "Matematik derslerinde okulda etkinliklerle ders işlerken grup arkadaşları ile yaşanan olumlu ve olumsuz durumlara ilişkin öğrenci görüşleri" ana teması oluşturulmuştur. Yapılan detaylı incelemeler sonucu; bu temaya ait davranışları içeren alt temalar belirlemiştir ve ulaşılan sonuçlara Tablo 5'de yer verilmiştir.

Tablo 5: Matematik derslerinde okulda etkinliklerle ders işlerken grup arkadaşları ile yaşanan olumlu ve olumsuz durumlara ilişkin öğrenci görüşleri

Alt Temalar	f
Olumlu Görüşler	
➢ Yardımlaşıp karşılaştırarak problem çözme	13
➢ Birlikte eğlenmek	11
➢ Arkadaşlık ilişkilerinin gelişmesi	8
➢ Dersi dağıtan arkadaşların da derse katılması	5
Olumsuz Görüşler	
➢ Sınıfta çok gürültü yapılması	7
➢ Arkadaşlarının olumsuz tutum ve davranışları	5
➢ Sınıfın kalabalık olması	4
➢ Bazı arkadaşların başarısız olması	3
➢ Materyal eksikliği	2
TOPLAM	**58**

Tablo 5 incelendiğinde; bu ana temaya ait öğrenci görüşlerine ilişkin yapılan yüklemeler görülmektedir. Elde edilen kodlamalar ortak özellikleri bakımından değerlendirilmiş ve Matematik derslerinde okulda etkinliklerle ders işlerken grup arkadaşları ile yaşanan olumlu ve olumsuz durumlara ilişkin öğrenci görüşleri temasına ait dört olumlu beş olumsuz alt tema oluşturulmuştur. Olumlu görüşlere ilişkin oluşan alt temalara bakıldığında; en fazla yükleme yapılandan en az yükleme yapılana doğru ***"Yardımlaşıp karşılaştırarak problem çözme" (f: 13), "Birlikte eğlenmek" (f: 11), "Arkadaşlık ilişkilerinin gelişmesi" (f: 8) ve "Dersi dağıtan arkadaşların da derse katılması" (f: 5)*** şeklinde sıralanmıştır. Olumsuz görüşlere ilişkin oluşan alt temalara bakıldığında ise; en fazla yükleme yapılandan en az yükleme yapılana doğru ***"Sınıfta çok gürültü yapılması" (f: 7), "Arkadaşlarının olumsuz tutum ve davranışları" (f: 5), "Sınıfın kalabalık olması" (f: 4), "Bazı arkadaşların başarısız olması" (f: 3) ve "Materyal eksikliği" (f: 2)*** şeklinde sıralanmıştır.

Araştırmaya katılan öğrencilerin bu alt temaya ilişkin olarak verdikleri cevaplardan bazıları aşağıda sıralanmıştır:

(Gr-Ö1-K) "Boyamalı etkinliklerde bazılarına boyama getirmeyi unutmuştum ve arkadaşlarımdan almıştım. Benim ihtiyacım olan renge arkadaşımın ihtiyacı oluyordu. O yüzden o benim ben onun bitirmesini bekliyordum."

(Gr-Ö3-K) "Yanımdaki arkadaşımın benim yapma dediğim şeyi inadına yapması beni rahatsız ediyordu."

(Gr-Ö5-E) "Daha çok kafa yorarak buluyorum ve daha eğlenceli geliyor."

(Gr-Ö6-E) "Bazı arkadaşlarım çözemediğim sorularda bana yardımcı oldu"

(Gr-Ö9-E) "Bir soruyu çözemediğimde arkadaşlarımızla o soruyu hep beraber çözebiliyoruz, bu arkadaşlık ilişkilerimizi olumlu yönde etkiliyor."

(Gr-Ö9-E) "Bazı arkadaşlarım sınıfta çok ses çıkarabiliyor. Konuyu anlayamamama neden oluyor. Önemli bir nokta olunca onu anlayamayıp geri kalmama sebep oluyor."

(Gr-Ö11-K) "Diğer arkadaşlarımızın derste konuşmaları ve dersi dağıtmaları engellendi."

(Gr-Ö14-E) "Bazen etkinlik yaparken sınıfta çok ses oluyordu böylece hocanın sesini duymakta zorluk çekiyoruz."

(Gr-Ö15-E) "Yaptığımız etkinlikleri arkadaşlarımızla beraber yapıyorduk. Birbirimize yardımcı oluyorduk."

Matematik derslerinde okulda etkinliklerle ders işlerken öğretmen ile yaşanan olumlu ve olumsuz durumlara ilişkin bulgular

Öğrencilere "Matematik derslerinde okulda etkinliklerle ders işlerken öğretmeninizle yaşadığınız olumlu ve olumsuz durumlar nelerdir?" sorusu yöneltilmiştir. Elde edilen veriler incelendiğinde, matematik derslerinde okulda etkinliklerle ders işlerken öğretmeninizle yaşadığınız olumlu ve olumsuz durumlar ilişkin kodlamalar tespit edilmiştir. Böylece "Matematik derslerinde okulda etkinliklerle ders işlerken öğretmen ile yaşanan olumlu ve olumsuz durumlara ilişkin görüşleri" ana teması oluşturulmuştur. Yapılan detaylı incelemeler sonucu; bu temaya ait davranışları içeren alt temalar belirlemiştir ve ulaşılan sonuçlara Tablo 6'da yer verilmiştir.

Tablo 6: Matematik derslerinde okulda etkinliklerle ders işlerken öğretmen ile yaşanan olumlu ve olumsuz durumlara ilişkin öğrenci görüşleri

Alt Temalar	**f**
Olumlu Durumlar	
➢ Öğretmen ile eğlenerek öğrenmek	11
➢ Öğretmenin verdiği emeklere karşı çalışma gereği hissetmek	8
➢ Öğretmenin anında dönüt vermesi	6
➢ Öğretmenin video ve etkinliklerde güzel anlatması	5
➢ Öğretmen ile daha samimi iletişim kurma	4
➢ Öğretmeni evinde gibi hissetme	3
➢ Korkumu yenmemi sağlaması	1
Olumsuz Durumlar	
➢ Öğretmenin sinirlenmesi	4
➢ Arka sırada oturmak	3
➢ Sınıf kalabalık olduğundan öğretmenin tüm sınıfa yetişememesi	2
TOPLAM	**61**

Tablo 6 incelendiğinde; bu ana temaya ait öğrenci görüşlerine ilişkin yapılan yüklemeler görülmektedir. Elde edilen kodlamalar ortak özellikleri bakımından değerlendirilmiş ve matematik derslerinde okulda etkinliklerle ders işlerken öğretmen ile yaşanan olumlu ve olumsuz durumlara ilişkin öğrenci görüşleri temasına ait yedi olumlu üç olumsuz alt tema oluşturulmuştur. Olumlu görüşlere ilişkin oluşan alt temalara bakıldığında; en fazla yükleme yapılandan en az yükleme yapılana doğru ***"Öğretmen ile eğlenerek öğrenmek" (f: 11), "Öğretmenin verdiği emeklere karşı çalışma gereği hissetmek" (f: 8), "Öğretmenin anında dönüt vermesi" (f: 6), "Öğretmenin video ve etkinliklerde güzel anlatması" (f: 5), "Öğretmen ile daha samimi iletişim kurma" (f: 4), "Öğretmeni evinde gibi hissetme" (f: 3) ve "Korkumu yenmemi sağlaması" (f: 1)*** şeklinde sıralanmıştır. Olumsuz görüşlere ilişkin oluşan alt temalara bakıldığında ise; en fazla yükleme yapılandan en az yükleme yapılana doğru ***"Öğretmenin sinirlenmesi" (f: 4), "Arka sırada oturmak" (f: 3) ve "Sınıf kalabalık olduğundan öğretmenin tüm sınıfa yetişememesi" (f: 2)*** şeklinde sıralanmıştır.

Araştırmaya katılan öğrencilerin bu alt temaya ilişkin olarak verdikleri cevaplardan bazıları aşağıda sıralanmıştır:

(Gr-Ö2-E) "Öncelikle Hacer hoca çok güzel konu anlattığı için anlamadığımız hiçbir konu kalmadı."

(Gr-Ö3-K) "Öğretmenimiz etkinliklerde ben istemediğim halde beni kaldırması hoşuma gidiyor çünkü ben korkup kalkmak istemiyorum bu da benim korkumu yenmeme yardımcı oluyor."

(Gr-Ö7-K) "Hocam sizinle daha çok eğlenmek sizinle bir şeyler paylaşabilmek."

(Gr-Ö7-K) "Hocam sizinle daha çok eğlenmek sizinle bir şeyler paylaşabilmek."

(Gr-Ö9-E) "Öğretmen konuyu kısa yoldan değil de hep bizim için en ince ayrıntısına kadar anlatıyor. Hacer hoca sayesinde konuyu daha rahat anlıyorum."

(Gr-Ö12-K) "Okulda etkinliklerle ders işlerken anlamadığım yerleri rahatlıkla soruyorum. Çünkü hoca anlamadığım zaman kızmıyor."

(Gr-Ö13-E) "Hocamızı kızdırıyorduk"

(Gr-Ö15-E) "Güzel yaptığımızda öğretmenimiz fotoğrafımızı çekiyordu. Aferin diyordu. Her zaman kontrol ediyordu. Hatalarımıza bakıyordu. Hoca emek verip bize etkinlik yapıyordu. Hocanın güzel video yapması."

(Gr-Ö16-E) "En arkada oturmak yüzünden etkinlikler zor oluyor"

(Gr-Ö19-K) "Sınıfımız çok kalabalık olduğu için öğretmenimiz herkese yetişmekte zorlanıyordu."

(Gr-Ö20-K) "Öğretmenimiz bize tam olarak açıklayabiliyordu. Öğretmenimi evimde gibi hissedebiliyorum."

(Gr-Ö25-K) "Daha iyi iletişim olması ve derste daha iyi katılım olumlu olumsuz olayları öğretmenimle paylaştığımda daha verimli katılabilirim"

Matematik konularını evde video ile izleyip okulda etkinliklerle işlemenin öğrencilerin matematik dersindeki problem çözmeye yönelik duygularını nasıl etkilediğine ilişkin bulgular

Öğrencilere "Matematik konularını evde video ile izleyip okulda etkinliklerle işlemek matematik dersindeki problem çözmeye yönelik duygularınızı nasıl etkiledi?" sorusu yöneltilmiştir. Elde edilen veriler incelendiğinde, matematik konularını evde video ile izleyip okulda etkinliklerle işlemenin öğrencilerin matematik dersindeki problem çözmeye yönelik duygularını nasıl etkilediğine ilişkin kodlamalar tespit edilmiştir. Böylece "Matematik konularını evde video ile izleyip okulda etkinliklerle işlemenin öğrencilerin matematik dersindeki problem çözmeye yönelik duygularını nasıl etkilediğine ilişkin görüşleri" ana teması oluşturulmuştur. Yapılan detaylı incelemeler sonucu; bu temaya ait davranışları içeren alt temalar belirlemiştir ve ulaşılan sonuçlara Tablo 7'de yer verilmiştir.

Tablo 7: Matematik konularını evde video ile izleyip okulda etkinliklerle işlemenin öğrencilerin matematik dersindeki problem çözmeye yönelik duygularını nasıl etkilediğine ilişkin görüşleri

Alt Temalar	f
Problem çözmeye ilişkin inanç ve kendine güven duygusunun artması	19
Problem çözmeye ilişkin korkularını yenmesi	14
Problem çözmekle uğraşmaktan zevk alması	13
Bilgilerin kalıcılığının artması	2
Tek başına problem çözme becerisinin gelişmesi	1
TOPLAM	**49**

Tablo 7 incelendiğinde; bu ana temaya ait öğrenci görüşlerine ilişkin yapılan yüklemeler görülmektedir. Elde edilen kodlamalar ortak özellikleri bakımından değerlendirilmiş ve matematik konularını evde video ile izleyip okulda etkinliklerle işlemenin öğrencilerin matematik dersindeki problem çözmeye yönelik duygularını nasıl etkilediğine ilişkin öğrenci görüşleri temasına ait beş alt tema oluşturulmuştur. Görüşlere ilişkin oluşan alt temalara bakıldığında; en fazla yükleme yapılandan en az yükleme yapılana doğru ***"Problem çözmeye ilişkin inanç ve kendine güven duygusunun artması" (f: 19), "Problem çözmeye ilişkin korkularını yenmesi" (f: 14), "Problem çözmekle uğraşmaktan zevk alması" (f: 13), "Bilgilerin kalıcılığının artması" (f: 2) ve "Tek başına problem çözme becerisinin gelişmesi" (f: 1)*** şeklinde sıralanmıştır.

Araştırmaya katılan öğrencilerin bu alt temaya ilişkin olarak verdikleri cevaplardan bazıları aşağıda sıralanmıştır:

(Gr-Ö1-K) "Problem çözerken ki durumum güvenim yerine geldi artık problem çözerken daha iyiyim ve mantık yürütebiliyorum."

(Gr-Ö3-K) "Evde video izleyip okulda etkinlik yapılması benim hoşuma gidiyor, bu sayede problemlerden korkmamayı, kendime güvenmeyi ve inanmayı öğrendim. Hocama teşekkür ederim."

(Gr-Ö2-E) "Beni problemden korkmaktan kurtardı, yapamayacağıma inanıyordum ama artık ben bunu yaparım deyip başlıyorum."

(Gr-Ö4-K) "Problem çözemeyeceğim diye korkuyordum ama şimdi korkmuyorum, yapacağıma inanıp yapıyorum"

(Gr-Ö15-E) "Önceden yapamayacağıma inanıyordum. Video izleyince yapacağıma inandım. Önceden de problemi çözebileceğime inanmıyordum arkadaşlarımdan yardım istiyordum ama şimdi tek başıma yapabiliyorum."

(Gr-Ö21-E) "Unutmaktan korkuyordum ama böyle kalıcı oldu"

(Gr-Ö23-E) "Eskiden kendime güvenmiyordum soru çözmekten korkuyordum ama şimdi eğleniyor ve zevk alıyorum"

Evde video ile izleyip okulda etkinliklerle ders işlemeyi başka derslerde de uygulamaya ilişkin öğrenci görüşlerine dayalı bulgular

Öğrencilere "Bu şekilde evde video ile izleyip okulda etkinliklerle ders işlemeyi başka derslerde de yapmak ister misiniz ?" sorusu yöneltilmiştir. Elde edilen veriler incelendiğinde, Evde video ile izleyip okulda etkinliklerle ders işlemeyi başka derslerde de uygulamaya ilişkin kodlamalar tespit edilmiştir. Böylece "Evde video ile izleyip okulda etkinliklerle ders işlemeyi başka derslerde de uygulamaya ilişkin öğrenci görüşleri" ana teması oluşturulmuştur. Yapılan detaylı incelemeler sonucu; bu temaya ait davranışları içeren alt temalar belirlemiştir ve ulaşılan sonuçlara Tablo 8'de yer verilmiştir.

Tablo 8: Evde video ile izleyip okulda etkinliklerle ders işlemeyi başka derslerde de uygulamaya ilişkin öğrenci görüşleri

Alt Temalar	f
Evet isterim	
➢ Daha kolay ve iyi anlama	9
➢ Daha fazla problem çözme imkanı sunması	9
➢ Derslerin eğlenceli geçmesi	7
➢ Daha fazla etkinlik yapılması	6
➢ Daha çok konu tekrarı imkanı sağlaması	6
➢ Derse katılım ve aktif olmayı sağlaması	3
➢ Daha rahat not tutma imkanı tanıması	2
➢ Sınava hazırlık sağlaması	1
Hayır istemem	
➢ Herkeste bilgisayar olmaması	1
TOPLAM	**44**

Tablo 8 incelendiğinde; bu ana temaya ait öğrenci görüşlerine ilişkin yapılan yüklemeler görülmektedir. Elde edilen kodlamalar ortak özellikleri bakımından değerlendirilmiş ve Evde video ile izleyip okulda etkinliklerle ders işlemeyi başka derslerde de uygulamaya ilişkin öğrenci görüşleri temasına ait yirmi dört 'Evet isterim' bir 'Hayır istemem' alt tema oluşturulmuştur. Evet isterim görüşünü belirtenlerin nedenlerine ilişkin oluşan alt temalara bakıldığında; en fazla yükleme yapılandan en az yükleme yapılana doğru ***"Daha kolay ve iyi anlama" (f: 9), "Daha fazla problem çözme imkanı sunması" (f: 9), "Derslerin eğlenceli geçmesi" (f: 7), "Daha fazla etkinlik yapılması" (f: 6), "Daha çok konu tekrarı imkanı sağlaması" (f: 6), "Derse katılım ve aktif olmayı sağlaması" (f: 3), "Daha rahat not tutma imkanı tanıması" (f: 2) ve "Sınava hazırlık sağlaması" (f: 1)*** şeklinde sıralanmıştır. "Hayır istemem diyen bir öğrenci ise nedenini ***"Herkeste bilgisayar olmaması" (f: 1)*** şeklinde belirtmiştir.

Araştırmaya katılan öğrencilerin bu alt temaya ilişkin olarak verdikleri cevaplardan bazıları aşağıda sıralanmıştır:

(Gr-Ö2-E) "Böylece sınıfta daha çok problem çözebiliyoruz bu da bizi sınav açısından daha iyi etkiledi"

(Gr-Ö2-E) "Böylece sınıfta daha çok problem çözebiliyoruz bu da bizi sınav açısından daha iyi etkiledi"

(Gr-Ö4-K) "Daha iyi olur bütün derslerde olunca daha fazla konu tekrarı yapabiliriz"

(Gr-Ö9-E) "Bize daha çok kolaylık sağlıyor orada konu işliyoruz burada daha çok örnek veya soru ya da etkinlik yapabiliyorum"

(Gr-Ö10-K) "Güzel olurdu çünkü mesela okulda olsa hocası videodaki gibi geri sarıp tekrar tekrar baştan dinleyemezdik ama video bu işe yarıyor"

(Gr-Ö12-K) "Evet isterim çünkü okulda anlamadığımda evde videoyu tekrar tekrar izleyerek anlıyorum"

(Gr-Ö14-E) "Hocalar bazen hızlı yazdırıyor yetiştiremiyorum böyle olunca daha güzel oluyor"

(Gr-Ö16-E) "Daha çok zamanımız oluyor ve daha çok dersi anlıyorum"

(Gr-Ö17-E) "Güzel eğlenceli olur"

(Gr-Ö23-E) "Dersler daha eğlenceli olurdu sıkılmazdık evde daha gayret edebiliriz."

(Gr-Ö25-K) "Daha çok verimli olurum okula gittiğimde konuları tekrar yaptığımda daha iyi derse katılıyorum."

Tartışma ve Sonuç

Yapılan çalışmada ortaokul 6. sınıf öğrencilerinin matematik dersinde etkinlik destekli ters yüz sınıf uygulamalarına ve bu uygulamaların problem çözme becerilerine etkisine ilişkin görüşlerini belirlenmiştir. Belirlenen bu genel amaç doğrultusunda öğrencilerin ters yüz sınıf modelinin etkinliklerle desteklenerek sınıfta uygulanmasına ve bu modelin problem çözme becerileri üzerine etkisine ilişkin görüşleri belirlenmeye çalışılmıştır. Yapılan nitel analiz sonucunda; öğrencilerin matematik dersinde evde video izleyip okulda etkinliklerle ders işlemeye ilişkin olumlu ve olumsuz görüşleri elde edilmiştir. Öğrencilerin etkinlikle desteklenmiş ters yüz sınıf modeline ilişkin olumlu görüşlerini; tekrara tekrar izleme imkanı sunması, okulda etkinliklere ve soru çözümüne daha fazla zaman kalması, konuların daha iyi anlaşılması, eğlenceli ve heyecan verici olması, derse hazırlıklı ve istekli gelmeyi sağlaması, videoyu durdurabilme ve kolay not alma imkanı sağlaması, derse katılımı arttırması ve problem üzerine düşünme isteğini arttırması, şeklinde sıraladıkları araştırmadan elde edilen önemli sonuçlardandır. Mevcut araştırmayı destekler nitelikteki birçok çalışmada da benzer şekilde ters yüz sınıf modeline yönelik öğrencilerin olumlu görüş belirttikleri ve memnuniyetlerini ifade ettikleri görülmüştür (Bhagat, Chang, & Chang, 2016; Cummins- Sebree & White, 2014; Butt, 2014; Gross, Marinari, Hoffman, DeSimone, & Burke, 2015; Ogden, 2015; Touchton, 2015;Turan ve Göktaş, 2015). Aynı temaya ait öğrencilerin olumsuz görüşleri incelendiğinde ise görüşlerin; videonun arkadaşlarım tarafından izlenmeden gelinmesi, bazen videoların açılmaması, bilgisayar olmadığından televizyondan izlenmesi, evde dış kaynaklardan gürültü olması, video izlemeden derse gitmek, evde sınıf ortamının olmaması (yalnız olmak) ve evde öğretmenden dönüt alamamak şeklinde sıralandığı görülmüştür. Çalışmasında benzer olumsuz durumlara değinen Kara (2015)'da özellikle geleneksel sınıf modeline alışmış öğrencilerin sınıfa gelmeden çalışmayı kabullenmekte zorlanabilecekleri ve her öğrencinin internete ulaşamayabileceği üzerinde durmuştur.

Araştırmadan elde edilen bir diğer önemli sonuç matematik dersinde işlenecek konuları önceden sınıf dışında video ile dinlenirken/izlenirken karşılaşılan sorunlara ilişkin öğrenci görüşleridir. Bu sorunları öğrenciler; Ev halkından kaynaklanan sorunlar, Sorun yok, Sınıf ortamının ve öğretmen dönütlerinin olmaması, Bilgisayarın olmaması ve videoyu açamama, Tekrar durdurup not almaya çalışmanın kafa karıştırması ve Videoyu izlemeden gelen arkadaş şeklinde sıralamışlardır. Öğrencilerin evde video izlemekte zorlandıkları ve özellikle izlemeden gelenlerden kaynaklı sorunlar yaşadıklarını belirttikleri çalışmayı destekler nitelikteki Turan ve Göktaş (2015)'ın çalışmasında da video uzunluğundan kaynaklı olarak bazı öğrencilerin videoyu izlemek istemedikleri sonucuna ulaşılmıştır. Bu doğrultuda Musib (2014)'in ileri sürdüğü videoların 10 dakikadan fazla olmaması gerekliliği göz önünde bulundurularak videolar hazırlanmalıdır.

Araştırmadan elde edilen diğer bir sonuç ise matematik konularını evde video ile izleyip okulda etkinliklerle işlemenin öğrencilerin matematik dersine ilişkin problem çözme becerilerinde neleri değiştirdiğine ilişkin görüşleridir. Bu noktada öğrencilerin problem çözme becerilerinde değişen durumları; problem üzerine düşünme (kafa yorma) becerisini, problemi anlama becerisini, problemi sorgulama ve yorumlama becerisini, problem çözümünde arkadaşlarla iletişim kurma becerisini, kendine güven duyma ve buna bağlı derste aktifleşme, problemi çözemeyince pes etmeme becerisi ve problem çözümünde hız kazanma becerisi şeklinde sıraladıkları görülmüştür. Benzer şekilde Çevikbaş (2018)'ın matematik öğretiminde ters yüz sınıf modeline ilişkin yaptığı çalışmasında da öğrencilerin problem çözme becerileri ve derse aktif katılımları üzerinde modelin etkili olduğu sonucuna ulaşılmıştır.

Araştırmanın bir diğer sonuç ise matematik derslerinde okulda etkinliklerle ders işlerken öğrencilerin grup arkadaşları ile yaşadıkları olumlu ve olumsuz durumlara ilişkin görüşleridir. Öğrencilerin yaşadıkları olumlu durumları; yardımlaşıp karşılaştırarak problem çözme, birlikte eğlenmek, arkadaşlık ilişkilerinin gelişmesi ve dersi dağıtan arkadaşların da derse katılması şeklinde sıraladıkları görülmüştür. öğrencilerin grup arkadaşları ile yaşadıkları olumsuz durumlara ilişkin görüşleri ise; sınıfta çok gürültü yapılması, arkadaşlarının olumsuz tutum ve davranışları, sınıfın kalabalık olması, bazı arkadaşların başarısız olması ve materyal eksikliği şeklinde sıralanmıştır. Güç (2017) araştırmasında mevcut çalışmayı destekler nitelikte öğrencilerin anlamadıkları bir konu yada soru olduğunda birbirleri ile yardımlaşarak çözüm üretmeye çalıştıkları sonucuna ulaşmıştır. Bu sonuç Çakır (2017) tarafından da desteklenmektedir.

Araştırmaya dair diğer bir sonuç, matematik derslerinde okulda etkinliklerle ders işlerken öğrencilerin öğretmenleri ile yaşadıkları olumlu ve olumsuz durumlara ilişkin görüşleridir. Öğrencilerin yaşadıkları olumlu durumları; öğretmen ile eğlenerek öğrenmek, öğretmenin verdiği emeklere karşı çalışma gereği hissetmek, öğretmenin anında dönüt vermesi, öğretmenin video ve etkinliklerde güzel anlatması, öğretmen ile daha samimi iletişim kurma, öğretmeni evinde gibi hissetme ve korkumu yenmemi sağlaması şeklinde sıraladıkları görülmüştür. Öğrencilerin öğretmenleri ile yaşadıkları olumsuz durumlara ilişkin görüşleri ise; Öğretmenin sinirlenmesi, arka sırada oturmak ve sınıf kalabalık olduğundan öğretmenin tüm sınıfa yetişememesi şeklinde sıralanmıştır. Araştırmasında öğrencilerin öğretmen ile iletişimlerinin güçlendiğini ve anlamadıkları konular üzerinde öğretmenlerine daha fazla soru sorma imkânı bulduklarının belirtildiği Güç (2017)'ün çalışması da mevcut çalışmayı bu açıdan desteklemektedir. Ayrıca sınıf mevcutlarının kalabalık olmasının öğretmen için bir dezavantaj olduğunu belirten Güç (2017) buna rağmen öğretmenlerin tüm öğrencilerin sorularına yanıt vermeye çalıştığını vurgulamıştır. Turan ve Göktaş (2015) ise çalışmalarında ters yüz sınıf uygulamalarının öğrenci-öğretmen etkileşimini arttırdığını belirtmiştir.

Araştırmadan elde edilen diğer bir bulgu ise matematik konularını evde video ile izleyip okulda etkinliklerle işlemenin öğrencilerin matematik dersine ilişkin problem çözme becerilerine yönelik duygularını nasıl etkilediğine ilişkin görüşleridir. Bu noktada öğrencilerin problem çözmeye yönelik duygularında değişen durumları; problem çözmeye ilişkin inanç ve kendine güven duygusunun artması, problem çözmeye ilişkin korkularını yenmesi, problem çözmekle uğraşmaktan zevk alması, bilgilerin kalıcılığının artması ve tek başına problem çözme becerisinin gelişmesi şeklinde sıraladıkları görülmüştür. Araştırmaya paralel çalışmalardan bir olan Hung (2015)'un araştırmasında TYS modelinin öğrenci merkezli olmasından dolayı öğrencilerin kendi öğrenme süreçlerini izlemelerinin önemli olduğu sonucuna ulaşılmıştır. Huang ve Hong (2016) ise çalışmalarında TYS modelinin öğrencilere gerçekçi problemler üzerinde uygulamalar yapabilme imkânı tanıdığını belirtmiştir. Literatür incelendiğinde TYS'nin özellikle problem çözmeye yönelik duygusal boyutunun yeterince ele alınmadığı görülmüştür.

Araştırmadan elde edilen son sonuç ise; evde video ile izleyip okulda etkinliklerle ders işlemeyi başka derslerde de uygulamaya ilişkin öğrenci görüşleridir. Bu doğrultuda öğrencilerin çoğunluğunun ters yüz sınıf modelinin başka derslerde de uygulanmasını istediği görülürken çok az sayıda öğrencinin ise bunu istemediği belirlenmiştir. Bu noktada istediğini belirtenlerin nedenlerini; daha kolay ve iyi anlama, daha fazla problem çözme imkânı sunması, derslerin eğlenceli geçmesi, daha fazla etkinlik yapılması, daha çok konu tekrarı imkânı sağlaması, derse katılım ve aktif olmayı sağlaması, daha rahat not tutma imkânı tanıması ve sınava hazırlık sağlaması şeklinde belirttikleri görülürken istemeyen tek öğrencinin nedeni ise herkeste bilgisayarın olmamasıdır. Gilboy, Heinerichs ve Pazzaglia (2015)'da yaptıkları çalışmada öğrencilerin ters yüz edilmiş sınıf modelini, geleneksel yöntemlerden daha fazla tercih ettiklerini ve ters yüz sınıf modelinin akademik başarıya daha çok katkı sağladığını vurgulamışlardır.

Araştırmada elde edilen sonuçlar ve benzer nitelikteki çalışmalara ait sonuçlar değerlendirildiğinde genel olarak öğrencilerin görüşleri ters yüz sınıf modelinin akademik başarı, problem çözme becerisi ve bir çok duyuşsal boyut üzerinde etkili olduğu yönündedir.

Öneriler

- Öğretmenlerin derslerde ters yüz sınıf modelini kullanmaları MEB tarafından teşvik edilmeli ve desteklenmelidir.

- Okullarda öğrencilerin bilişim teknolojilerini (bilgisayarlar, tabletler vs.) daha rahat kullanabilmeleri için bilişim teknolojileri sınıflarının düzenlenmesi ve buna yönelik idari çalışmalar yapılmalıdır.

- Ters yüz sınıf modelinin farklı sınıf düzeyleri ve alanlar üzerine de etkilerinin incelendiği benzer çalışmalar yapılmalıdır.

Kaynakça

Bergmann, J., & Sams, A. (2012), Flip your classroom: Reach every student in every class every day. Washington: International Society for Technology in Education.

Bhagat, K. K., Chang, C. N., & Chang, C. Y. (2016). The impact of the flipped classroom on mathematics concept learning in high school. *Educational Technology & Society, 19*(3), 134–142.

Butt, A. (2014). Student views on the use of a flipped classroom approach: evidence from Australia. *Business Education & Accreditation, 6*(1), 33-44.

Cummins-Sebree, S. E., & White, E. (2014). Using the flipped classroom design: Student impressions and lessons learned. *Association for University Regional Campuses of Ohio Journal, 20*, 113-129.

Çakır, E. (2017). *Ters-yüz sınıf uygulamalarının fen bilimleri 7. Sınıf öğrencilerinin kademik başarı, zihinsel risk alma ve bilgisayarca düşünme becerileri üzerine etkisi.* Yüksek lisans tezi, Ondokuz Mayıs Üniversitesi, Eğitim Bilimleri Enstitüsü, Samsun.

Çevikbaş, M. (2018). *Ters-yüz sinif modeli uygulamalarina dayali bir matematik sinifindaki öğrenci katilim sürecinin incelenmesi*. Doktora tezi. Gazi Üniversitesi, Eğitim Bilimleri Enstitüsü, Ankara.

Er, O., Biçer, N. & Bozkırlı K. Ç. (2012). Yabancılara Türkçe öğretiminde karşılaşılan sorunların ilgili alan yazını ışığında değerlendirilmesi. *Uluslararası Türkçe Edebiyat Kültür Eğitim Dergisi. 1,* 51-69.

Gross, B., Marinari, M., Hoffman, M., DeSimone, K., & Burke, P. (2015). Flipped @ SBU: Student satisfaction and the college classroom. *Educational Research Quarterly, 39*(2), 36–52.

Güç, F. (2017). *Rasyonel sayılar ve rasyonel sayılarda işlemler konusunda ters-yüz sınıf uygulamasının etkileri.* Yüksek Lisans Tezi. Amasya Üniversitesi, Fen Bilimleri Enstitüsü, Amasya.

Herreid, C.F., & Schiller, N.A. (2013). Case studies and the flipped classroom. Journal of College Science Teaching, 42(5).

Huang, Y. N. and Hong, Z. R. (2016). The effects of a flipped English classroom intervention on students' information and communication technology and English reading comprehension. *Educational Technology Research and Development,64*(2), 175-193.

Hung, H. T. (2015). Flipping the classroom for English language learners to foster active learning. *Computer Assisted Language Learning, 28*(1), 81-96.

Johnson, L., Adams Becker, S., Estrada, V., & Freeman, A. (2014). NMC Horizon Report: 2014 Higher Education Edition. Austin, Texas: The New Media Consortium.

Kara, C.O. (2015). Ters yüz sınıf. *Toraks Cerrahisi Bülteni 9*: 224-8

Lage, M. J., Platt, G. J. & Treglia, M. (2000). Inverting the classroom: A gateway to creating an inclusive learning environment. Journal of Economic Education, 31(1), 30-43.

Lichtman, M. (2006). Qualitative research in education: A user's guide. California: Sage Publications Inc.

McMillan, J. H. & Schumacher, S. (2006). *Research in education. Evidence-based nquiry (Sixth edition).* Boston: Pearson Educations, Inc

MEB. (2018). Matematik Dersi Öğretim Programı (İlkokul ve Ortaokul 1, 2, 3, 4, 5, 6, 7 ve 8. Sınıflar). Ankara.

Ogden, L. (2015). Student perceptions of the flipped classroom in college algebra. *PRIMUS, 25*(9-10), 782-791.

Touchton, M. (2015). Flipping the classroom and student performance in advanced statistics: Evidence from a quasi-experiment. *Journal of Political Science Education, 11*(1), 28-44.

Tucker, B. (2012). The flipped classroom. Education Next, 12(1), 82-83. http://educationnext.org/the-flipped-classroom/ sayfasından erişilmiştir.

Turan, Z., & Göktaş, Y. (2015). Yükseköğretimde yeni bir yaklaşım: Öğrencilerin ters yüz sınıf yöntemine ilişkin görüşleri. *Yükseköğretim ve Bilim Dergisi, 5*(2), 156-164.

Yıldırım, A. & Şimşek, H. (2006). *Sosyal bilimlerde nitel araştırma yöntemleri.* Ankara: Seçkin Yayınları.

Zownorega, J. S. (2013). Effectiveness of flipping the classroom in a honors level, mechanics-based physics class. Master's Thesis. Eastern Illinois University

EVALUATION OF PHYSICAL ACTIVITY LEVELS AND ANTHROPOMETRIC MEASUREMENTS IN TURKISH ADULTS

Esen Karaca
esen.karaca@acibadem.edu.tr
Gülgün Ersoy
gersoy@medipol.edu.tr
Dilek Toprak
dilekt66@yahoo.com
Nurhan Doğan
dogan.nurhan@gmail.com
Nesli Arpacı
nesliarpaci@hacettepe.edu.tr

Objective: The aim of this study is to determine the relationship between physical activity levels and antropometric measurements of Turkish adults

Materials and Method: The data were obtained via interviews with a questionnaire from 3453 subjects, who were chosen with simple random sampling among adults. Their physical activity levels and durations were recorded. Then, anthropometric measurements were taken. In the study, subjects were also asked whether they smoke or not. Physical activities done in previous week were evaluated via International Physical Activity Questionnaire (IPAQ). The statistical analyses were made in SPSS 16.0 package program; the averages, standard deviations, frequencies were determined; $p \leq 0.05$ accepted as statistically significant.

Findings:47.5% (n = 1639) of the participants were female and 52.5% (n = 1814) were male. 66.8% (n = 2305) of the participants were between the ages of 18-40, 33.2% (n = 1148) were over 41 years of age. 71.1 % (n=2476) of male subjects were high school and below graduates and 28.3% (n=977) of them were university and higher graduates. Body Mass Index (BMI) averages for male and female subjects were 25.88±3.89 kg/m² and 25.88±5.63 kg/m², respectively. The average of daily moderate physical activity and walking duration were more in males (p=0.000). Frequencies of individuals who do vigorous, moderate and walking scores were detected respectively as 17.4% (n=597), 73.2% (n=920) and 90.5% (n=3126). Conclusion: People who had normal BMI, high educated and younger age group were found to have higher physical activity rates. Females have less physical activity/week than males and they walk shorter time than males. This study revealed a project need about pushing people to have higher physical activity.

EVALUATION OF THE GENDER DIFFERENCES AND REPRODUCTIVE PHYSIOLOGY OF CATFISH (ANCISTRUS CIRRHOSUS)

*Nilay Seyidoglu[1], Cetin Yagcilar[2]

[1]Tekirdag Namik Kemal University, Faculty of Veterinary, Department of Physiology, Tekirdag, Turkey
[2] Tekirdag Namik Kemal University, Faculty of Veterinary,Tekirdag, Turkey
*nseyidoglu@nku.edu.tr

Abstract: Ancistrus cirrhosis is a catfish which used for removing algae from aquariums. It is known that it's the largest genus in the Ancistrus family and is represented by 64 species. It feeds by herbal supplement and can tolerate a wide range of water condition. In general, all kinds of algae containing foods and also vegetables such as peas, carrots, spirulina are included in their diet.
The male fishes are larger than female fishes. Although female fishes have tentacles in the upper of the head, this structure is not available in females. The inside of the slot is cleaned by male fishes for reproduction. The male fish that cleans the area attracts the female to the breeding zone with their behavior. The female fishes adhere the eggs to clusters with adhesive properties. After pouring the eggs, the male fish looks at the eggs for 7 to 10 days. During this period, the male does not leave the nest even if the fish is to be fed.
In our study, it's aimed to observe the sex differences and reproductive physiology of Ancistrus cirrhosis fishes. 7 male and 7 female fishes were studied and took their pictures and recorded the videos during the behavioral process. All this process were also staged graphically. As a result, these fishes are being important in aquarium sector with its gender differences and nutrition.

Key words: Ancistrus cirrhosis, catfish, aquarium

Introduction

The Ancistrus is firstly specified by Kner at 1854 (Bifi et al., 2009). However, 59 various types were observed by the times and have been involved in the aquarium since the early 1900s. (Regan 1904; Isbrücker 1980). These fishes show the typical features of the Loricariidae family (Sabaj et al 1999). Ancistrus species are found in the high Andean rivers and white, clear and black waters. As a general rule, species from white and clear waters have colors ranging from light gray to medium brown and are usually either dark or light. However, almost all species encountered in territorial waters exhibit a dark brown color to black with a pattern of small to medium-sized white to yellow dots. Ancistrus can also swallow atmospheric air to help them breathe in environments with low oxygen content.
Ancistrus cirrhosus (Catfish) is a type of small stingray which also a great tank cleaner (Regan 1904). They have become a preffered fish due to their smaller structure, and a good algae eater than other pleco species. They can live and reproduce in a wide pH range in tanks with different water characteristics. Also they are more active at night like other types and live in a harmony with many peaceful fish species. Herbal feeds are important for these fishes. They can eat vegetable protein such as spirulina, boiled spinach, boiled carrot or cucumber. Their gender distinction is quite difficult since they're in small offspirng. There are thorny extensions at front and the trunks are both of wide and long in males. On the other hand, in the females, the thorny appendages can not be seen or very small. Also, their bodies and structures are thinner than male ones. The males are polygamy which means mating with more than one female in the same tank and make offspring. Then, the male cleans the region and attracts the female to the breeding area with courtship behavior, and also they look at the eggs and protects them. They protect the eggs for 7 to 10 days (Sabaj et al., 1999).
There is not much interest in breeding fishes which are not famous in domestic market. On the other hand, the production of this type of fish is a difficult, laboraius and demanding job. However, they are most popular in aquarium trade. Nico et al (2018) observed that "Aquarium release; bristlenosed catfish (along with many other species of the armored catfish family Loricariidae) are highly popular in the aquarium trade." Besides that, in Turkey, the amount of these fishes produces by domestic producers can not meet the demand sufficiently. In this study, it's aimed to observe the sex differences and reproductive physiology of Ancistrus cirrhosis (Catfish) to clarify and detect the importance of this genus.

Material and Methods

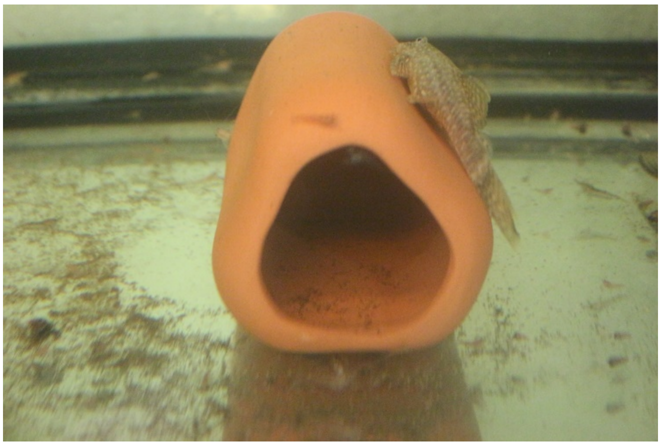
Animals and Experiment: The research was carried out in the Tekirdag Namik Kemal University, Faculty of Veterinary Medicine, Fisheries and Diseases Laboratory. In the trial, 7 male and 7 female fishes were studied. The animals were housed under standard laboratory conditions (average 27.06±0.49 C; 59.27±13.58% humidity). Also the salinity (312.61±17.89) and TDS (dissolved solids; 500.89±29.17) were in normal range (Table 1). 12 hours light and 12 hours dark photoperiod was applied in aquariums with a height of 80 * 35 * 45 cm. One side open and the other side closed test were used for reproduction (Figure 1).

Table 1. Water quality parameters.

Water Quality Parameters	**Mean ± SD**
Salinity (g/kg)	312.61±17.98
TDS (mg/l)	500.89±29.17
Aquarium temperature (°C)	27.66±0.49
Environmental temperature (°C)	28.27±0.35
Humidity (%)	59.27±13.58
pH	8.08±0.10
Oxygen concentration (mg/l)	9.00±1.41
Conductivity (µs)	620.39±37.16

The daily pH, salinity, TDS, conductivity and aquarium temperature were measured by the Extech Instrument. Environmental temperature and humidity was measured by Thermo Hygro and oxygen concentration was detected by commercial JBL kits. A pipe filter was used for filter system. During trial, it siphoned the waste accumulated in the aquariums every two days and exchanged water with the same temperature as the aquarium.

Figure 1. Reproduction cube



Fishes fed a standart diet. Some morphological parameters such as weight and height, were measured in all ages. Gender discrimination was separated according to the extensions formed by looking at the head structure of the adult fish (Figure 2). Also, their photos were taken and videos were recorded during all ages and behavioral process.

Statistical analysis: Statistical analyses performed with SPSS (Version 20.0). All the values were grouped and calculated as means ± standard deviation. One-way ANOVA was applied to all parameters to examine the difference between groups. Differences were considered significant at $p<0.05$. Tukey's test (Dowdy & Wearden, 1981) evaluated if the difference between groups was provided to be significant ($p<0.05$). On the other hand, in non-homogenous groups, differences between means were analyzed by Kruskal Wallis and following Mann Whitney U test between groups one by one (Dawson and Trapp 2001). Also, The correlation analysis were identified by Pearson Correlation method.

Result and Discussion

The height and weight of all fishes were figured in Grapic 1. Also, some female reproductive parameters (larvae and egg counts) are shown in Table 2. The mean live weights of female and male fishes were 9.46±0.63 and 8.90±0.79, and the height of males and females were 8.77±0.27 and 9.70±0.43, respectively. The larvae and egg counts were 49.00 ± 16.63 and 53.00 ± 16.91, respectively. There were no statistical differences between either groups or parameters ($p>0.05$). However, there positively and statistically corelations were observed, especially among female weight, larvae and egg counts. There are positive and statistical correlations between weights and egg counts (r^2:0,977 p:0,001) which means that if weight being higher egg counts are more than normal. The positive and statistical correlation was found in weights and larvae counts (r^2:0,958 p:0,001), and egg and larvae counts (r^2:0,994 $p<0,001$). It means that if weight being higher larvae counts are more than normal. Also, if have more egg, it means that larvae counts are getting more than normal.

Grapic 1. The height and weight parameters of males and females

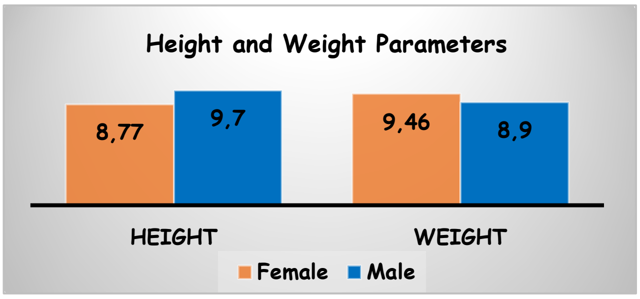
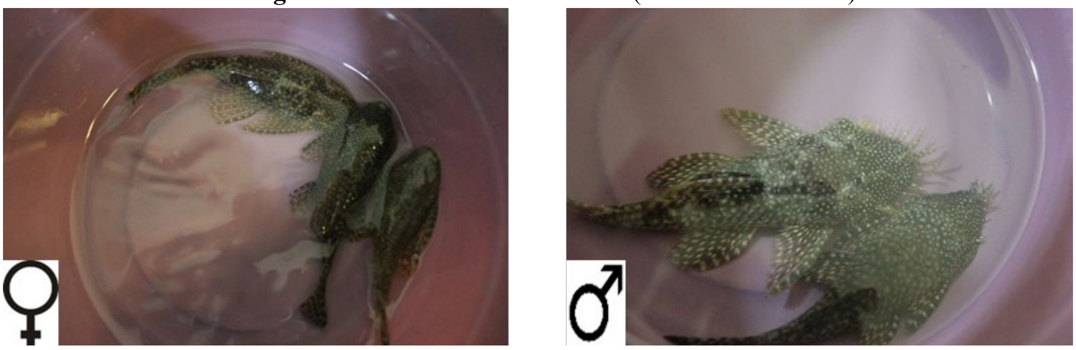


Table 2. The female reproductive parameters.

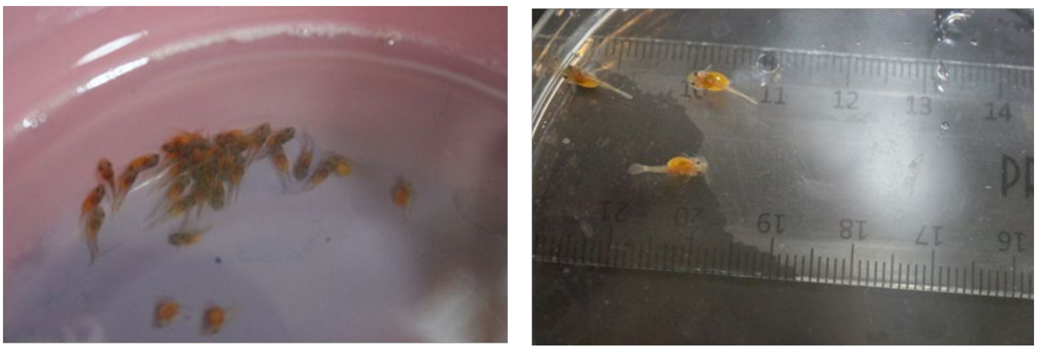
Female	Minimum	Maximum	Mean ± SD
Height (cm)	7.80	10.00	8.77 ± 0.72
Weight (g)	6.02	11.35	9.46 ± 1.67
Egg counts (piece)	21.00	74.00	53.00 ± 16.91
Larvae counts (piece)	19.00	72.00	49.00 ± 16.63

Figure 2. Male and Female Catfish (Ancistrus cirrhosus)



Male and female were fed three times a day with two Spirulina tablets. Reproduction began within a week in all separated fishes. It was observed that adopting and swimming around the cube of the male fish are the breeding behaviors. On the other hand, the female one came close to the cube after egg maturating, and also laying eggs was reported. After laying eggs, female left the cube and the male fish cared the eggs for about 7 to 10 days with ventilation by his fings.

Figure 3. Puppies with egg sacs and 1 cm puppies of Catfish (Ancistrus cirrhosus)



At the end of the 7 or 10 days, the puppies, 1 cm height, left from cube and started to feed after the egg sacs consumption period were detected (Figure 3).

Figure 4. One month puppies of Catfish (Ancistrus cirrhosus)

After eggs consumption period, it was determined that the puppies growth rapidly with either 2 or 3 cm height after approximately 1 month (Figure 4).

There is limited study about this species of fish for nutrition and reproductivity. Researchers reported that the tentacules of catfish like as an olfactory organ which for detecting the odors (Burgess 1989; Sabaj et al., 1999). Also, this organ can be used to attach the eggs. Sabaj et al (1999) hypothesised that the snout tentacles are related to reproductivity. The male protects the eggs and cavity-nest which has a preference for females. Also they indicated that eggs and juveniles are guarded by males after hatching.

Conclusion

The aquarium industry has become an important sector in the world and has been a source of livelihood for thousands of people, especially in countries where fish are collected from nature. According to United Nations Commodity Trade Statistics Database in 2016 the ornamental fish industry included 128 countries in the collection, breeding, import and export of ornamental fish, with a total value of $333 million. The number of fish traded is estimated to be approximately 1.11 billion (EU Statistics 2017; Raja et al., 2019). In Turkey, these fishes are import from other countries, and belong this, it’s being more expensive. The nutrition and growth of these fishes are approximately difficult and requires experience. Identifiying the problems encountered in the production of this species, suggesting solutions and introduction biotic and abiotic factors are important for professional procuders. Therefore, it’s being more important to support the demand for this species with production.

References

Bifi, A.G., Pavanelli, C.S. & Zawadzki, C.H. (2009). *Three New Species Of Ancistrus Kner, 1854 (Siluriformes: Loricariidae) From The Rio Iguaçu Basin, Paraná State, Brazil*. Zootaxa (pp.2275: 41–59).

Burgess, W.E. (1989). *An atlas of freshwater and marine catfishes. A preliminary survey of the Siluriformes*. Neptune City, New Jersey: T.F.H. Publications, Inc.

Dowdy, S. & Wearden, S. (1981). *Statistics for Research*. (pp. 262-274). John Wiley&Sons Press, New York.

Dawson, B. & Trapp, R.G. (2001). *Basic and Clinical Biostatistics*. (3rd Edn.). New York: Lange Medical Books/McGraw International Editions,

EU Ornamental Fish Import & Export Statistics. (2017). *EU Ornamental Fish Import & Export Statistics 2016 (Third Countries & Intra-EU Community trade)*. Ornamental Aquatic Trade Association Ltd Reports.

Isbriicker, J.H. (1980). *Classification and catalogue of the mailed Loricariidae (Pisces, Siluriformes).* Versl. Techn. Gegevens, Univ. Amsterdam. (pp. 22:1-181).

Nico, L., Fuller, P. & Neilson, M. (2018). *Ancistrus sp. Kner, 1854*. U.S. Geological Survey, Nonindigenous Aquatic Species Database, Gainesville, Florida. Available: https://nas.er.usgs.gov/queries/factsheet.aspx?SpeciesID=2598. (November 2018).

Raja, K., Aanand, .P, Padmavathy, S. & Stephen Sampathkumar, J. (2019). *Present and future market trends of Indian ornamental fish sector.* International Journal of Fisheries and Aquatic Studies. (p. 7(2):6-15).

Regan, C. T. (1904). *A monograph of the fishes of the family Loricariidae*. Trans. Zool. Soc. Lond. (pp. 17:191-324).

Sabaj, M.H., Jonathan W.A. & Lawrence M.P. (1999). *Spawning in Ancistrus (Siluriformes: Loricariidae) with comments on the evolution of snout tentacles as a novel reproductive strategy: larval mimicry.* Ichthyol. Expior. Freshwaters. (pp. 10(3):217-229).

EXPRESSION OF EPIDERMAL GROWTH FACTOR RECEPTOR AFTER LOW DOSE CAPSAICIN ADMINISTRATION IN RAT DUODENUM

Ender Deniz ASMAZ[1], Berrin ZIK

[1]Uludağ Üniversitesi Veteriner Fakültesi, Histoloji ve Embriyoloji A.D. Görükle/BURSA
dnz.smz@gmail.com

Abstract: Growth factors are essential for the development, growth and homeostasis of multicellular organisms and play an important role in the development and the maintenance of the gastrointestinal tract. Capsaicin (CAP) with neurotoxic properties has been shown to have a protective effect against experimental gastric mucosal injury in animals and humans. Epidermal growth factor (EGF) and ıt's receptore has been shown to exert gastric hyperemic and gastroprotective effects via capsaicin-sensitive afferent neurons, including the release of calcitonin gene-related peptide (CGRP). The. aim of the present study was to investigate the effects of low dose capsaicin (CAP) on epidermal growth factor receptor (EGFR) expression in the duodenum. In this study, 21-day-old rats were divided into two groups as CAP-treated and vehicle. CAP prepared in a solvent and injected subcutaneously to CAP-treated group (0.5 mg/kg/d) and vehicle group was injected with only solvent for 20 days. At the end of the experiment, tissue samples were collected and paraffin-embedded tissues were processed for standard immunohistochemistry by the labelled streptavidin-biotin technique. The EGFR localizations were identified on the surface epithelium of the villi, Lieberkühn crypts, in the Brunner's glands and smooth muscles layer of the duodenumIn the experimental group, the expression of EGFR in surface epithelial cells was not different compared to the control group, while the expressions in the Lieberukhn crypts, Brunner's glands and smooth muscle layer were stronger than the control group. As a result, the low dose capsaicin increased EGFR expression in the digestive system and probably have positive effects on the digestive system

Key Words: Capsaicin, duodenum, epidermal growth factor, rat.

Introduction

Capsaicin (8-methyl-N-vanillyl-6-nonenamide) is the pungent ingredient in red peppers and chillies that has been a pharmacological tool for the study of thin afferent fibres for almost half a century (Hwang et. al 2010). Capsaicin at a low dose stimulates release of neuropeptides such as catecholamines, neurokinin A (NKA), vasoactive intestinal polypeptide (VIP), calcitonin gene-related peptide (CGRP), and substance P (SP) from sensory neurons endings (Holzer 1991, Surh and Lee, 1996). In contrast, high dose capsaicin shows neurotoxic effect and induces an irreversible long-standing inactivation of the capsaicin-sensitive nerve endings with a loss of their sensory-afferent functions and their ability to release sensory neuropeptides (Holzer 1991).

Sensitive primary afferent neurons of capsaicin participate in the regulation of gastrointestinal (GI) motility (Barthó et. al 2002). The effects of CAP are dependent on the concentration of capsaicin and of the mode of application. Also, Capsaicin induces the apoptosis of cancers cells, including myeloid leukemia (Ito et. al 2004), human hepatoma (Lee et. al 2004), and colon cancer (Kim et. al 2007). However, epidemiologic and animal experimental evidence suggests that capsaicin also acts as a carcinogen or cocarcinogen, particularly during the tumor promotion stage (Surh and Lee, 1996).

Growth factors are essential for the development, growth and homeostasis of multicellular organisms (Wieduwilt et. al 2008). The epidermal growth factor (EGF) is a polypeptide of 53 amino acids originally isolated from the rodent submaxillary gland (Cohen, 1962). EGF is continuously secreted from the salivary glands and the duodenal Brunner's glands (Konturek et. al 1995, Konturek, 1990). Intragastric EGF has been shown to enhance the healing of gastric mucosal injury (Konturek et. al 1995, Konturek, 1990, Olsen et. al 1986) and to protect the gastric mucosa against various stimuli such as stress, ethanol, hypertonic saline, and aspirin (Hui et al. 1993, Kang et al. 1998, Konturek, 1988, Konturek et. al 1981a, Konturek et. al 1981b). Therefore, it has therapeutic potential in digestive system disorders. The protective effects of EGF-family members are most likely related to their ability to modulate epithelial cell migration (Dignass et. al 1993), mucosal blood flow (Hui et al 1993) gastrointestinal motility (McLeay et al.1990), mucus production and secretion (Kelly and Hunter 1990), and gastric acid secretion (Rhodes et. al 1986). In addition, EGF and related peptides are potent mitogens for cells of the gastrointestinal tract in vivo (Al-Nafussi and Wright 1982) and in vitro (Carpenter and Cohen 1979)

The epidermal growth factor receptor (EGFR) is a receptor tyrosine kinase that mediates intracellular signaling in response to various extracellular stimuli (Cohen, 2003). The epidermal growth factor family of receptor tyrosine kinases plays essential roles in regulating cell proliferation, survival, differentiation and migration (Wieduwilt and Moasser 2008).
EGF and EGFR have been shown to exert gastric hyperemic and gastroprotective effects via capsaicin-sensitive afferent neurons, including the release of calcitonin gene-related peptide (CGRP) EGF has a protective role in gastric mucosal injury, via capsaicin-sensitive afferent neurons involving calcitonin gene-related peptide (CGRP) mechanisms (Matsumoto et. al 2001**).**
Overexpression of epidermal growth factor receptor (EGFR) is common in many tumors. Specifically in colon and rectal cancer, EGFR is estimated to be overexpressed in 60%-80% of tumors, and is associated with a poor prognosis (Cohen, 2003).
In previous studies, EGFR immunolocalization is in the lung, stomach, duodenum, pituitary gland, thyroid gland, mammary gland, ovary, smooth muscle cells and small intestinal epithelium cells were determined (Carpenter and Cohen 1979, Carpenter 1987, Gómez-Pinilla et al.. 1988, Thompson 1988, Kajikawa et al. 1991, Massagué and Pandiella 1993, Playford et al. 1996, Kelly et al. 1997, Jeffrey et al. 2001, Zeineldin and Hudson 2006)
However, the effects of capsaicin on the small intestine, the role of EGFR is not fully understood. The aim of the present investigation was to determine the localization of EGFR in rat duodenum by immunohistochemistry and to identify different EGFR immunoreactivity after the application of a low dose of capsaicin in the rat's duodenum.

Material and Methods

Thirty immature female Sprague- Dawley rats (21 d old) were used throughout the experiments. The rats were obtained from the Experimental Animals Breeding and Research Centre, Uludag University, Turkey. The animals were housed five per cage, in temperature controlled conditions of (20–24ºC), humidity (60–70%), and lighting (12 h light/dark cycle), and were provided with feed and water *ad libitum*. The experimental protocols were approved by the Animal Care and Use Committee of the Uludag University and were in accordance with the National Institute of Health Guide for the Care and Use of Laboratory Animals.

Experimental protocol. The rats were divided at random into 2 groups of 20 animals each. The first group (control) remained without any treatment. The second group (experimental) received subcutaneous injection of CAP (Sigma Chemical Co.) (0.5mg/kg/d), prepared in a solvent consisting of 10% of ethanol, 10% of Tween 80, and 80% of distilled water, for 20 consecutive days, Following 20 d of capsaicin treatment, the animals were euthanasised by the injection of sodium pentobarbital and the abdominal walls were opened. The proximal part of the duodenum was removed and fixed in alcoholic formaldehyde. Tissue samples were embedded in paraffin blocks according to routine histological procedures. Five micrometres thick sections were cut and immunostained for EGFR localisation (Inoue et. al 2002).

Immunohistochemistry analysis

After dewaxing and rehydration, slides were carried out antigen retrieval by boiling sections in microwave oven at 750 W in sodium citrate buffer (1 M, pH 6.1). After cooling, slides were rinsed with PBS and endogenous peroxidase activity was blocked by 10 min incubation at room temperature in 3% H_2O_2 solution in distilled water. After blocking with non-immune serum into kit for 30 minute to reduce nonspecific antibody binding, sections were incubated with primary antibodies, a rabbit polyclonal antibody to EGFR (sc 03, Santa Cruz, CA, USA) diluted to 1:100 for overnight at 4°C. The sections were stained using ImPRESS IgG-peroxidase kits (Vector Labs) (cat. No. MP-7401), according to the supplier's instructions. Finally, 3.3'-diaminobenzidine (DAB) was used for colour development. After counterstaining with haematoxylin, specimens were dehydrated and mounted.

Quantitative evaluated according to the staining intensity as follows: no staining (negative, −), slight brown (weak, +), brown-yellow (moderate, ++), and dark brown (strong, +++). The accumulated score of the positive staining represented the relative expression of the protein (Fromowitz et al. 1987, Ergin et al. 2008).

Results and Discussion

The EGFR localizations were identified on the surface epithelium of the villi, Lieberkühn crypts, in the Brunner's glands and smooth muscles layer of the duodenum (Fig. 1a, 2a, 3a). EGFR expression differences between groups are presented in Table 1. In the regions,

In the duodenum of the control group, EGFR expression in the surface epithelium of the tunica mucosa layer showed a strong immunoreactivity. EGFR expression also demonstrated strong immunoreactivity in the surface epithelial cells of the experimental group. (Fig. 1a, 1b) (Table 1.). In the control group, a moderate EGFR immunoreactivity was observed in the Lieberkühn crypts in the Tunica mucosa, while a strong EGFR expression was observed in the experimental group (Fig. 2a, 2b,3b) (Table 1.).

EGFR immunoreaction in Brunner's glands of the submucosa showed intracytoplasmic location. A weak EGFR imunoreactivity was observed in the control group, while a strong immunoreaction was observed in the Brunner's glands of the experimental group (Fig. 2a, 2b) (Table 1.).

Muscle layer. both the circular and longitudinal muscle layers, the dose of CAP administered increased EGFR expression. A weak EGFR expression was determined in the circular muscle layer in the control group, while a moderate EGFR immunoreactivity was observed in the circular muscle layer in the experimental group (Fig 2a 3a, 3b) (Table 1.).

EGFR expression was moderate in the longitudinal muscle layer of the control group, while it showed a strong immunoreactivity in the experimental group. (Fig 2a 3a, 3b) (Table 1.).

Table 1. Semiquantitative observations of the EGFR immunoreactivity in the rat duodenum.

	T. Mucosa		T.Submucosa	T. Muscularis Externa	
	S. Epithelial Cells	Liβ. Cryps.	Brunner's glands	C.Muscle Layer	L. Muscle Layer
Control	+++	++	+/-	+	++
Experimental	+++	+++	+++	++	+++

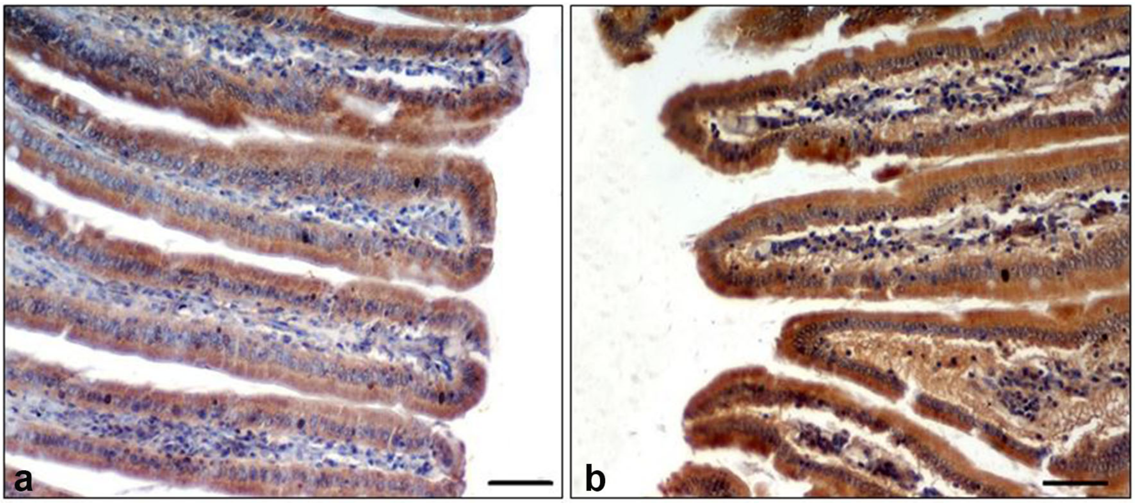


Figure 1. EGFR expression in surface epithelia cells of (a) control group, (b) experimental group. Bar 50 μm.

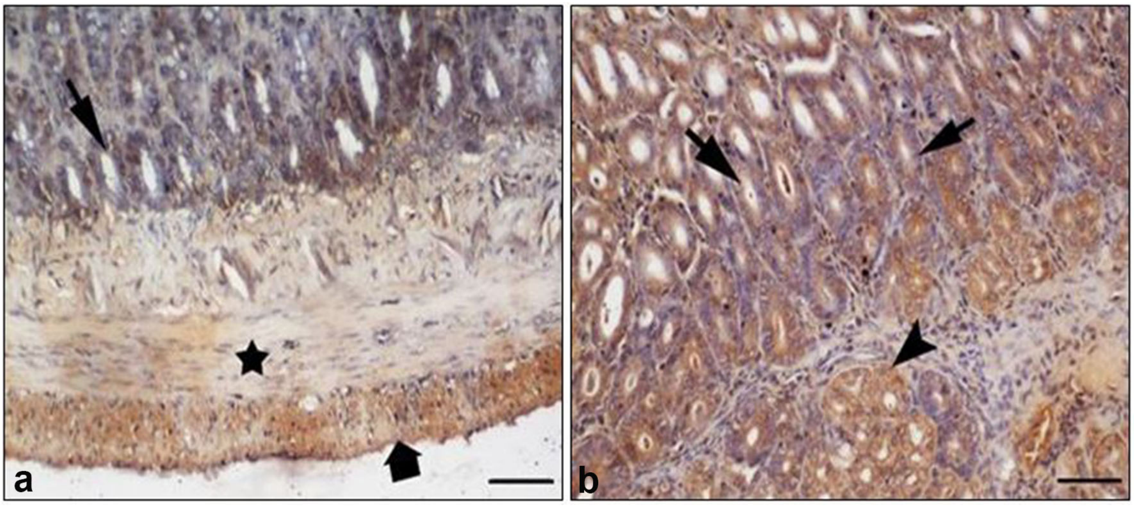


Figure 2. . EGFR expression in Liβ. Cryps, circular and longitudinal muscle layers of (a) control group, (b) experimental group. Bar 50 μm.

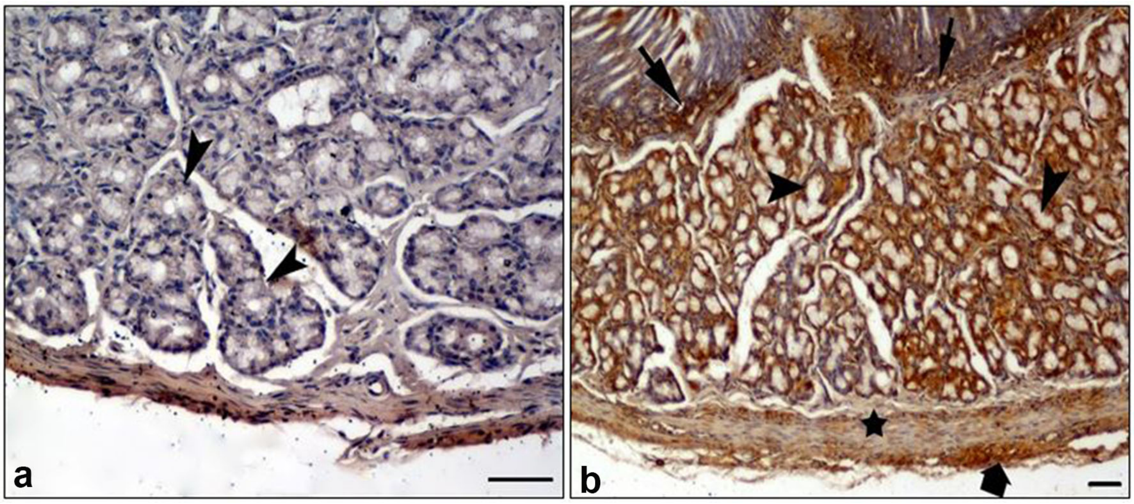


Figure 3. EGFR expression in Brunner's gland, circular and longitudinal muscle layers of (a) control group, (b) experimental group. Bar 50 μm.

The EGFR family members have roles in a broad spectrum of human diseases and are a paradig m for the translation of fundamental biological discoveries into therapeutics for human disease (Wieduwilt and Moasser 2008), and numerous studies have shown the existence of capsaicin sensitivity neurons in the gastrointestinal tract (Holzer, 1991, Nozawa et al. 2001, Patterson et. al 2003). In the present study, we observed that the given low-dose CAP increased EGFR expression in the duodenum's Lieberkühn cryptes, Brunner's glands and smooth muscle layer. Capsaicin has been reported to be effective on growth and development by increasing the release of growth factors. On the other hand EGFR plays essential roles in regulating cell proliferation, survival, differentiation and migration (Szalasi and Blumberg 1999, Yıldız et. al 2013, Bakır and Sarı 2015).

Aberrant regulation of EGFR activates downstream signals including ERKs and Akt resulting in increased tumor cell proliferation, survival, and invasiveness. Thus, modulation of EGFR signalingis key in preventing cancers. Capsaicin enhanced the metastasis of murine breast cancer cells by reducing the expressionof apoptosis-related genes (Erin et al. 2006) and induced LNCaP prostatecancer cell proliferation by increasing androgen receptor expression through the activation of ERKs and Akt (Malagarie-Cazenave et al. 2009). Also, another studies have shown that capsaicin-sensitive afferent neurons do not have a possible role in induction of EGFR in the duodenum (Bulut et al. 2008).

The biological effects of capsaicinoids are dependent on the dose of these compounds administered and the time of exposure (Bley et al. 2012).

Studies have shown that high doses of capsaicin (over 100 mg capsaicin per kg body weight) over a long period of time cause peptic ulcers, accelerate the development of prostate, stomach, duodenal and liver cancers and improve breast cancer metastasis (Mózsik et al. 2009, Bley et al. 2012).
Several convergent studies indicate that low-doses of capsaicin display a cancer-chemopreventive, anti-neoplastic activity (Lau et al. 2012, Aggarwal et al. 2008). Capsaicin induces robust apoptosis in multiple types of human cancer cells both in vitro and in mice models. Recent studies have focused on the potential of capsaicin as a viable anti-cancer drug applicable to the management and treatment of human breast cancer, and colon cancer (Lau et al. 2012, Lau et al 2014). The intestinal absorption of low capsaicin in vitro was done using everted intestinal sacs isolated from rats (Monsereenusorn, 1980). It was observed that capsaicin was robustly absorbed both into intestinal tissues, jejunum and serosal fluid. Kawada et al. (1984) studied the in situ metabolism of capsaicin using ligated loops of stomach, jejunum and ileum (Kawada et al. 1984). The application of 1 mM capsaicin led to rapid absorbance of the compound in the lumen within one hour; the absorbance rate was 50% in the stomach, 80% in the jejunum and 70% in the ileum. This indicated that capsaicin was absorbed better in the jejunum and ileum as compared to the stomach. The authors repeated these studies with dihydrocapsaicin and obtained similar results (Kawada et al. 1984).
Intragastric EGF has been shown to enhance the healing of gastric mucosal injury (Konturek et al. 1990, Konturek et al. 1995, Olsen et al. 1986) and to protect the gastric mucosa against various stimuli such as stress, ethanol, hypertonic saline, and aspirin.

Conclusion

Considering all these data, the fact that low dose CAP application increased the expression of EGFR which plays an important role in cell proliferation, differentiation and migration on dudodenum, suggests that it affects the intestinal activities positively and has a more facilitating effect on digestion.

Acknowledgements

This study was funded by a grant from TUBITAK- TOVAG (The Scientific and Technological Research Council of Turkey) project no: 104 O 372. .

References

Aggarwal, B.B., Kunnumakkara, A.B., Harikumar, K.B., Tharakan, S.T., Sung, B., Anand, P. (2008): Potential of spice-derived phytochemicals for cancer prevention. *Planta Med* 74(13): 1560-9.

Al-Nafussi, A.I., Wright, N.A.(1982): The effect of epidermal growth factor (EGF) on cell proliferation of the gastrointestinal mucosa in rodents. *Virchows Arch B Cell Pathol Incl Mol Pathol* 40: 63–69

Bakır, B., Sarı, E.K.. (2015): Immunohistochemical distribution of platelet derived growth factor-c and platelet derived growth factor receptor-alpha in small intestine of rats treated with capsaicin. *Turk J Vet Anim Sci* 39: 160-167.

Barthó, L., Benkó, R., Lázár, Z., Illényi, L., Horváth, O.P. (2002): Nitric oxide is involved in the relaxant effect of capsaicin in the human sigmoid colon circular muscle. *Naunyn Schmiedebergs Arch Pharmacol* 366: 496-500.

Bley, K., Boorman, G., Mohammad, B., McKenzie, D., Babbar, S. (2012): A comprehensive review of the carcinogenic and anticarcinogenic potential of capsaicin. *Toxicol Pathol* 40(6): 847-73

Bulut, K., Felderbauer, P., Hoeck, K., Schmidt, WE., Hoffmann, P. (2008): Increased duodenal expression of transforming growth factor-a and epidermal growth factor during experimental colitis in rats. *European Journal of Gastroenterology & Hepatology* 20:10.

Carpenter, G., Cohen, S. (1979): Epidermal growth factor. *Annu Rev Biochem* 48: 193–216.

Carpenter, G. (1987): Receptors for epidermal growth factor and other polypeptide mitogens. *Annu Rev Biochem* 56: 881-914.

Cohen, S. (1962): Isolation of a mouse submaxillary gland protein accelerating incisor eruption and eyelid opening in the newborn animal. *J Biol Chem* 237: 1555–1562.

Cohen, R.B. (2003): Epidermal growth factor receptor as a therapeutic target in colorectal cancer. *Clin Colorectal Cancer* 2: 246-251.

Dignass, A.U., Podolsky, D.K. (1993): Cytokine modulation of intestinal epithelial cell restitution: central role of transforming growth factor beta. *Gastroenterology* 105: 1323–1332.

Ergin, K, Gursoy, E., Bağımoğlu, K.Y., Bağaloğlu, H., Seyrek, K. (2008): Immunohistochemical detection of insulin-like growth factor-I, transforming growth factor-b2, basic fibroblast growth factor and epidermal growth factor-receptor expression in developing rat ovary. *Cytokine* 43: 209-214.

Erin, N, Zhao, W., Bylander, J., Chase, G., Clawson, G. (2006): Capsaicin-induced inactivation of sensory neurons promotes a more aggressive gene expression phenotype in breast cancer cells. *Breast Cancer Res Treat* 99:351–64.

Fromowitz, F.B., Viola, M.V., Chao, S., Oravez, S., Mishriki, Y., Finkel, G. (1987): Ras 21 expression in the progression of breast cancer. *Hum Pathol* 18: 1268-1275.

Gómez-Pinilla, F, Knauer, D.J., Nieto-Sampedro, M. (1988): Epidermal growth factor receptor immunoreactivity in rat brain. Development and cellular localization. *Brain Res* 438(1-2):385-390.

Holzer, P. (1991): Capsaicin: cellular targets, mechanisms of action, and selectivity for thin sensory neurons. *Pharmacol. Rev* 43: 143-201.

Hui, W.M., Chen, B.W., Kung, A.W., Cho, C.H., Luk, C.T., Lam, S.K. (1993) :Effect of epidermal growth factor on gastric blood flow in rats: possible role in mucosal protection. *Gastroenterology* 104:1605–1610.

Hwang, M.K., Bode, A.M., Byun, S., Song, R.N., Lee, H.J., Lee, K.W., Dong, Z. (2010): Cocarcinogenic Effect of Capsaicin Involves Activation of EGFR Signaling but Not TRPV1. *Therapeutics, Targets, and Chemical Biology* 6859-569.

Inoue, K., Koizumi, S., Fuziwara, S., Denda, S., Denda, M. (2002): Functional vanilloid receptors in cultured normal human epidermal keratinocytes. *Biochem Biophys Res Commun* 291: 124–129.

Ito, K., Nakazato, T., Yamato, K. (2004): Induction of apoptosis in leukemic cells by homovanillic acid derivative, capsaicin, through oxidative stress: implication of phosphorylation of p53 at Ser-15 residue by reactive oxygen species. *Cancer Res* 64:1071–8.

Jeffrey, S.C., Murray, M.J., Eichorn, E.S. (2001): Distribution of epidermal growth factor receptor (EGFr) in normal and acute peptic-injured equine gastric squamous epithelium. *Equine Vet J* 33(6):562-569.

Kang, J.Y., Teng, C.H., Chen, F.C., and Wee, A. (1998): Role of capsaicin sensitive nerves in epidermal growth factor effects on gastric mucosal injury and blood flow. *Gut* 42: 344–350,

Kajikawa, K., Yasui, W., Sumiyoshi, H., Yoshida, K., Nakayama, H., Tahara, E. (1991): Expression of epidermal growth factor in human tissues. Immunohistochemical and biochemical analysis. *Virchows Arch A Pathol Anat Histopathol* 418(1):27-32.

Kawada, T., Suzuki, T., Takahashi, M., Iwai, K. (1984): Gastrointestinal absorption and metabolism of capsaicin and dihydrocapsaicin in rats. *Toxicol Appl Pharmacol* 15; 72(3):449-56.

Kim, Y.M., Hwang, J.T., Kwak, D.W., Lee, Y.K., Park, O.J. (2007): Involvement of AMPK signaling cascade in capsaicin-induced apoptosis of HT-29 colon cancer cells. *Ann N Y Acad Sci* 1095:496–503.

Kelly SM, Hunter JO. Epidermal growth factor stimulates synthesis and secretion of mucus glycoproteins in human gastric mucosa. Clin Sci (Lond) 1990; 79:425–427.

Kelly, E.J., Newell, S.J., Brownlee, K.G., Farmery, S.M. (1997): Role of epidermal growth factor and transforming growth factor alpha in the developing stomach. *Arch Dis Child Fetal Neonatal Ed.* 76(3): 158-162.

Konturek, S.J., Brzozowski, T., Piastucki, I., Dembinski, A., Radeck, T. (1981a): Role of mucosal prostaglandins and DNA synthesis in gastric protection by luminal epidermal growth factor. *Gut* 22: 927–932.

Konturek, S.J., Radeck, T., Brzozowski, T., Piastucki, I., Dembinski, A,. Gregory, H. (1981b): Gastric cytoprotection by epidermal growth factor. Role of endogenous prostaglandins and DNA synthesis. *Gastroenterology* 81: 438–443.

Konturek SJ. (1988): Role of epidermal growth factor in gastroprotection and ulcer healing. *Scand J Gastroenterol* 23: 129–133,

Konturek, S.J. (1990): Role of growth factors in gastroduodenal protection and healing of peptic ulcer. *Gastroenterol Clin North Am* 19: 41–6.

Konturek, P.C., Konturek, S.J., Brzozowski, T., Ernst, H. (1995): Epidermal growth factor and transforming growth factor-a: role in protection and healing of gastric mucosal lesions. *Eur J Gastroenterol Hepatol* 7: 933–938.

Lau, J.K., Brown, K.C., Dom, A.M., Dasgupta, P. (2012): *Capsaicin: Potential Applications in Cancer Therapy*. London, United Kingdom: Bentham Press..

Lau, J.K,, Brown, K.C., Dom, A.M., Witte, T.R., Thornhill, B.A., Crabtree CM, Perry HE, Brown JM, Ball JG, Creel RG, Damron CL, Rollyson WD, Stevenson CD, Hardman WE, Valentovic MA, Carpenter AB, Dasgupta P. (2014): Capsaicin induces apoptosis in human small cell lung cancer via the TRPV6 receptor and the calpain pathway. *Apoptosis* Aug; 19(8):1190-201.

Lee, Y.S., Kang, Y.S., Lee, J.S., Nicolova, S., Kim, J.A. (2004): Involvement of NADPH oxidase-mediated generation of reactive oxygen species in the apoptotic cell death by capsaicin in HepG2 human hepatoma cells. *Free Radic Res* 38: 405–12.

Malagarie-Cazenave, S., Olea-Herrero, N., Vara, D., Diaz-Laviada, I. (2009): Capsaicin, a component of red peppers, induces expression of androgen receptor via PI3K and MAPK pathways in prostate LNCaP cells. *FEBS Lett* 583: 141-7.

Massagué, J., Pandiella, A (1993): Membrane-anchored growth factors. *Annu Rev Biochem* 62: 515-541.
Matsumoto, Y., Kanamoto, K., Kawakubo, K., Aomi, H. (2001): Gastroprotective and vasodilatory effects of epidermal growth factor: the role of sensory afferent neurons. *Am J Physiol Gastrointest Liver Physiol* 280: G897–G903.
McLeay, L.M., Comeskey, M.A., Waters, M.J. (1990): Effects of epidermal growth factor on gastrointestinal electromyographic activity of conscious sheep. *J Endocrinol* 124:109-115.
Monsereenusorn, Y. (1980): In vitro intestinal absorption of capsaicin. *Toxicol Appl Pharmaco*l 30: 53(1): 134-9.
Mózsik, G., Past, T., Abdel-Salam, O.M., Kuzma, M., Perjési, P. (2009): Interdisciplinary review for correlation between the plant origin capsaicinoids, non-steroidal antiinflammatory drugs, gastrointestinal mucosal damage and prevention in animals and human beings. *Inflammopharmacology* 17(3): 113-50.
Nozawa, Y., Nishihara, K., Yamamoto, A., Nakano, M., Ajioka, H., Matsuur, N. (2001): Distribution and characterization of vanilloid receptors in the rat stomach. *Neurosci Lett* 309: 33-36.
Olsen, P.S., Poulsen, S.S., Therkelsen, K., Nexo, E. (1986): Oral administration of synthetic human urogastrone promotes healing of chronic duodenal ulcer in rats. *Gastroenterology* 90: 911– 917.
Patterson, L.M., Zheng, H., Ward, S.M., Berthoud, H.R. (2003): Vanilloid receptor (VR1) expression in vagal afferent neurons innervating the gastrointestinal tract. *Cell Tissue Res* 31: 1277-1287.
Playford, R.J., Hanby, A.M., Gschmeissner, S., Peiffer, L.P., Wright, N.A., McGarrity, T. (1996): The epidermal growth factor receptor (EGF-R) is present on the basolateral, but not the apical, surface of enterocytes in the human gastrointestinal tract. *Gut* 39(2):262-266.
Rhodes, J.A., Tam. J.P., Finke, U., Saunders, M., Bernanke, J., Silen, W., Murphy, R.A. (1986): Transforming growth factor alpha inhibits secretion of gastric acid. *Proc Natl Acad Sci U S A* 83: 3844-3846.
Surh Y.J., Lee S.S. (1996): Capsaicin in hot chili pepper: carcinogen, cocarcinogen or anticarcinogen? *Food Chem Toxicol* 34: 313- 316.
Szalasi, A., Blumberg, P.M (1999): Vanilliod (capsaicin) receptors and mechanisms. *Pharmacol Rev* 51: 159-211.
Thompson, J.F. (1988): Specific receptors for epidermal growth factor in rat intestinal microvillus membranes. *Am J Physiol* 254(3): 429-435.
Wieduwilt, M.J., Moasser, M.M. (2008): The epidermal growth factor receptor family: biology driving targeted therapeutics. *Cellular and molecular life sciences* 65(10): 1566-1584.
Yıldız SE, Nazlı M, Nur G. (2013): Immunohistochemical distribution and gene expression of transforming growth factor alpha in ovarian tissue of rats treated with capsaicin in puberty. Turk J Med Sci 43: 326-332.
Zeineldin, R., Hudson, L.G. (2006): Epithelial cell migration in response to epidermal growth factor. *Methods Mol Biol* 327:147-158.

EXPRESSION OF INSULIN-LIKE GROWTH FACTOR I IN GASTROINTESTINAL TRACT OF THE LOW DOSE CAPSAICIN TREATED RAT

Berrin ZIK[1], Ender Deniz ASMAZ[1], Rüstem NİYAZ[2]

[1] Bursa Uludağ Üniversitesi Veteriner Fakültesi, Histoloji ve Embriyoloji A. D. Görükle/Bursa
bzik@uludag.edu.tr
[2]Bursa Uludağ Üniversitesi Fen Edebiyat Fakültesi Moleküler Biyoloji ve Genetik Bölümü Görükle /Bursa

Abstract: Capsaicin (CAP) has been demonstrated to have neurotoxic properties whereas it is protective against experimental gastric mucosal injury in animals and humans. The gastrointestinal tract is a major target organ of IGF-I action. One of the most prominent effects is stimulation of intestinal epithelial cell and muscle cell proliferation and maintenance of cell survival by reduction of apoptosis. For this purpose, in this study, we investigated the immunoreactivity of IGF-I after administration of low dose capsaicin in the duodenum, jejenum, ileum, and colon of the rat. Animals (21 old day) were divided into 3 groups; first group (control A) remained without any treatment. Second group (control B) is vehicle injected group for 20 days which is received 10% of ethanol, 10% of Tween 80, and 80% of distilled water, and the third group (experimental) received subcutaneous injection of CAP (0.5mg/kg/d) prepared in a solvent. At the end of the experiment, tissue samples were collected and labelled streptavidin-biotin immunohistochemical technique was used for IGF-I expression. In all groups, IGF-I immunoreactivity detected on the epithelial layers of the villi, in duodenum's Brunner's glands, smooth muscles layer, and crypts. IGF-I expression was increased in surface epithelial cells of duodenum and jejenum except for ileum and colon. On the other hand, in the CAP treated group, IGF-I immunoreaction was stronger than the other groups in crypts epithelial cells of all gastrointestinal tract and in the Brunner's glands of the duodenum. However, immunoreaction was similar in smooth muscles of all groups. As a result, we concluded that application of CAP increased IGF-I synthesis and it can be promote the functions of the rat gastrointestinal tract.
Key Words: Capsaicin, gastrointestinal tract, insulin like growth factor, rat

Introduction

Capsaicin (CAP) belongs to the genus Capsicum of the family Solanaceae. CAP (8-methyl-N-vanillyl-6-nonenamide), the main ingredient of hot chilli peppers, selectively activates the peripheral terminal of sensory C and Aδ fibbers, generally referred as polymodal nociceptors (Surh and Lee 1995). It is currently being utilized for therapeutic treatment of various peripheral conditions such as rheumatoid arthritis and diabetic neuropathy (Surh and Lee 1995). Also, Capsaicin has been reported to have effects on the gastrointestinal, cardiovascular, and respiratory systems (Surh and Lee 1995) and on lipid metabolism (Kawada et al. 1988). The effect of capsaicin, which is a studied subject in numerous fields today, varies based on the applied dose, organ, and exposure time (Kim et al. 1997). CAP has been shown to protect the gastric mucosa of animals and humans against various kinds of damage (Caterina et al. 1997, Saito and Yamamoto 1996, Sugimoto et al. 1998). It is generally considered that CAP's effect results from the activation of sensory afferent neurons in the gastrointestinal tracts and is mediated by various physiological functions, such as mucosal blood flow, mucus secretion, and bicarbonate secretions (Abdel-Salam et al. 1999, Kang et al. 1995).
The gastrointestinal tract is a major target organ of IGF action (Howarth 2003). The IGF system functions as a leading endocrine, paracrine, and autocrine regulatory axis for cellular proliferation, survival, and apoptosis in the gastrointestinal tract. In addition, it has general activities relating to energy metabolism, body size, carcinogenesis, and specific functions of organ. Most biological activities of IGF-I and IGF-II in the gastrointestinal tract and liver are mediated by the IGF-IR. The presence and distribution of IGFs and IGF receptors in the gastrointestinal tract has been extensively determined (Lund et al. 1986, Han et al. 1988, Laburthe et al. 1988, Ryan and Costigan 1993, Brown et al. 1986).

CAP is not only used as a research tool or topical ointments for the treatment of pain, but also is consumed regularly by many people as hot chili pepper. The amount varies between the ethnical groups, but most people are exposed to low levels of CAP through diet.
To our knowledge, immunohistochemical studies demonstrating the effects on IGF-I expression of CAP in gastrointestinal tract were not yet undertaken. This study was conducted to investigate the effect on IGF-I expression of low dose CAP in duodenum, jejunum, ileum and colon of the rat.

Materials And Methods

Animals.

In this study, we used throughout the experiments 21-days old Sprague- Dawley female rats, obtained from the Experimental Animals Breeding and Research Centre, Uludag University, Turkey. Animals were kept under controlled laboratory conditions during the study. The experimental protocols were approved by the Animal Care and Use Committee of the Uludag University and were in accordance with the National Institute of Health Guide for the Care and Use of Laboratory Animals.

Experimental protocol.

The rats were divided at random into 3 groups of 10 animals each. The first group (control A) remained without any treatment. The second group (experimental) received subcutaneous injection of CAP (Sigma Chemical Co.) (0.5mg/kg/d), prepared in a solvent consisting of 10% of ethanol, 10% of Tween 80, and 80% of distilled water, for 20 consecutive days, and the third group (Control B- vehicle treated) received an equal volume of the solvent in the same way used for CAP. Following 20 d of capsaicin treatment, the animals were euthanasised by the injection of sodium pentobarbital and the abdominal walls were opened. The part of the duodenum, jejenum, ileum and colon were removed from intestines and fixed in alcoholic formaldehyde. Tissue samples were embedded in paraffin blocks according to routine histological procedures. Five micrometres thick sections were cut and immunostained for IGF-I localisation.

Immunohistochemistry

The standard streptavidin biotin peroxidase complex technique were carried out using ImPRESS anti goat Ig Peroksidaz (MP-7405). After the sections were deparaffinized, hydrated, sections were performed in a microwave oven of 750 W with sodium citrate buffer (1 M, pH 6.1) for 3 x 5 minutes for antigen retrieval. After the sections were washed with PBS, the sections blocked for 10 minutes for endogenous peroxidase activity. To reduce nonspecific antibody binding, horse serum was applied to sections for 20 min. After that sections were incubated overnight 4°C with anti IGF-1 primary antibody (G-17) (sc-1422) diluted 1:100 as recommended by manufacturer. Samples were then washed three times with PBS and incubated with ImmPRESS reagent for 30 min at room temperature. After washing again with PBS for 3 to 5 minutes, the tissues were washed with distilled water and incubated with 5 minutes DAB for imaging. Hematoxylin was used as counterstaining. Sections were cleared with xylol and covered with the entellan. Negative controls were incubated with the antibody diluent without using the primary antibody. All the slides were coded so that the investigator was blinded to staining for each slide and graded them according to the following scale: - no staining, + slight, ++ moderate, +++ strong.

Results and Discussion

The IGF-1 localisation.
IGF-I immunoreactivity detected on the epithelial layers of the villi, in duodenum's Brunner's glands, smooth muscles layer, and crypts (Figure 1, 2, 3,4,5). Differences in the expression of IGF-I immunoreaction between the groups in the mentioned regions are presented in Table. In the regions, IGF-I labelling was found to be distributed intracytoplasmatically.

Table-1: Semiquantitative observations of the IGF-I immunoreactivity in gastrointestinal tract of control and CAP treatment group.

	Duodenum			Jejenum			Ileum			Colon		
	Control	CAP	Vehicle	Control	CAP	Vehicle	Control	CAP	Vehicle	Control	CAP	Vehicle
Surface Epithelium	++	+++	+++	+	+++	+++	++	++	++	++	++	++
Brunner's glands	++	+++	++									
Cript epithelial cell	-	++	+	+/-	++	+	+	++	+	+/-	++	+/-
Circular muscle layer	++	++	++	++	++	++	++	++	++	++	++	++
Longitudinal muscle layer	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++

(-) no staining, (+) slight, (++) moderate, (+++) strong staining.

IGF-I immunoreactivity in duodenum
While moderate immunoreaction was observed in the surface epithelial cells of control A group, strong reaction was observed in experimental and vehicle group (Figure 1a, b, Table).
In Lieberkühn crypts, immunoreactions were observed moderate in experimental group (Figure 2b) and slight in vehicle group (Figure 2a), but no reaction was observed in control A group. In Brunner's glands, the immunoreactions in experimental group were stronger than the control groups which had strong immunoreaction intensity (Figure 2c). IGF-I immunoreaction was detected moderate in the circular muscle cells, strong in longitudinal muscle layer in all groups (Figure 2 a, b,c, Table).

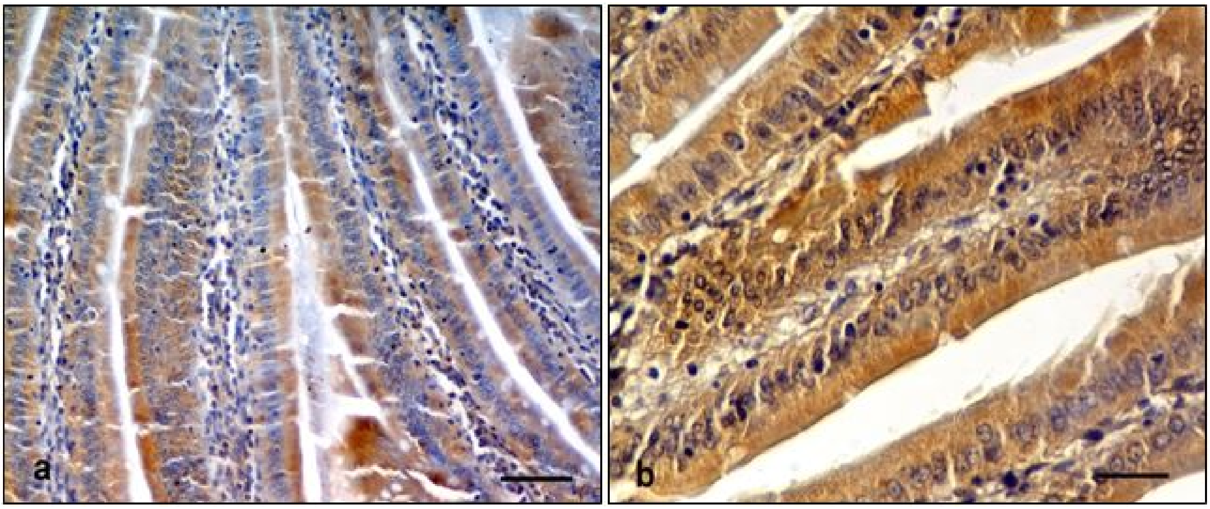


Figure 1: Immunostainings of IGF-I in the surface epithelium in the control A (a) (Bar: 50 µm) and CAP-treated (b) groups of the duodenum (Bar: 25 µm).

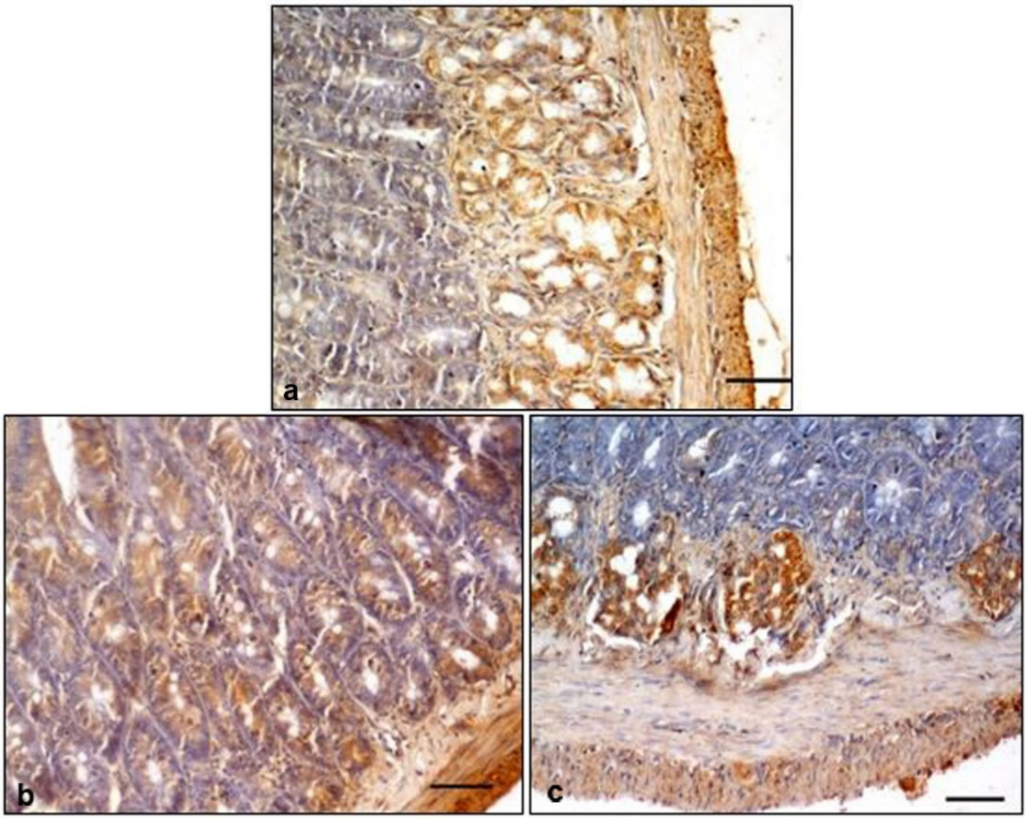


Figure 2. (a) In Control B group, weak IGF-I immunoreactivity in crypt epithelial cells, moderate immunoreactivity in Brunner's glands. In CAP treated groups **(b)** moderate IGF-I immunoreactivity in crypt epithelial cells**, (c)** strong immunoreactivity in Brunner's glands (Bar: 50 μm).

IGF-I immunoreactivity in jejenum

In the jejenum, slightly reaction was determined in villus epithelial cells of control A group, while strong immunoreaction was present in villus epithelial cells of CAP treatment group and vehicle group (Figure 3a,b). However, it was observed that crypt epithelial cells had very slight in control A group and slight cytoplasmic reaction in control B group while CAP treatment group had moderate cytoplasmic reaction (Figure 3a,b). The circular and longitudinal muscle layer were showed immunoreaction similar to the duodenum, which showed moderate immunoreaction in circular muscle layer, strong in longitudinal muscle layer of all groups (Figure 3 a,b).

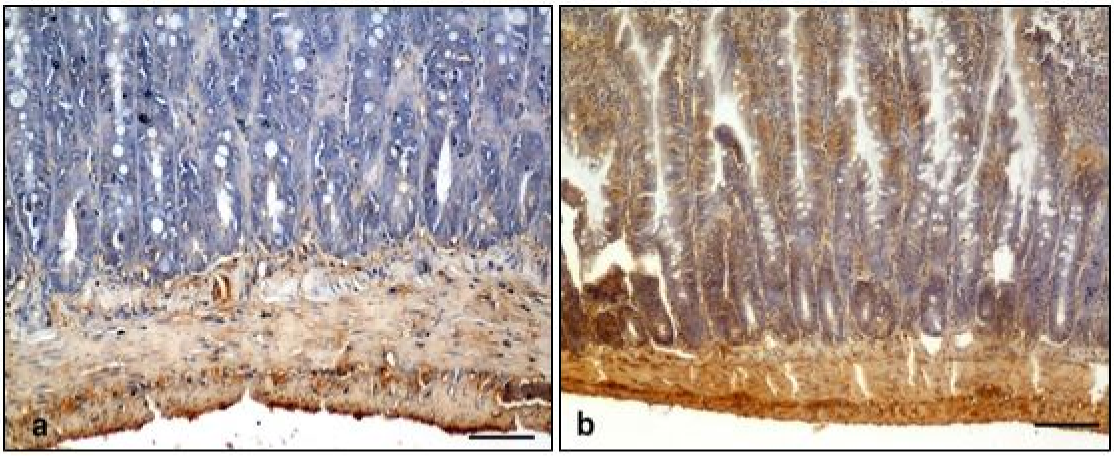


Figure 3: Crypt epithelial cells of jejunum; (a) Weak IGF-I expression in the Control A group (Bar 50 μm), and (b) moderate IGF-I expression in the CAP treated group (Bar 100 μm). Surface epithelial cells (a) Weak IGF-I expression in the Control A group (Bar 50 μm), and (b) strong IGF-I expression in the CAP treated group (Bar 100 μm).

IGF-I immunoreactivity in ileum

In the ileum, moderate immunoreaction was determined in villus epithelial cells of all group (Figure 4 c). Cript epithelial cells were observed to have slight reaction in control groups and moderate reaction in CAP treatment group (Figure 4 a,b). Similar immunoreaction was observed in circular and longitudinal muscle cells both control groups and treatment group. While IGF-I immunoreaction was detected moderate reaction in circular muscle layer, was strong in longitudinal muscle layer (Figure 4 a,b).

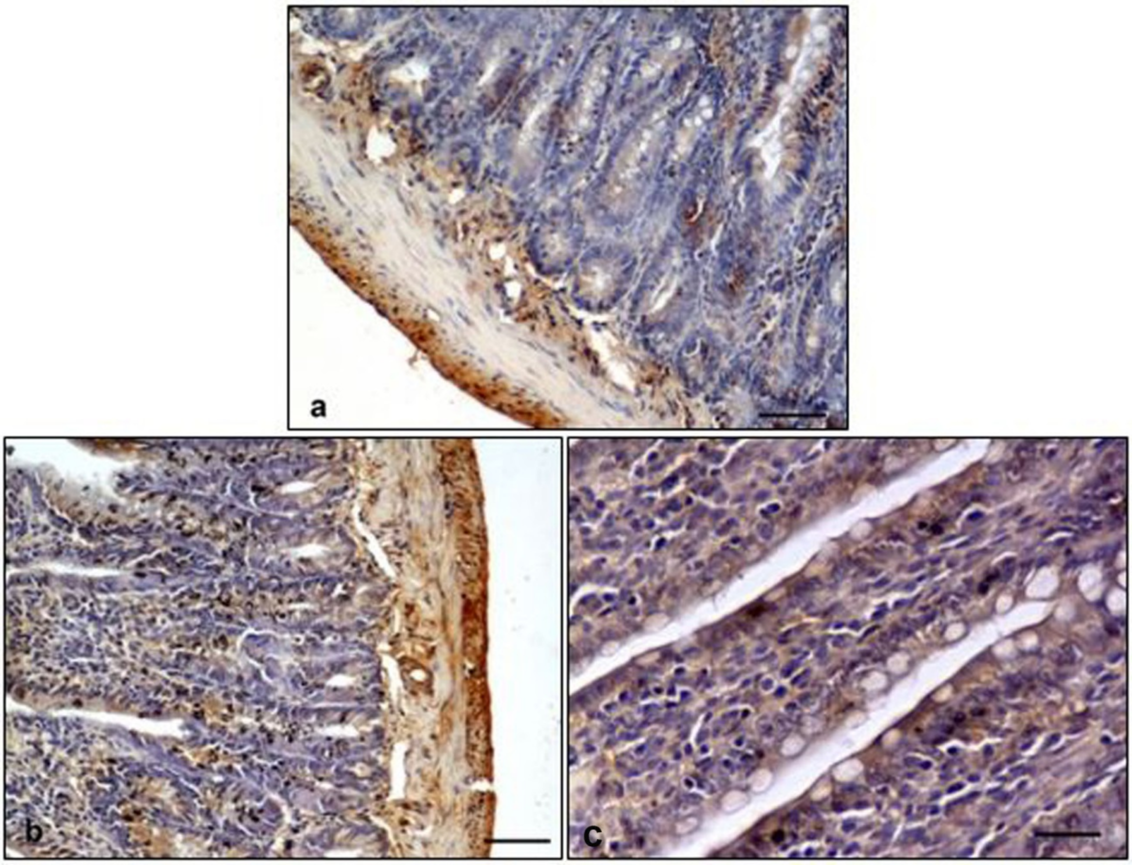


Figure 4. Crypt epithelial cells of ileum; **(a)** Weak IGF-I expression in the control B group **(b)** Moderate IGF-I expression in the CAP treatment group (Bar 50 µm). **(c)** Moderate IGF-I immunoreaction in experimental group surface epithelial cells (Bar 25 µm)

IGF-I immunoreactivity in colon

In the surface epithelial cells of colon was found moderate immunreactions in all groups (Figure 5a,b). Cript epithelial cells of control groups had very slight immunoreaction, those of CAP treatment group had moderate reaction (Figure 5a,b). While IGF-I immunoreaction was detected moderate reaction in circular muscle layer, was strong in longitudinal muscle layer (Figure 5a,b).

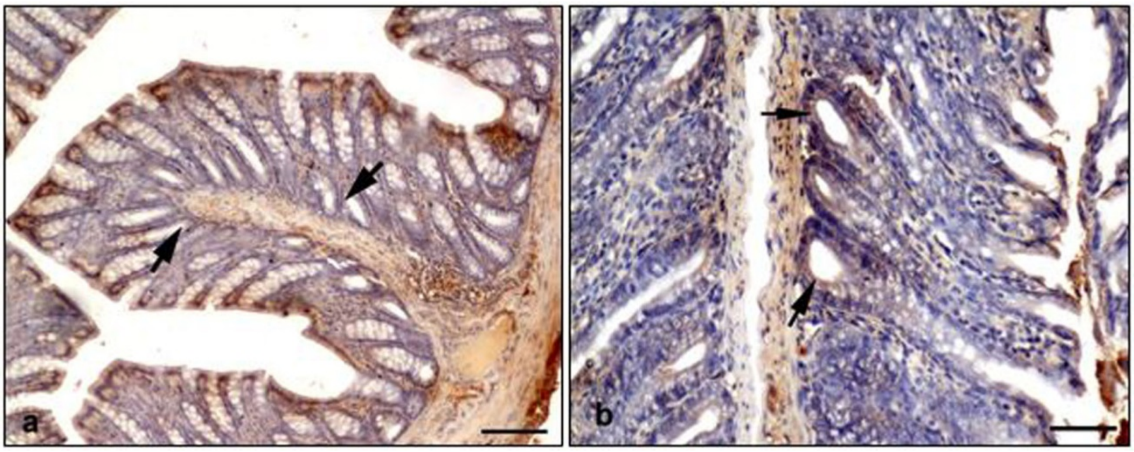


Figure 5. Moderate IGF-I immunoreaction in (a) Control B group (Bar 100 µm), and (b) Experimental group (Bar 50 µm) in surface epithelial cells.
(a) Weak immunoreaction (Bar 100 µm) in control B group, (b) Moderate IGF-I immunoreaction in the experimental group (Bar 50 µm) in crypt epithelial cells (arrows).

The gastrointestinal tract is known to be rich in neurons. These sensory neurons are primary afferents and have several important physiological functions in the gastrointestinal tract (Faussone-Pellegrini et al. 2005, Kang et al. 1993). A rich plexus of nerve fibers containing sensory neuropeptides such as substance-P (SP) or calcitonin gene related peptide (CGRP) is distributed throughout the gastric mucosa (Green and Dockray 1987, Sharkey et al. 1984). It is well known that CAP has been shown to cause neuropeptides release (Holzer, 1991) and this neuropeptides play important roles on gastrointestinal tract. Vanilloid receptor subtype 1 (VR1), a receptor responsible for capsaicin action, positive sensory nerve fibres are able to protect the oesophageal, gastric and intestinal mucosa from a variety of injurious insults (Holzer, 1998). Administration of capsaicin to the oesophageal, gastric and intestinal mucosa increases mucosal blood flow, a response which is mimicked by exposure to excess acid (Holzer, 1998). On the other hand, Hoffmann et al. (2002) indicated that stimulation of primary afferents in the rat colon by CAP induced an increase in mucosal epithelial cell proliferation.
In the present study, we demonstrated by immunohistochemical technique the expression of IGF- I in the rat gastrointestinal tract after CAP treatment. IGFs are mitogenic for intestinal epithelial and smooth muscle cells (Kuemmerle et al. 2004, Trahair et al. 1997). Expression of IGF-I, IGF-II, insülin- like growth factor binding protein (IGFBP) sprecies and IGF receptors has been described throughout the gastrointestinal tract. IGF-I is a potent stimulator of proliferation in the intestinal crypts (Steeb et al. 1994). In addition to, more recently, growth hormone and IGF-I have been demonstrated to protect intestinal cells from radiation-induced apoptosis in vitro (Mylonas et al. 2000) and in vivo utilizing IGF-I transgenic mice (Wilkins et al. 2002). In our study, the intensity of IGF-I immunoreactivity after CAP treatment was increased in the Brunner's glands of duodenum and surface epithelial cells in duodenum and jejenum. In experimental group, IGF-I expressions was increased in cripts epithelial cells of the all small intestine and colon. Similar to our study, Harada et al. (2003) demonstrated that subcutaneous administration of capsaicin increased tissue levels of IGF-I and IGF-I mRNA in various organs including skin in the mice. Finally, in evaluation the our immunohistochemical data showed the administered CAP increased IGF-I which play important roles on cell growth, proliferation and differentiation of gastrointestinal tract.

Conclusion

In our previous study showed that CAP is increased SP immunoreaction in the surface epithelium, Lieberkühn crypts, in the Brunner's glands, smooth muscles layer, and the neurons of the myenteric plexus of the duodenum (Özgüden -Akkoç et al 2017). Also, in the other our study, Vanilloid receptor subtype 1 (VR1) were identified on the epithelial layers of the villi, in the Brunner's glands, smooth muscles layer, and the neurons of the myenteric plexus of the duodenum (Zık et al. 2007). We confirmed that VR1 and SP expression was increased by CAP treatment in the duodenum (Zık et al. 2007, Özgüden-Akkoç et al. 2017). The previous studies reported that stimulation of sensory nerves by capsaicin leads to release of neurotransmitter such as calcitonin gene-related peptide and substance P (Tarnawski et al. 1993, Holzer 2007, Stroff et al. 1995) and these neurotransmitters increases IGF-I production (Vignery and McCarthy 1996, Harada et al. 2007). Furthermore, since IGF-I has been found to sensitize VR-1 (Van Buren et al. 2005). Thus, it is possible that increase in the IGF-I production in response to application of capsaicin might due to the release of one or several specific neuropeptides.
After CAP applications, IGF-I expression intensity was similar in the smooth muscle layers of all groups which had moderate immunoreaction in the circular muscle cells, strong in longitudinal muscle layer. These results

indicate that the duration administration and dose of capsaicin, may not be sufficient to stimulate of sensory neurons leading to an increase in IGF-I production in these area.

Acknowledgements

This study was funded by a grant from TUBITAK- TOVAG (The Scientific and Technological Research Council of Turkey) project no: 104 O 372.

References

Abdel-Salam, O.M.E., Debreceni, A., Mózsik, G.Y. (1999): Capsaicin-sensitive afferent sensory nerves in modulating gastric mucosal defense against noxious agents. *J Physiol* 93: 443-454.

Brown, A.L., Graham, D.E., Nissley, S.P., Hill, D.J., Strain, A.J., Rechler, M.M. (1986): Developmental regulation of insulin-like growth factor II mRNA in different rat tissues. *J Biol Che.* 261:13144–13150.

Caterina, M.J., Schumacher, M.A., Tominaga, M., Rosen, T.A., Levine, J.D., Juliu,s D. (1997): The capsaicin receptor: a heat-activated ion channel in the pain pathway. *Nature*, 389: 816–824.

Faussone-Pellegrini, M.S., Taddei, A., Bizzoco, E. (2005): Distribution of the vanilloid (capsaicin) receptor type 1 in the human stomach. *Histochem Cell Biol* 124: 61-68.

Green, T., Dockray, G.J. (1987): Calcitonin gene-related peptide and substance P in afferents to the upper gastrointestinal tract in the rat. *Neurosci Lett* 76: 151-156.

Han, V.K., Lund, P.K., Lee, D.C., D'Ercole, A.J. (1988): Expression of somatomedin/insulin-like growth factor messenger ribonucleic acids in the human fetus: identification, characterization, and tissue distribution. *J Clin Endocrinol Metab* 66: 422–429.

Harada, N., Okajima, K., Uchiba, M., Katsuragi, T. (2003): Contribution of capsaicin-sensitive sensory neurons to stress-induced increases in gastric tissue levels of prostaglandins in rats, *Am J Physiol Gastrointest Liver Physio.* 285: G1214–G1224.

Harada, N., Okajima, K., Arai, M., Kurihara, H., Nakagata, N. (2007): Administration of capsaicin and isoflavone promotes hair growth by increasing insulin-like growth factor-I production in mice and in humans with alopecia**.** *Growth Horm IGF Res* 17(5):408-15.

Hoffmann, P., Mazurkiewicz, J., Holtmann, G. (2002): Capsaicin-sensitive nerve fibres induce epithelial cell proliferation, inflammatory cell immigration and transforming growth factor-alpha expression in the rat colonic mucosa in vivo. *Scand J Gastroenterol* 37: 414-422.

Holzer, P. (1991): Capsaicin: Cellular targets, mechanisms of action, and selectivity for thin sensory neurons. *Pharmacol Rev* 43: 143-201.

Holzer, P. (1998): Neural emergency system in the stomach. *Gastroenterology* 114:823–839.

Holzer, P. (2007): Role of visceral afferent neurons in mucosal inflam- mation and defense. *Curr Opin Phamacol* 7: 563–569.

Howarth, G.S. (2003): Insulin-like growth factor-I and the gastrointestinal system: therapeutic indications and safety implications. *J Nutr* 133:2109–2112.

Kang, J.Y., Alexander, B., Math, M.V. (1993): The effect of chilli and its pungent ingredient capsaicin on gastrointestinal transit in the rat. *J Gastroenterol Hepatol* 8: 513-516.

Kang, J.Y., Teng, C.H., Wee, A. (1995): Effect of capsaicin and chilli on ethanol induced gastric mucosal injury in the rat. *Gut* 36: 664-669.

Kawada, T., Sakabe, S., Watanabe, T., Yamamato, M., Iwai, K.(1988): Some pungent principle of spices causes the adrenal medulla to secrete catecholamine in anesthetized rats. *P Soc Exp Biol Med* 188: 229–233.

Kim, J.D., Kim, J.M., Pyo, J.O., Kim, S.Y., Kim, B.S., Yu, R., Han, I.S. (1997): Capsaicin can alter the expression of tumor forming-related genes which might be followed by induction of apoptosis of a Korean stomach cancer cell line. *Cancer Lett* 120: 235–241.

Kuemmerle, J.F., Zhou, H., Bowers, J.G. (2004): IGF-I stimulates human intestinal smooth muscle cell growth by regulation of G1 phase cell cycle proteins. *Am J Physiol Gastrointest Liver Physiol* 286:G412–G419.

Laburthe, M., Rouyer-Fessard, C. (1988): Gammeltoft S. Receptors for insulin-like growth factors I and II in rat gastrointestinal epithelium. *Am J Physiol* 254:G457–G462.

Lund, P.K., Moats-Staats, B.M., Hynes, M.A. (1986): Somatomedin-C/insulin-like growth factor-I and insulin-like growth factor-II mRNAs in rat fetal and adult tissues. *J Biol Chem* 261:14539–14544.

Mylonas, P.G., Matsouka, P.T., Papandoniou, E.V., Vagianos, C., Kalfarentzos, F., Alexandrides, T.K. (2000): Growth hormone and insulin-like growth factor I protect intestinal cells from radiation induced apoptosis. *Mol Cell Endocrinol* 160: 115–122.

Özgüden-Akkoç, C.G., İlhan, T., Peker, S., Zik, B. (2017): The effects of low dose capsaicin on substance P expression in rat duodenum. *Ankara Üniv Vet Fak Derg* 64: 31-36.

Ryan, J., Costigan, D.C. (1993): Determination of the histological distribution of insulin like growth factor 1 receptors in the rat gut. *Gut* 34:1693–1697.
Saito, A., Yamamoto, M. (1996): Acute oral toxicity of capsaicin in mice and rats. *J Toxicol Sci* 21: 195-200.
Sharkey, K.A., Williams, R.G., Dockray, G.J. (1984): Sensory substance P innervation of the stomach and pancreas. Demonstration of capsaicin-sensitive sensory neurons in the rat by combined immunohistochemistry and retrograde tracing. *Gastroenterology* 87: 914-21.
Steeb, C.B., Trahair, J.F., Tomas, F.M., Read, L.C. (1994): Prolonged administration of IGF peptides enhances growth of gastrointestinal tissues in normal rats. *Am J Physiol* 266: G1090–G1098.
Stroff, T., Plate, S., Respondek, M. (1995): Protection by gastrin in the rat stomach involves afferent neurons, calcitonin gene-related peptide, and nitric oxide. *Gastroenterology* 109: 89-97.
Sugimoto, T., Xiao, C., Ichikawa, H. (1998): Neonatal primary ne uronal death induced by capsaicin and axotomy involves an apoptotic mechanism. *Brain Res* 807: 147-154.
Surh, Y.J., Lee, S.S. (1995): Capsaicin, a double-edged sword: toxicity, metabolism, and chemopreventive potential. *Life Sci* 56: 1845-1855.
Tarnawski, A., Sarfeh, I.J., Lu, S.Y., (1993): Quality of ulcer healing: evidence for impaired restoration of sensory CGRP nerves in the scar of experimental gastric ulcer. *Eur J Gastroenterol and Hepatol* S81-S85.
Trahair, J.F., Wing S.J., Quinn, K.J., Owens, P.C. (1997): Regulation of gastrointestinal growth in fetal sheep by luminally administered insulin-like growth factor-I. *J Endocrinol* 152:29–38.
Wilkins, H.R., Ohneda, K., Keku, T.O., D'Ercole, A.J., Fuller, C.R., Williams, K.L., Lund, P.K. (2002): Reduction of spontaneous and irradiationinduced apoptosis in small intestine of IGF-I transgenic mice. Am. J. Physiol. Gastrointest. *Liver Physiol* 283: G457–G464
Van Buren, .J.J., Bhat, S, Rotello, R., Pauza, M.E., Premkumar L.S. (2005): Sensitization and translocation of TRPV1 by insulin and IGF-I. *Mol Pain*;1:17.
Vignery, A., McCarthy, T.L. (1996): The neuropeptide calcitonin gene- related peptide stimulates insulin-like growth factor I production by primary fetal rat osteoblasts. *Bone* 18: 331–335.
Zık, B., Özgüden-Akkoç, C.G, Tütüncü, Ş., İlhan, T. (2007): Expressıon Of Vanılloıd Receptor-1 In The Duodenum Of The Capsaıcın Treated Rat. *Bull Vet Inst Pulawy* 51: 149-153, 2007

HANDWRITING AND VOICE RECOGNITION APPLICATION FOR STUDENTS WHO NEED SPECIAL EDUCATION

Umut Zeki[1], Tolgay Karanfiller[2], Kamil Yurtkan[3]

[1,3]Department of Computer Engineering, Cyprus International University,
Haspolat, Nicosia, CYPRUS

[2] Computer and Instructional Technology Teacher Education, Cyprus International University,

Haspolat, Nicosia, CYPRUS

[1]umut_zeki@hotmail.com, [2]tkaranfiller@ciu.edu.tr, [3]kyurtkan@ciu.edu.tr

Abstract: The students who need special education can learn relatively slower than the usual students. To assist and enhance the learning activities for these kinds of students, we have proposed a mobile application in our previous studies. In this study, we have developed two modules that will make it possible to implement all the features of the stepwise learning method. The additional modules are those that can recognize the handwriting of the students and also recognize the voice of the students. In stepwise teaching method, "write" and "say" are fundamental steps. Therefore, with the addition of these modules, the system will be able to recognize the voice and handwriting as well. The main contribution of this study is that the sayings of mentally impaired students are different than the usual students. So, the learning system will include a training system that is dedicated to each student. Furthermore, the handwritings of these students may include many translations and transformations of the images. The learning system will be employed to cover all possible translations and transformations on the images of mentally impaired students. We aim to recognize the voice and handwriting of mentally impaired students with an acceptable rate of accuracy. The system will be tested on real students in the learning process of the digits. This study will be used to enhance the teaching modules for other assistive teaching methods that are currently available.

Keywords: special education, mobile application, stepwise method, rule-based system, voice recognition, handwriting recognition.

Introduction

Because of having portability, Internet, games and social media, mobile devices have become an indispensable part of our lives. For this reason, new applications for mobile devices are being developed every day. Although there are many applications in almost every area, there is not enough study in some areas such as Special Education. Students who need special education may learn slower than other students and consequently may face with learning difficulties. Based on this problem, we proposed an intelligent mobile application that supports the teaching of digits(0-9) in mathematics. This article will explain the two modules of the application: handwriting recognition and voice recognition. Students with mental disabilities may learn slower and need more repetition to reinforce what they have learned. If this kind of applications increases, the students will be able to consolidate what they have learned at school without the limit of time and space alone or under the supervision of teachers. The algorithm of this application designed based on the Stepwise Method; because it is a very effective method to teach mathematics concepts to the students who need special education. In addition, all steps of the Stepwise Method can be applied by using this algorithm.

In the application development process, the handwriting recognition module which will be used in the ‘write’ step and the voice recognition module which will be used in the ‘say’ step is not yet completed. The ‘do’ and ‘show’ steps are completed. At the same time, the student's responses will be collected in a database and will be designed to provide detailed analysis and reports about the student by using Rule-Based System. Although the language of the application is in Turkish, it can be adapted to other languages in the future. Implementation of all the steps of the Stepwise Method, voice recognition and handwriting recognition modules and the ability to make analyses about the student through the Rule-Based System are the novelties of this study. In application, as in the Stepwise Method, there are four stages to teach a concept; “do, show, say and write”. The 16 steps, which are the combination of these, consist of sessions such as do-do, do-show, say-write; where the teacher first teaches the concept and then expects the student to apply it. The part where the teacher explains the concept is adapted with the help of animation and sound in the application. All of the parts that the student “do” and “show” is completed and explained in the previous study.

Methodology

Since this study is about developing a smart application for children in need of special education, the literature review has been done by selecting keywords special education, mobile application, stepwise method, rule-based system, voice recognition, and handwriting recognition. However, since there are not many studies that are similar to the ongoing study and include all keywords, the studies that are included in the literature and partially contain the keywords have been added to the article from the side of our interest. Demands for mobile applications have increased in parallel with the increasing use of smart devices.

Developments Related to Smart and Educational Mobile Applications

The “Intelligent Mobile Learning Interaction System (IMLIS)” provides an environment of mobile learning for people who need special education [8].

“Fingu” is designed for children aged 4 to 8 to develop their arithmetic skills that use a multi-touch feature for iPad devices.

Erkalan, Calp, Şahin, designed an expert system; “Designing and Realizing an Expert System to be Used to Profession Choosing by Utilizing Multiple Intelligences Theory”.

Fórtiz, Almendros, and Martínez developed a mobile learning application on IOS devices for students who need special education.

“My Voice” is another application designed for special education. Users can input vocabulary words and the application link these words with pictures.

“A Prototype Mobile Expert System for Nutritional Diagnosis” analyses the eating habits and body characteristics, it makes a proper eating plan for the person.

“A Mobile Application Design for Students Who Need Special Education” aims to teach the students the concepts like short-long, more-less and order the objects.

“Design and Development of a Mobile Learning System For Computer Science Education in Nige¬rian Science Education Context” is a mobile learning system to support teaching and learning of com¬puter science courses.

“1x1 Trainer with Handwriting Recognition” is a mathematical learning application which facilitates the learning and studying of simple multiplications by using handwriting recognition.

“Handwritten Text Recognition: With Deep Learning and Android” offers a new solution to traditional handwriting recognition techniques using concepts of Deep learning and computer vision.

“Mobile Learning Application for Children: Belajar Bersama Dino” proposed the design and development process of Mobile Learning Application which is Belajar Bersama Dino that mainly suitable for children who aged four to six years old including voice recognition capability.

Handwritten Recognition

Handwriting recognition is the recognition of handwritten letters, numbers, and symbols by computer systems. Although this process is quite easy for people, it is a very difficult problem for computers to automatically recognize lines and curves on the ground as letters and numbers, and later on as meaningful words. Today, many documents are still on paper only. It is very important to digitize these documents and transfer the information to the computer. In recent years, great progress has been made in the studies on the recognition of text, so that programs that automatically recognize printed texts on a clean and readable surface have started to enter our lives. On the other hand, the current technology is still limited to handwriting recognition. The difficulty in recognizing handwriting arises from the fact that there are many different types of writing characters and differences from person to person, as well as the letters being interconnected. When handwriting recognition methods become operational, this also saves us from using the keyboard and allows us to type and draw in a much more natural way. Examples of such systems are the electronic agenda (PDA) and other tablet computers.

Methods

Handwriting recognition methods can be divided into two groups: Interactive (online) and non-interactive (offline) methods. Interactive systems are specially designed systems that recognize handwriting at the time of writing. In general, electromagnetic or electrostatic tablets are used. The touches of the pen and the continuity of the movements are considered. Electronic agendas (PDA) is a very common method today. Non-interactive systems are generally the process of trying to recognize the information previously written on paper by digitizing. While interactive systems need to be very fast to keep up with the writing speed, in non-interactive systems, there is no time limitation for the recognition of writing. The advantage of interactive systems is that the shape characteristics of the letters can be observed as well as the movements during writing. Furthermore, one of the greatest benefits of interaction with the user is that errors can be corrected immediately. Non-interactive systems are easier to mislead, as there is no information about the movements during writing, and especially because old documents will not be clean and legible enough.

Non-interactive (Offline) methods

Non-interactive methods are used to recognize the print on paper. First, the document needs to be digitized. Document analysis is the first important step. The document must first be divided into paragraphs and sentences, then into words.

Interactive (Online) methods

Interactive systems are generally systems that automatically detect handwriting or drawings by obtaining coordinates of pen movements by electronic tablets. Although it is faster to use a keyboard to migrate an existing document to a computer, the use of pen and paper is more preferred for creativity and reorganization of documents. Therefore, such systems that interactively recognize handwriting are very important. Two different features are important for correct recognition of letters: static and dynamic properties. Static properties are also used by non-interactive systems, the different sizes of upper and lower case letters, 'g', 'y', 'j' as they lie below the reference line, 'l', 'k', 'b' than other letters long, some letters are dotted. They are important for separating the letters. Dynamic features, which are unique to interactive systems, are similar to where the pen's first touch is when writing a letter, then how the pen follows the movement, and how many times the hand is raised and lowered during a single letter. Interactive systems use both features to recognize handwriting. One of the major advantages of interactive systems is that the user can adapt to the system day by day because it is constant interaction with the user and start writing his writing in a way that it is easier to recognize and also correct errors immediately.

Voice Recognition

Speech recognition is a software or hardware that the ability to translate the human voice to a form that computer can understand. This kind of recognition is frequently used to control a device, do tasks, or write without using a keyboard, mouse, or press any buttons. Nowadays, it is accomplished on a computer by using Automatic Speech Recognition(ASR) software programs. A lot of programs that have ASR capability need the user to "train" the ASR program to recognize their voice. By doing that, it can more accurately transform the speech to text. There are two types of speech recognition. One is called speaker-dependent and the other is speaker-independent.

Speaker Dependent Voice Recognition System

Speaker–dependent software is commonly used for dictation software, while speaker–independent software is more commonly found in telephone applications. Speaker–dependent software works by learning the unique characteristics of a single person's voice, in a way similar to voice recognition. New users must first "train" the software by speaking to it, so the computer can analyze how the person talks. This often means users have to read a few pages of text to the computer before they can use the speech recognition software.

Speaker Independent Voice Recognition System

Speaker–independent software is designed to recognize anyone's voice, so no training is involved. This means it is the only real option for applications such as interactive voice response systems. The downside is that speaker–independent software is generally less accurate than the speaker–dependent software.

Stepwise Method

The Stepwise Method, is developed by Cawley, which is a teaching method for learning mathematical concepts that are mostly applied to the students who have special education needs. There are 16 steps in this teaching method, which is the dual combination of the steps of “do, say, show and write”. During the implementation of the method, the teacher first explains a concept and then asks the student that concept. For example, in step do-do, the teacher does and asks the student to do it; or the teacher says and then asks the student to write (say-write). There are 4 sets of tools in each step and these sets are implemented one after the other. If the student responds correctly to the three of the 4 sets of sessions, the criteria are met and proceeds to the next step. To be able to apply this method, students should have some abilities: touch, rhythmic counting, readiness to distinguish between concepts less; also should understand and apply such instructions like saying, receiving, giving, showing, etc. However, the names of symbols in the toolsets to be used to teach the numbers must also be well known by the student.

All steps of the Stepwise Method are shown in Table 1.

Table 1: Teacher / Student interaction in Stepwise Method.

Teacher/Student	DO	SHOW	SAY	WRITE
DO	*DO-DO*	*DO-SHOW*	*DO-SAY*	*DO-WRITE*
SHOW	*SHOW-DO*	*SHOW-SHOW*	*SHOW-SAY*	*SHOW-WRITE*
SAY	*SAY-DO*	*SAY-SHOW*	*SAY-SAY*	*SAY-WRITE*
WRITE	*WRITE-DO*	*WRITE-SHOW*	*WRITE-SAY*	*WRITE-WRITE*

Methodology

Our motivation is to develop an application to teach numbers to the students with mild mental retardation who have only a few studies in the literature. In this context, we deemed it appropriate to adopt the Stepwise Method, which is a very successful and frequently used method to teach mathematical concepts to the children who need special education. The "write" session in which the student will respond by writing, will be performed by using handwriting recognition and the "voice" session which the student will respond by talking, will perform by using voice recognition. Using this application with mobile devices allows the student to repeat a concept as many times as he/she needs anywhere. This will speed up learning.

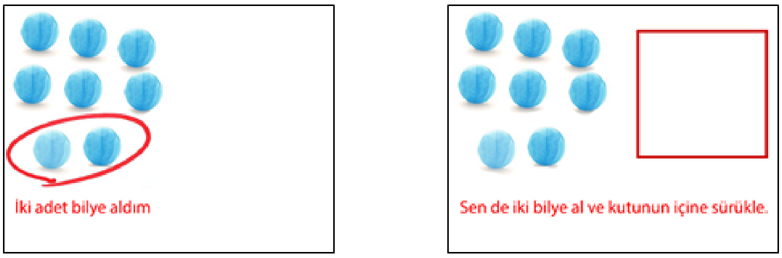
Adaptation of Stepwise Method to the Mobile Application

In the mobile application, this method will be applied as follows: First of all, while setting research subjects, students will be selected to have a well understanding of less-than-concept and to be able to demonstrate prerequisite behaviour of rhythmic counting from 1 to 10. It is also expected that subjects will have basic self-care skills (toilet, eating, and dressing), matching skills in terms of concepts and recipient language skills. The two-word directions should be understood and their fulfillment is important in terms of using this practice.

Before the training, the student is asked whether knows the material to be used in this session (eg. do-do steps/marbles). If the student answers correctly, the training begins. Otherwise, the program quits to the main menu. This question is repeated if the student does not respond to a question asked(10s), or if the question is answered incorrectly. If the student does not answer the question or gives wrong answers three times, the program gives a clue to the student. The same question is asked again after the clue is given. If the student remains unresponsive or gives a wrong answer 3 times, the application will move to the next step and the student will be considered unsuccessful in this session. At the end of a step, if the student knows at least 3 out of 4 (75%) of the questions asked in 4 sets, the criterion is deemed valid and the next step is taken. There are 16 steps in the teaching of each concept. They are applied by the teacher-student interaction, therefore, an iterative algorithm will be applied by changing the steps.

Teaching the Concept of Numbers

Figures 2 through 5, the sample animations are shown. On the left, the animations are shown instead of the teacher in real life. The Figures on the right are the realization of what the students do in real life by saying, touching, dragging or writing in the program.

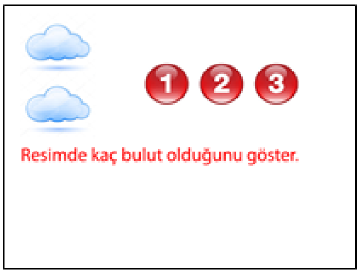


(a) (b)

Figure 2. *Do-Do (Yap-Yap in Turkish) Step: (a) the application shows how to take two marbles. (b) The student is asked to drag two marbles into the box.*

(a) (b)

Figure 3. *Show - Say(Göster - Söyle in Turkish)*: Step *(a) the application shows two stars. (b) the student is asked to say the number of stars.*



(a) (b)

Figure 4. *Show – Show (Göster-Göster in Turkish) Step: (a) the application shows two clouds. (b) the student is asked to show the number of clouds.*

(a) (b)

Figure 5. *Do - Write (Yap - Yaz in Turkish) Step:(a) the application shows two stars. (b) the student is asked to write the number of stars.*

As already stated, the instructions and tips given by the teacher are provided as animations in the application. When the student's response is expected, various tools will be used to respond to by doing, showing, saying and writing according to the application stage. In the do step, the drag and drop feature will be used to drag the desired amount of the items to the desired area. In the show phase, the touch feature will be used, so that the student can show the item at the desired amount. In the say phase, when the student says the number of items, voice recognition will be used so that the application can identify this voice. In the write phase, handwriting recognition will be used, so that the application can verify whether the written digit to the desired region is correct or not.

The Interface

The application "Rakamları Öğreniyorum" – 'I am Learning Digits' aims to teach digits(0-9) with mild mental disabilities. The application is being developed by using the Java Programming Language on the Android Studio platform.

The Figure 6 shows the authentication screen of the program. If user has already registered, he/she can login by pressing the orange button(GİRİŞ) otherwise, user has to press the pink button(KAYIT OL) to go to the register screen(Figure 7). When user login successfully, opening screen appears as shown in Figure 8.

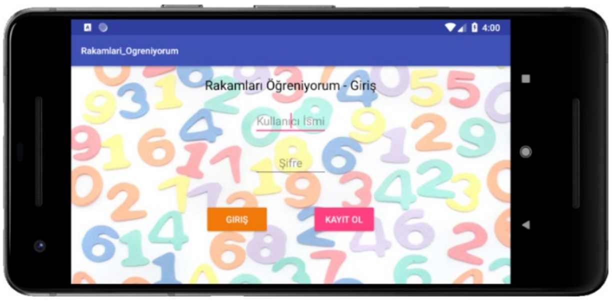


Figure 6. *Login screen.*

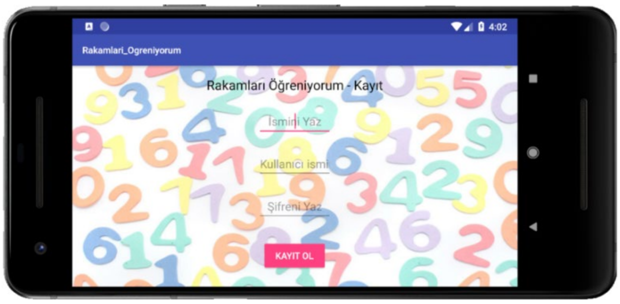


Figure 7. *Register screen..*

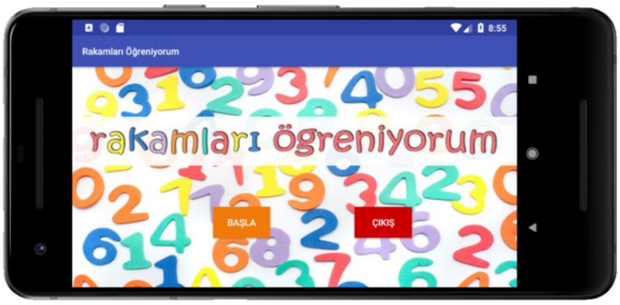


Figure 8. *Opening screen of the program(After successful login).*

In real life Stepwise Method is accomplished with the teacher. The owl was used as a tutor because it represented wisdom here, shown in Figure 9.

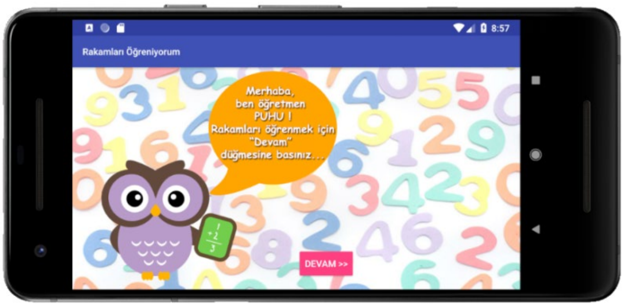


Figure 9. *Teacher Puhu.*

The application starts with do-do step and applies all steps in sequence. However, before the training, it is checked whether the materials to be used in that step are known to the student. An example is provided in Figure 10.

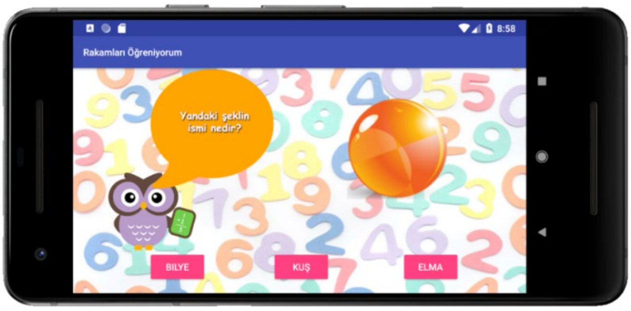


Figure 10. *The block diagram of the application (numbers in the diagram indicates the order of processing).*

In the first structure of the do-do step, the student is given information about the concept with the help of an animation; In the second build step, the student is expected to perform the required application by giving a directive, as shown in Figure 11.

Figure 11. *Student is informing about the concept.*

For example, when applying the do-do step of concept 2, the student is expected to use the drag-and-drop feature to move the ball from left to right as desired. If the student does it correctly, the application moves to the next stage. If the student does wrong, the application asks the same question again. It gives a hint when it doesn't know 3 times. If it does not know 6 times in total, the program moves to the next stage. Figures 12 and 13 show related screen shots.

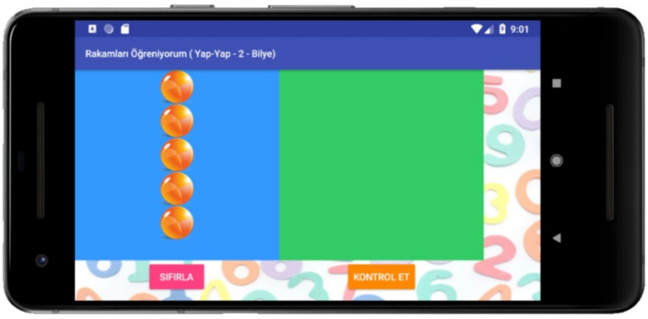


Figure 12. *Student is expected to drag and drop 2 marbles.*

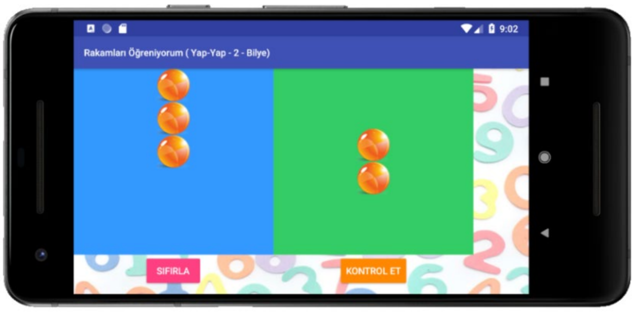


Figure 13. *Two marbles are dragged. Program will pass to next stage if student presses "kontrol et(check)" button.*

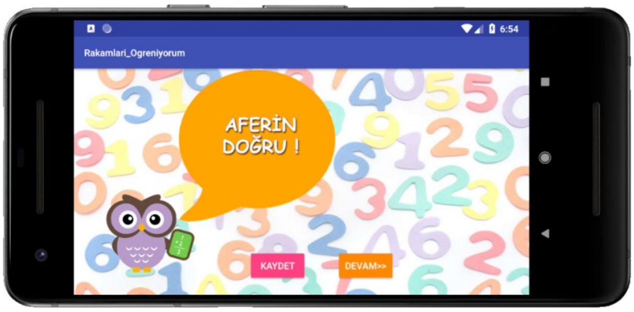


Figure 14. *If the student answers correctly, this screen appears.*

Implementation of Handwritten Recognition System to the Mobile Application

Handwritten Recognition is a method used to read a handwriting, recognize and transfer it to computer as optical characters. By adapting the handwriting recognition method to the application, the "write" session will be held by the student using the Stepwise Method. Studies related to this module are in progress. Mentally disabled individuals may experience difficulties while writing; for example, writing slower than normal peers, the letter or number is skewed, unable to write without raising his hand. For this reason, these are taken into account when developing the handwriting diagnostic system.

In the handwriting recognition module, the student is expected to write down the result in the blank box next to the symbols shown in the Figure 15.

Figure 15.*Student has to draw a number into the grid.*

The module is developing using TensorFlow software in Android Studio. Tensor flow is an open source deep learning library. Convolutional Neural Network will be used as Handwriting Recognition Algorithm. CNN have been widely employed for image recognition applications because of their high accuracy, which they achieve by emulating how our own brain recognizes objects.

Machine learning only works more accurately with a lot of data. So it is needed handwritten number samples to get started. MNIST data set of handwritten numbers will be used as samples.

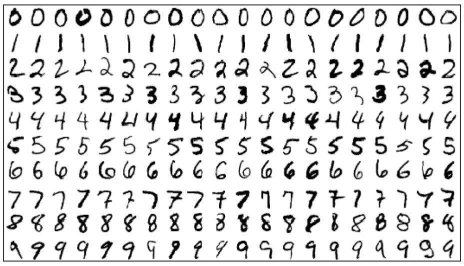


Figure 16. *Some numbers from the MINST data set.*

The next step is to use a neural network to take numbers as input. Neural networks are a set of algorithms, modeled loosely after the human brain, that are designed to recognize patterns   According to a computer, an image is really just a grid of numbers that represent how dark each pixel is:

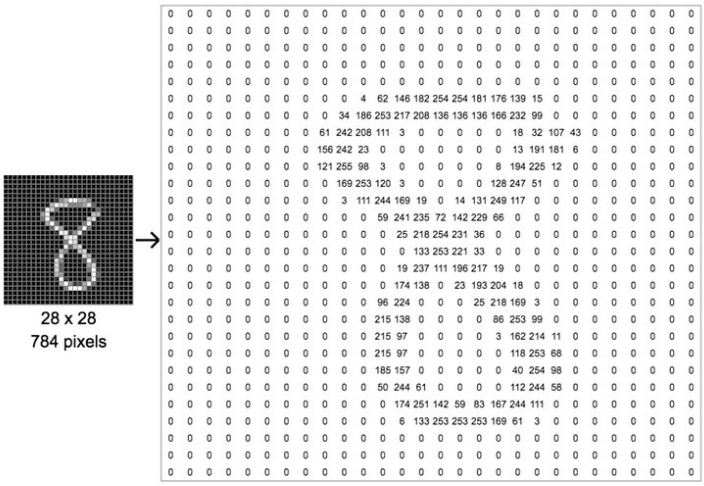


Figure 17. *To a computer, an image is really just a grid of numbers that represent how dark each pixel is.*

In this process, it will not be difficult to define a number that is properly written to the centre. The main problem is the numbers written on the edges that are not in the centre. These will not give proper results in a poorly designed handwriting identification system and will result in low accuracy of the system. There are several ways to solve this problem: One of them to use the Brute Force Algorithm to scan a grid frame by frame, the other one is using Brute Force Algorithm to store an image file in the system for every possible position. But, the most effective method is to use Convolutional Neural Networks. The idea is to divide the image to several pieces by sliding window search and save each result as a seperate image tiles. The next thing is to fed a single image into a neural network to see if it was an “8”. The same implementation will be done for each individual image tile by keeping the same neural network weights in the same original image.

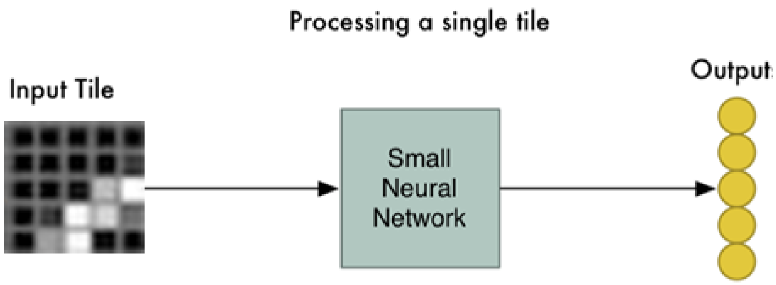


Figure 18.*Feed each image tile into a small neural network.*

Then the results from each processed tile will be saved into a new array. The next step is to make downsampling because the array is still big.

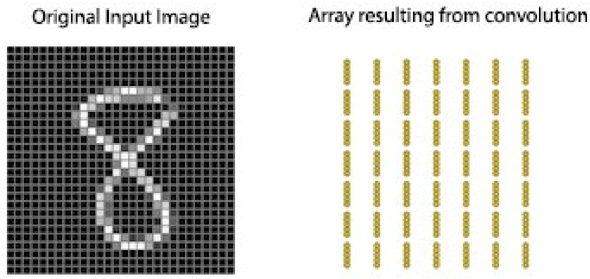


Figure 19. *To reduce the size of the array, we downsample it using an algorithm called max pooling.*

To reduce the size of the array, max pooling algorithm will be used. The algorithm checks each 2x2 square of the array and keep the biggest number. Eventually, the image is down to a small array. It is more suitable to use that array as inputs of another neural network.

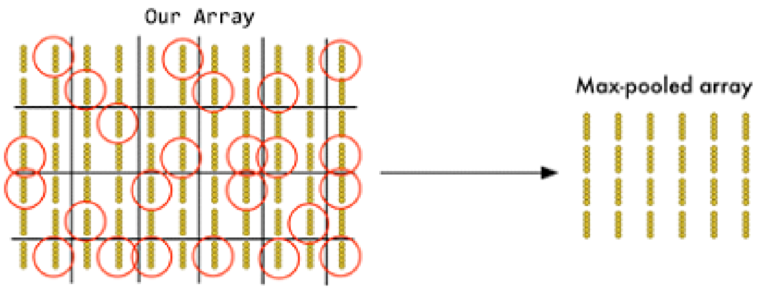


Figure 20. *Algorithm checks each 2x2 square of the array and takes the biggest number.*

This final neural network will decide if the image is or isn't a match. To differentiate it from the convolution step, it is called as "fully connected" network which it is shown in Figure 21.

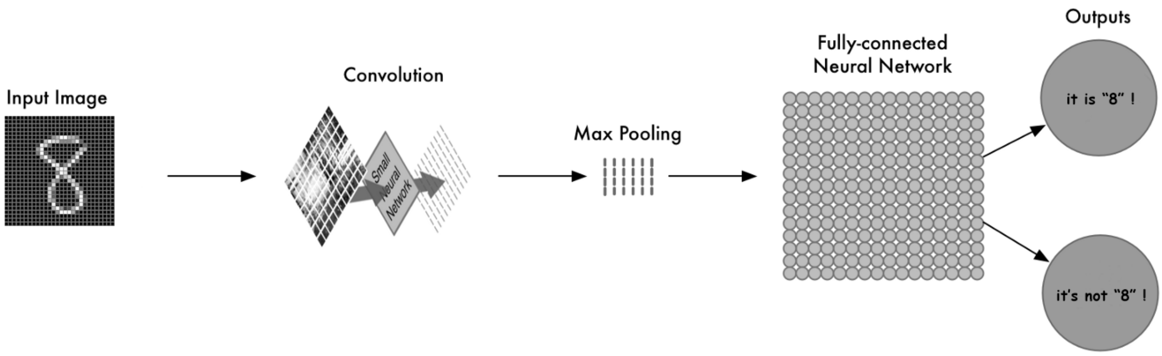


Figure 21. *Fully connected network.*

The use of convolutional neural networks is a conventional method. The main challenge is that the students who need special education, have very different and unique style of writing. Instead of the conventional training phase including training set images, we are planning to propose a subject based training algorithm. Where, each student's writing style will be trained as a seperate classifier.

Implementation of Speech-to-Text Recognition System to the Mobile Application

In the speech-to-text recognition module, the student is expected to say the result by pressing the microphone. Speech-to-text recognition is a tool that has the ability to process the human voice and decode it as text. By adapting the speech-to-text recognition method to the application, the student's "say" session of The Stepwise Method will be held.

Figure 22. *Student has to talk by pressing the microphone button.*

For children with special educational needs, acquisition of the mother tongue is one of the areas that may be problematic. Children affected by various degrees of mental disabilities may experience problems in both receptive and expressive language development (slower speaking, stuttering, swallowing some words). Therefore, taking speech samples of normal individuals and trying to understand what a mentally disabled child is saying during the voice recognition process may result in low accuracy. For this reason, the voice samples of each student will be taken before they come to the saying part of the program. The program will do this itself during the flow process of the program. To overcome this challenge, a subject-based training algorithm will be developed to achieve accurate speech recognition.

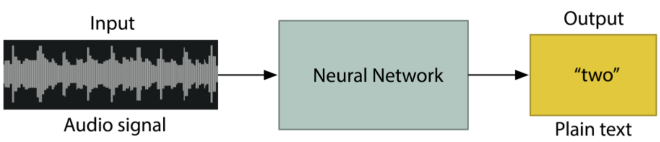


Figure 23. *Neural machine translation*

In the implementation, each student's voice will be trained to the system with the help of the teacher using the program. After the student's voice has been trained, the given answer will be recorded as a one-dimensional sound wave. After acquiring the audio input, it will be fed into a deep neural network. The input to the neural network will be sufficient audio chunks. For each little audio slice, it will try to figure out the letter that corresponds to the sound currently being spoken.

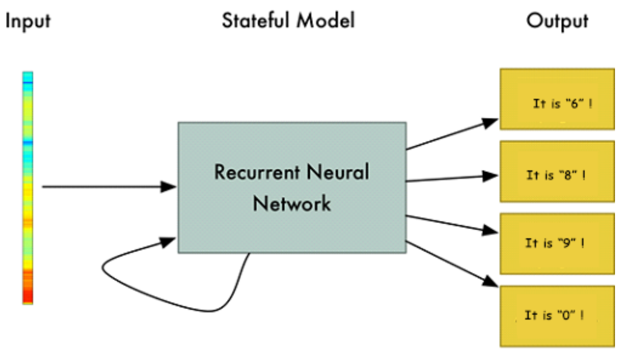


Figure 24. *The model's current state influences the next calculation.*

Recurrent neural network will be used for estimations because it is a neural network that has a memory to influence the future predictions. By having that memory of previous predictions helps the neural network make more accurate predictions going forward.

Block Diagram of The Application

The overall process consists of three main blocks shown in Figure 12. Each block contains teacher guidance. In the beginning of the presentation, application checks whether the student knows the object of the educational set to be used. If the answer is true, education begins, otherwise application returns to main menu. Student will count as successful, if the student answered correctly among 3 of the 4 material sets presentations.

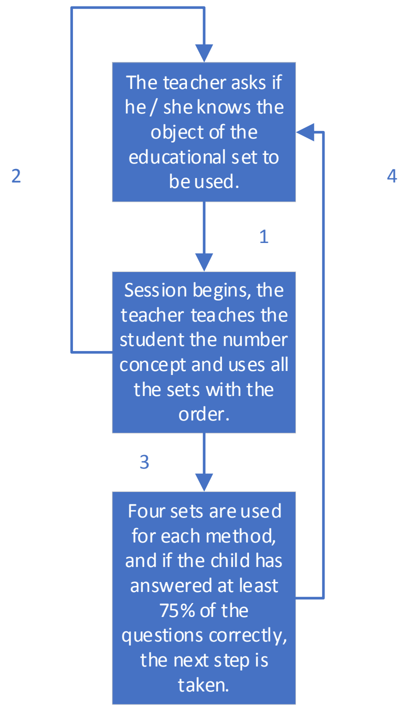


Figure 25. The block diagram of the application
(numbers in the diagram indicates the order of processing).

The Flowchart of the Overall Process

This flowchart given in Figure 13 shows the teaching process of the digit 2. The same algorithm will be applied to all numbers. In the flowchart; item_set[ ] is an array for item set pictures to demonstrate the teaching part and set_no is the index of item sets. Pictures will be taken from image database. The objects of item sets are shown below:

item_set[0]=beads
item_set[1]=buttons
item_set[2]=erasers
item_set[3]=lids

There will be 16 steps in this algorithm and in each step, the four item set will be shown to the student in an orderly manner. During the teaching process, if necessary, a hint picture will be shown to the student.

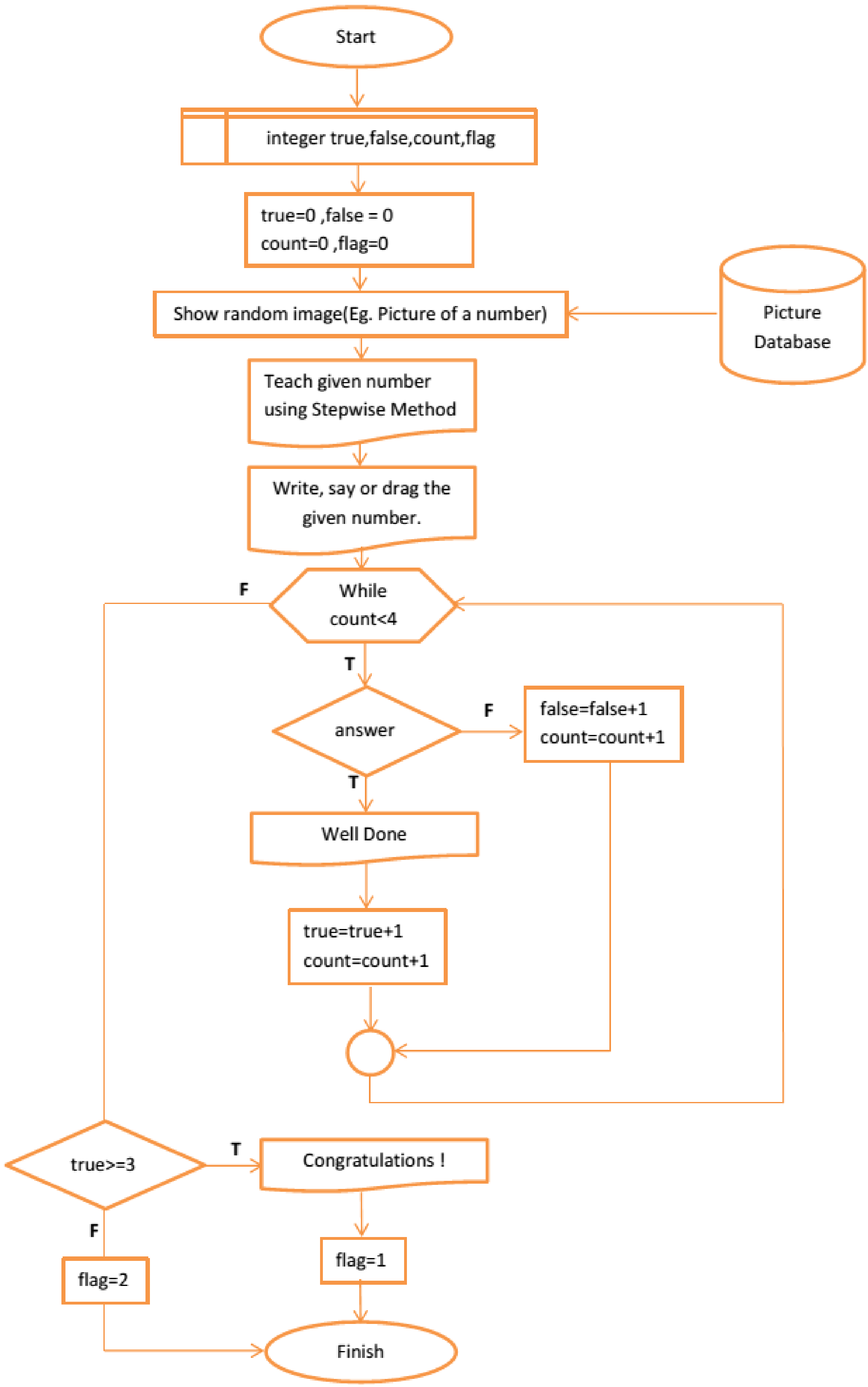


Figure 26. The generic flowchart of the teaching module.

Application Platform

The application is developed in Android Studio platform, based on Java Programming Language. In order for users to be able to run this application, the operating system installed on their smart phones or tablets must be at least Android 4.0 (Ice Cream Sandwich).

Android Studio has been chosen as a program development environment; because, Android-powered devices are much more common than the others, currently in the marketplace. According to the Netmarketshare.com, year 2018 market share of operating systems for mobile devices are: IOS (29.29%), Android Studio (68.93%) and other (1.65%). Also, Android-powered devices are cheaper and more accessible than other competitors [14].

Conclusion

This article contains information about two modules of an application written to assist teaching numbers to children who need special educational. The application aims to use the Stepwise Method, which is a very effective method used to teach mathematics to children in need of special education, in all aspects. The proposed application is aimed to assist the teacher during education. In brief, this system consists of several sessions where the teacher first informs the child about the desired concept and then expects the child to respond to the same concept. The sessions are a total of 16 and can be exemplified by the combination of do, say, show, and write. For example, the do-show step consists of sessions that the teacher does through the training and asks the student to show. I bought two marbles from the stack, and you show me which card have two marbles. The teacher side in the application is designed with animation. In the sections that the student will apply, the stages of make and show were explained in the previous article. What is described here is how to integrate the write and say steps into the application. At the write level, the student is expected to write the answer to the question asked where the application applies handwriting recognition methodology. In the say step, the student is expected to answer the question by speaking. Then the application applies enhanced speech recognition methodology. Both modules will be designed using Deep Learning. The novelty in this part is that the neural networks will employ subject based training phase. The unique feature of this work is that the system is designed to implement all the steps of the Stepwise Method.

References

Zeki, U. & Karanfiller, T & Yurtkan, K. (2019). An Intelligent Mobile Application Design Based On Stepwise Method Supporting Special Education. *International Symposium on Engineering, Artificial Intelligence & Applications.*

Zeki, U. & Karanfiller, T & Yurtkan, K. (2018). An Extended Mobile Application Design For Special Education To Teach Numbers. *International Conference On Perspectives In Future Education*.

Karanfiller, T., Göksu, H., & Yurtkan, K. (2017). A Mobile Application Design for Students Who Need Special *Education. Education & Science/Egitim ve Bilim, 42(192).*

Cawley, J. F., & Vitello, S. J. (1972). Model for arithmetical programing for handicapped children. *Exceptional Children*, *39*(2), 101-110.

Balçık, B. (2015). Zihinsel yetersizliği bulunan öğrencilere etkileşim ünitesi yöntemiyle toplama becerisinin öğretimi. *Abant İzzet Baysal Üniversitesi Eğitim Fakültesi Dergisi*.

Oyelere, S. S., Suhonen, J., Wajiga, G. M., & Sutinen, E. (2018). Design, development, and evaluation of a mobile learning application for computing education. *Education and Information Technologies*, *23*(1), 467-495.

FernáNdez-LóPez, Á., RodríGuez-FóRtiz, M. J., RodríGuez-Almendros, M. L., & MartíNez-Segura, M. J. (2013). Mobile learning technology based on iOS devices to support students with special education needs. *Computers & Education*, *61*, 77-90.

Barendregt, W., Lindström, B., Rietz-Leppänen, E., Holgersson, I., & Ottosson, T. (2012, June). Development and evaluation of Fingu: A mathematics iPad game using multi-touch interaction. In *Proceedings of the 11th international conference on interaction design and children* (pp. 204-207). ACM.

Zare, S. Intelligent Mobile Learning Interaction System (IMLIS). *A Personalized Learning System for People with mental Disabilities Department of Mathematics and Informatics, University of Bremen*.

Campigotto, R., Mcewen, R., & Epp, C. D. (2013). Especially social: Exploring the use of an iOS application in special needs classrooms. *Computers & Education*, *60*(1), 74-86.

Netmarketshare (2019), Available: http://www.netmarketshare.com.

Rabko, M., & Ebner, M. (2018). 1x1 Trainer with Handwriting Recognition. *International Journal of Interactive Mobile Technologies (iJIM), 12(2), 69-79.*

Yahaya, N. S., & Salam, S. N. A. (2014). Mobile Learning Application for Children: Belajar Bersama Dino. *Procedia-Social and Behavioral Sciences*, *155*, 398-404.

IDENTIFICATION OF PHENOLIC COMPOUNDS AND ANTIBACTERIAL EFFECTS OF ETHANOL EXTRACT FROM LEAVES OF DENDROPHTHOE FALCATA (LORANTHACEAE) HEMIPARASITIC ON MELIA AZEDARACH HOST TREE

Sri Atun1*, Sri Handayani1, Anna Rakhmawati2,Nur Aini Purnamaningsih3, Bian Ihda An Naila1, and Astuti Lestari1

1Department Chemistry Education, Faculty of Mathematics and Natural Science,

Universitas Negeri Yogyakarta, INDONESIA

Jl. Colombo No.1 Depok, Sleman, Yogyakarta, 55281, Indonesia

2Department of Biology Education, Faculty of Mathematics and Natural Science, Universitas Negeri Yogyakarta, INDONESIA

Jl. Colombo No.1 Depok, Sleman, Yogyakarta, 55281, Indonesia

3Faculty of Health, Universitas Jendral Achmad Yani, Yogyakarta, INDONESIA

Jl. Brawijaya, Ringroad barat, Ambarketawang, Gamping, Sleman, Yogyakarta

*Corresponding Author: sriatun@uny.ac.id

Abstract

This study aimed to identify phenolic compounds and to analyze the antibacterial effects of ethanol extract from leaves of Dendrophthoe falcata which are known as hemiparasites in the Melia azearach host tree. Dried leaves of D. falcata were extracted using ethanol. Ethanol extract was sequentially partitioned using n-hexane, chloroform, and ethyl acetate. The compounds contained in ethyl acetate fraction (60 g) were separated and then purified by chromatography. Identification of isolated compounds was carried out by UV, IR, and NMR (1H and 13C) 1D and 2D spectroscopy. Antimicrobial activity was tested using disc diffusion method on pathogenic bacteria, both gram positive and negative. This study resulted in the identification of two phenolic compounds from ethyl acetate fraction, namely quercitrin (quersetin-3-O-rhamnosida) as much as 20.1 g (33.3%) and in small amounts of kaemferol-3-rhamnosida (150 mg). The extracts and fractions showed moderate to strong bacterial inhibition response against Escherichia coli ATCC 11229, Staphylococcus aureus ATCC25923, Staphylococcus epidermidis FNCC 0048, and Streptococcus mutans. The highest inhibition zone (18.20 ± 0.81 mm) was found after the treatment of ethyl acetate fraction of D. falcata (0.5%) against Staphylococcus aureus ATCC25923. This study shows that leaves of D. falcata have potential compounds suitable for the treatment of various infections caused by microbes.

Keyword: leaves of Dendrophthoe falcata; antimicrobial; pathogenic bacteria; quercitrin; kaemferol-3-O-rhamnosida

İLKOKUL 4. SINIF ÖĞRETMENLERİNİN DEĞERLER EĞİTİMİNE VE DEĞERLERİN KAZANDIRILMASINDA ÜSTBİLİŞSEL BECERİLERİ GELİŞTİREN STRATEJİ KULLANIMINA İLİŞKİN GÖRÜŞLERİ*

Serkan PULLU

Fırat Üniversitesi, Eğitim Fakültesi, Elazığ- TÜRKİYE

spullu@firat.edu.tr

Hilal KAZU

Fırat Üniversitesi, Eğitim Fakültesi, Elazığ- TÜRKİYE

hkazu@firat.edu.tr

Özet: Eğitim sistemi içerisinde önemli bir yere sahip olan değerler eğitiminin okullardaki uygulanışının incelenmesinin, değerlerin öğrenciler tarafından kazanılma düzeylerini arttırmada etkili olacağı düşünülmektedir. Bu nedenle öğretim programının uygulayıcıları olan öğretmenlerden değerler eğitimine ilişkin görüş almaya ihtiyaç duyulmuştur. Bu bağlamda araştırmanın amacı 4. sınıf öğretmenlerinin değerler eğitimine ve değerlerin kazandırılmasında üstbilişsel becerileri geliştiren strateji kullanımına ilişkin görüş ve önerilerini belirlemektir. Bu araştırmada nitel araştırma yöntemlerinden olgu bilim deseni kullanılmıştır. Araştırmanın çalışma grubunu, 2015-2016 eğitim-öğretim yılında Elazığ'da beş farklı eğitim bölgesinde bulunan ilkokulların 4. Sınıflarında görev yapan on sınıf öğretmeni oluşturmaktadır. 4. sınıf sosyal bilgiler dersinde değerlerin kazandırılmasında üstbilişsel becerileri geliştiren stratejinin kullanıldığı sınıflarda görev yapan beş öğretmen, bu stratejinin kullanılmadığı ve öğretim programını değiştirmeden uygulayan sınıflardan da beş öğretmen olmak üzere toplam on öğretmenden değerler eğitimine ilişkin görüş alınmıştır. Görüşler yarı yapılandırılmış bir formla alınmıştır. Form, öğretim programına bağlı kalarak ve üstbilişsel becerileri geliştiren stratejileri kullanmadan ders işleyen öğretmenler için 8 sorudan, değerlerin kazanılmasında üstbilişsel becerileri geliştiren stratejinin kullanıldığı sınıflarda görev yapan öğretmenler için 12 sorudan oluşmuştur. İlk 8 soru her iki formda da aynı olmakla birlikte, diğer dört soru değerlerin kazandırılmasında üstbilişsel becerileri geliştiren strateji kullanımı ile ilgilidir. Araştırmadan elde edilen veriler, içerik analizi ile çözümlenmiştir. Araştırmada içerik analizi ile çözümlenen veriler sonucunda değerlerin kazandırılmasında üstbilişsel stratejileri kullanan ve kullanmayan öğretmenlerin değer öğretimine ve gerekliliğine ilişkin görüşleri, en çok kullandıkları değer öğretimi yaklaşımı ve bu yaklaşıma uygun kullandıkları yöntem ve teknikler, değer öğretimi sırasında karşılaştıkları sorunlar ve değer öğretimine ilişkin önerileri bağlamında ana temalar elde edilmiştir. Ayrıca değerlerin kazandırılmasında üstbilişsel strateji kullanan öğretmenlerin bu stratejinin kullanımın olumlu yönleri ve sınırlılıklarına ilişkin görüşleri, bu stratejiyi başka derslerde de kullanma isteği, bu stratejinin öğrenciler üzerindeki olumlu ve olumsuz etkileri ve bu strateji ile ilgili genel önerilerine ilişkin temalar da ortaya çıkmıştır. Elde edilen bulgular doğrultusunda, öğretmenlerin değerler eğitimini önemli ve gerekli gördükleri belirlenmiştir. Ayrıca öğretmenlerin değerlerin kazandırılmasında, çoğunlukla değer açıklama yaklaşımını benimsedikleri sonucuna ulaşılmıştır. Öğretmenler, öğrencilere rol-model olmanın, değer eğitiminde önemli bir yere sahip olduğunu da vurgulamışlardır

Anahtar Kelimeler: Üstbiliş, Değerler Eğitimi, Sosyal Bilgiler Dersi

Giriş

Dinden ekonomiye, psikolojiden sosyolojiye kadar değişik alanlarda kullanılan bir kavram olan değer (Aydın, 2011: 39), insanların çevresindeki varlıkları anlamlandırmak için kendilerine özgü belirlediği duygusal ölçütlerdir (Yeşil ve Aydın, 2007: 66). Genetik olarak aktarılamayan değerler, sosyal rollerle öğrenilerek bir sonraki kuşaklara aktarılırlar. Sosyal rollerle biçimlenen mesleki, cinsel, sosyal, kişisel gibi kimlik yapılarının oluşmasında değerler

* Bu çalışma, Fırat Üniversitesi Eğitim Bilimleri Enstitüsü'nde Doç. Dr. Hilal Kazu danışmanlığında Serkan Pullu tarafından hazırlanan "İlkokul 4. Sınıf Sosyal Bilgiler Dersinde Üstbilişsel Becerileri Geliştiren Strateji Kullanımının Değerlerin Kazanılmasına ve Derse Karşı Tutuma Etkisi" başlıklı doktora tezinden üretilmiştir.

oldukça önemlidir. Değerler çeşitli sosyal rollerde bize neler yapmamız gerektiğini belirtmektedir (Sarı, 2005: 77). Schwartz (1994), değerlerin davranışlara yön verip, duygusal yoğunluk kazandırarak sosyal varlıkları motive edebildiğini ve davranışları yargılayıp nedenlerini açıklayan standartlar olduklarını belirtmiştir.

Değerlerin aktarım sürecinin önemli bir basamağı olan öğretmenler, hem okul programında açık olarak belirtilen hem de belirtilmeyen değerleri öğretip; öğrencileri belirlenen kurallar doğrultusunda disipline ederek ve onların ahlaki gelişimine katkıda bulunarak karakterlerini olumlu yönde etkilemektir (Akbaş, 2008: 9). Eğitimi değerlerle ortak paydada buluşturan nokta, eğitimin aktarım sürecini yerine getiren eğitim kurumlarıdır (Cihan, 2014: 432). Eğitim kurumlarının genel hedefleri arasında vatansever olma, temiz olma, sağlığına dikkat etme, düzenli olma, adil olma, yaratıcı olma, girişimci olma gibi birçok değer yer almaktadır. Eğitim kurumları bu değerler ile öğrencilere nelerin önemli olduğunu, nelerin tercih edilmesi gerektiği ve nasıl yaşanması gerektiği konusunda rehberlik etmektedir (Akbaş, 2008: 10).

Günümüzde öğrenme, öğrenci merkezli anlayışla öğrencinin zihinsel becerilerini geliştirerek ve bilgiyi yapılandırarak öğrenmesine imkan verecek şekilde düzenlenmektedir. Bireylerin, toplumda eğitim sürecinin birer ürünü olarak yer almaları, ancak kendini bilme yeteneğine sahip olmaları ile mümkündür (Özsoy, 2007: 3). Yapılandırmacı öğrenme çerçevesinde öğrenciler, diğer öğrencilerin problem çözme süreçlerini ve anlamı nasıl yapılandırdıklarını görerek kendi problem çözme süreçlerine ve kendi anlama yollarına odaklanıp anlamı nasıl oluşturduklarını değerlendirebilmektedirler (Yurdakul ve Demirel, 2011: 73). Bireyin kendi bilişsel sürecinin farkında olması gerekir. Bireylerin bu farkındalığı etkili bir şekilde kullanılabilmeleri için ise de üstbilişsel becerilere yönelik eğitim almaları gerekir (Katrancı ve Yangın, 2013: 737). Çünkü birey, bilinçli bir şekilde izlediği, düzenlediği, denetlediği ve bir hedefe yönlendirebildiği bilişsel süreçlerini bilip bunları kontrol altına alabildiği zaman kendi anlamlarını nasıl oluşturduğunu rahatlıkla açıklayabilmektedir (Yurdakul ve Demirel, 2011: 74).

Değerlerin kazandırılmasında farklı bir çok yöntem, teknik ve uygulamalar kullanılmaktadır. Johnson (2002: 68)'a göre, değerler eğitimi, bireylerin kendi kültürlerinde değerlerinin nasıl geliştiğine dair farkındalıklarını temel almayı hedefleyebilir. Bu farkındalıkların gerçekleşmesini sağlamada üstbilişsel becerilerin gelişiminin katkı sağlayacağı düşünülmektedir. Çünkü üstbiliş, bireylerin algılama, hatırlama ve düşünmelerini gerçekleştiren zihinsel etkinliklerinin farkında olmasıdır (Hacker ve Dunlosky, 2003). Bu doğrultuda, çalışmada değer eğitimine ve değerlerin kazandırılmasında üstbilişsel becerileri geliştiren stratejilerin kullanılmasına ilişkin öğretmen görüşleri belirlenmiştir.

Yöntem

Bu araştırmanın amacı 4. sınıf öğretmenlerinin değerler eğitimine ve değerlerin kazandırılmasında üstbilişsel becerileri geliştiren strateji kullanımına ilişkin görüş ve önerilerini belirlemektir. Araştırmada olgu bilim deseni (fenomenoloji) kullanılmıştır. Fenomenoloji insanın denyimleriyle oluşturduğu anlamlara odaklandığı için katılımcıların deneyimlediği bir durum olması önemlidir (Ersoy, 2016:55). Araştırmanın çalışma grubu amaca yönelik örnekleme desenine göre belirlenmiştir. Amaca yönelik örnekleme deseninde, araştırmacı katılımcıları belirli kıstaslar doğrultusunda bizzat seçer. Bu desende araştırma problemini aydınlatmada hangi katılımcıların daha fazla katkı sağlayacağı sorgulamasıyla araştırmacılar, zengin bilgi kaynağı olduğunu düşündükleri durumlara, vakalara, kişilere, nesnelere ve belgelere yönelirler (Gliner, Morgan ve Leech, 2015:125). Araştırmanın amacına uygun olacağı ve verilerin daha derinlemesine, sağlıklı elde edileceği düşüncesiyle deneysel çalışmaya katılan ve üstbilişsel becerileri geliştiren strateji kullanarak ders işleyen deney grubu öğretmenleri ile bu stratejileri kullanmadan ders işleyen kontrol grubu öğretmenleri araştırmaya dahil edilmiştir.

Bu doğrultuda araştırmanın çalışma grubu, 2015-2016 eğitim-öğretim yılında Elazığ'da beş farklı eğitim bölgesinde bulunan ilkokulların 4. sınıflarında görev yapan on sınıf öğretmeninden oluşmaktadır. Beş öğretmen 4. sınıf sosyal bilgiler dersinde değerlerin kazandırılmasında üstbilişsel becerileri geliştiren stratejinin kullanıldığı sınıflarda görev yapmakta, diğer beş öğretmen ise bu stratejinin kullanılmadığı ve öğretim programını değiştirmeden uygulayan sınıflarda görev yapmaktadır. Araştırmada veri toplama aracı olarak yarı yapılandırılmış görüşme formu kullanılmıştır. Görüşme formunda öğretim programına bağlı kalarak ve üstbilişsel becerileri geliştiren stratejileri kullanmadan ders işleyen öğretmenler için 8 soru yer alırken, değerlerin kazanılmasında üstbilişsel becerileri geliştiren stratejinin kullanıldığı sınıflarda görev yapan öğretmenler için 12 soru yer almaktadır. İlk 8 soru her iki formda da aynı olmakla birlikte, diğer dört soru değerlerin kazandırılmasında üstbilişsel becerileri geliştiren strateji kullanımı ile ilgilidir. Görüşme formundan elde edilen veriler içerik analizi yöntemine gore çözümlenmiştir. İçerik analizi; amaçları belirleme, kavramları tanımlama, analiz birimlerini belirleme, konu ile ilgili verilerin yerini belirleme, mantıksal bir yapı geliştirme, kodlama kategorilerini belirleme, sayma, yorumlama ve sonuçları yazma şeklinde aşamalandırılır. (Büyüköztürk, Kılıç Çakmak, Akgün, Karadeniz ve Demirel, 2012: 241-242).

Bulgular ve Yorum

Bu bölünmde araştırmanın bulguları ve bulgulara dayalı yorumlar yer almaktadır. Araştırmada elde edilen veriler içerik analizine göre çözümlenerek ana ve alt temalar oluşturulmuştur.

Tablo 1: Kontrol Grubu Öğretmenlerinin "Değer öğretimi nedir?" Sorusuna Verdikleri Cevaplara İlişkin Alt Temalar ve Yükleme Sayıları

Alt Temalar	f
Toplumsal Değerleri Aktarma/Öğretme	**20**
• hoşgörü	4
• saygı	4
• sevgi	3
• doğruluk/dürüstlük	2
• empati	2
• yardımlaşma	2
• adalet	1
• ahlak kuralları	1
• güven	1
Toplam	**20**

Veriler incelendiğinde değer öğretiminin ne olduğuna ilişkin olarak kontrol grubu öğretmenlerinin görüşleri incelendiğinde "Toplumsal Değerleri Aktarma/Öğretme" teması ortaya çıkmıştır. Bu temada yer alan kodlamalara ilişkin öğretmen görüşleri aşağıda yer almaktadır.

Öğrt.1.K. "Kültürümüze *ait değerlerin bireylere öğretilmesidir. Sevgi-saygı-sorumluluk-yardımseverlik-doğruluk-dürüstlük-empati, hoşgörü, güven, adalet gibi kavramlar.*"
Öğrt.2.K. "*Değer öğretimi toplumsal değerlerin çocuklara kazandırılmasıdır. (Doğruluk, dürüslük, empati, saygı, hoşgörü vb…)"*
Öğrt.3.K. "*Değer öğretimi sayesinde toplumsal miraslarımızı geleceğe aktarabiliriz. Bireylere sağlıklı bir kişilik kazandırabiliriz.*"
Öğrt.4.K. "İnsanlarda *yaşam sıtandartlarının arttığı saygı-sevgi hoşgörüyü, yardımlaşma ve dayanışmayı içinde barındıran; kısacası insan olmanın tüm gereklerini içeren geçmişten günümüze gelen tüm olumlu ve insani davranışların hayata geçirilmesi demektir.*"
Öğrt.5.K. "*Toplumsal yaşamın gerekli kıldığı hoşgörü saygı, sevgi ahlak kurallarının toplumsal yaşama uygulana bilme çabaları.*"

Tablo 2: Deney Grubu Öğretmenlerinin "Değer öğretimi nedir?" Sorusuna Verdikleri Cevaplara İlişkin Alt Temalar ve Yükleme Sayıları

Alt Temalar	f
Toplumsal Değerleri Aktarma/Öğretme	**5**
• ahlak	1
• dürüstlük	1
• hoşgörü	1
• saygı	1
• sorumluluk	1
Vicdan İle İlişkilendirme	**2**
• vicdan-akıl	1
• vicdan-inanç, düşünce, yaşam tarzı	1
Kaybolan Değerlerin Ön Plana Çıkartılması	**2**
Toplam	**9**

Değer öğretiminin ne olduğuna ilişkin olarak deney grubu öğretmenlerinin görüşleri incelendiğinde "Toplumsal Değerleri Aktarma/Öğretme", "Vicdan İle İlişkilendirme" ve "Kaybolan Değerlerin Ön Plana Çıkartılması" şeklinde üç alt tema ortaya çıkmıştır. Bu alt temalara ilişkin öğrenci görüşleri aşağıdaki gibidir.

Öğrt.1.D. "*Kültürümüzde kaybolan değerlerin yeni nesle öğretimidir. Ahlaki değerlerin öğretimidir.*"
Öğrt.2.D. "*Ahlaklı, hoşgörülü, saygılı, dürüst ve sorumluluk sahibi bireyler yetiştirmektir. Toplumun değer yargılarına saygılı bireyler yetiştirmek.*"
Öğrt.3.D. "*Bir konu hakkında karar verirken kendi inanç düşünce, yaşam tarzı ve vicdanımıza danışarak davranma biçimidir.*"
Öğrt.4.D. "*İnsanda bulunan fakat zamanla silikleşmiş değerleri on plana çıkarıp bunlar çerçevesinde yaşanmasını sağlamak.*"
Öğrt.5.D. "*Vicdan ve aklın uyum içinde toplumsal ilişkiyi geliştirmeye yönelik çabalardır. Bu çalışmaların okul sürecinde ele alınması.*"

Tablo 3: Kontrol grubu öğretmenlerinin değer öğretimimin gerekliliğine yönelik cevaplarına ilişkin alt temalar ve yükleme sayıları

Alt Temalar	f
Gerekli	**5**
• birliktelik için	2
• aktarım için	1
• toplumsal huzur için	1
• üst düzey düşünme becerilerini geliştirmek için	1
Toplam	**5**

Kontrol grubu öğretmenlerinin değer öğretiminin gerekliliğine ilişkin olarak cevapları incelendiğinde "Gerekli" alt teması ortaya çıkmıştır. Bu temada yer alan kodlamalara ilişkin öğretmen görüşleri aşağıda yer almaktadır.

Öğrt.1.K. "*Kesinlikle inanıyorum. Çünkü değerler yaşandıkça toplum daha huzurlu olur. Bireyler mutlu olur.*"
Öğrt.2.K. "*Değerler eğitimin toplumsal değerlerin kazandırmasında etkili olduğu gibi aynı zamanda eleştirel düşünme ve problem çözme becerilerinin geliştirilmesinde de etkilidir.*"
Öğrt.3.K. "*Evet inanıyorum. Toplumsal miraslarımızı korumazsak bir süre sonra toplum olmaktan çıkıp bireysel düşünen, neme nazımcı insanlar olacağımızı düşünüyorum .*"
Öğrt.4.K. "*Kesinlikle katılıyorum Değerlerini ve insani yaşam standartlarının geliştirilip gelecek nesillere aktarılmasının en önemli yoludur.*"
Öğrt.5.K. "*Evet çağımızın maddiyatçı bakış açısını kırabilmek toplumu kaynaştırmak birlikte yaşamanın gerekliliklerini kavratmak için.*"

Tablo 4: Deney grubu öğretmenlerinin değer öğretimimin gerekliliğine yönelik cevaplarına ilişkin alt temalar ve yükleme sayıları

Alt Temalar	f
Gerekli	**4**
• birliktelik için	1
• ruhsal iyilik ve akademik başarı için	1
• toplumsal güç için	1
• toplumsal huzur için	1
Gerekli Değil	**1**
Toplam	**5**

Değer öğretiminin gerekliliğine ilişkin olarak deney grubu öğretmenlerinin görüşleri incelendiğinde "Gerekli" ve "Gerekli Değil" şeklinde iki alt tema ortaya çıkmıştır. Bu alt temalara ilişkin öğrenci görüşleri aşağıdaki gibidir.

Öğrt.1.D. "*Değerler öğretilmez aile içinde yaşanır topluma yayılır.*"
Öğrt.2.D. "*Evet. Çünkü toplumları ayakta tutan değerlerdir. Vicdan ve merhamet sahibi bireyler topluma zarar vermezler. Toplumun huzur ve mutluluğu değerler eğitimi ile sağlanabilir.*"
Öğrt.3.D. "*Evet inanıyorum. Değerlerini bilen bireylerin daha güçlü olduğunu düşünüyorum.*"

Öğrt.4.D. "*Evet inanıyorum. İnsanı insan yapan değerleri koruyamazsak birlik olma ve insanca yaşama becerimizi kaybederiz.*"
Öğrt.5.D. "*Evet iyi bir değerler eğitimi çocuğun ruhsal ve akademik başarısını arttırır.*"

Tablo 5: Kontrol grubu öğretmenlerinin değer öğretimini kullandıkları derslere ilişkin kodlamalar ve yükleme sayıları

Kodlamalar	f
• Sosyal Bilgiler	3
• tüm dersler	2
• İnsan Hakları ve Demokrasi	1
• Rehberlik	1
• Türkçe	1
• Oyun ve Fiziki Etkinlikler	1
Toplam	**9**

Değer öğretimini kullandıkları derslere ilişkin olarak kontrol grubu öğretmenlerinin görüşleri incelendiğinde altı farklı kodlama oluşmuştur. Bu kodlamalara ilişkin öğrenci görüşleri aşağıdaki gibidir.

Öğrt.1.K. "*Derslerin konularına göre değerler öğretimini yapıyorum. Bunu bireylere sürekli yaşatmak gerekir ki kalıcı olsun.*"
Öğrt.2.K. "*Türkçe ve Sosyal Bilgiler derslerinde değerler öğretimi yapıyorum. Bu dersler konuları itibarıyla değerler eğitimi verilmesine uygun.*"
Öğrt.3.K. "*Değer öğretiminin çocuğa çok küçük yaşta başlanmasını okulda devam etmesini istiyorum. En fazla Sosyal Bilgiler dersinde ama ben okulda kaldığımız her dakika bunların verilmesi taraftarıyım.*"
Öğrt.4.K. "*Sosyal Bilgiler, Rehberlik, İnsan Hakları ve Demokrasi, Oyun ve Fizik Etkinlikleri.*"
Öğrt.5.K. "*Tüm derslerde. An itibarı ile yaşanan olaya, davranışa göre.*"

Tablo 6: Deney grubu öğretmenlerinin değer öğretimini kullandıkları derslere ilişkin kodlamalar ve yükleme sayıları

Kodlamalar	f
• İnsan Hakları ve Demokrasi	3
• Sosyal Bilgiler	3
• tüm dersler	3
• Matematik	1
• Trafik	1
• Türkçe	1
Toplam	**12**

Değer öğretimini kullandıkları derslere ilişkin olarak deney grubu öğretmenlerinin görüşleri incelendiğinde altı farklı kodlama oluşmuştur. Bu kodlamalara ilişkin öğrenci görüşleri aşağıdaki gibidir.

Öğrt.1.D. "*Konuya uygun derslerin hepsini kullanıyorum. Değerlerde ders ayrımı olmamalı.*"
Öğrt.2.D. "*"Sosyal Bilgiler", "İnsan Hakları ve Yurttaşlık", Matematik. Yeri geldikçe diğer derslerde de işlenmeli.*"
Öğrt.3.D. "*Sosyal Bilgiler-İnsan Hakları ve Demokrasi- Türkçe.*"
Öğrt.4.D. "*Bütün derslerde yeri ve zamanı geldikçe. Çünkü canlı örneklerle işlendiğinde daha kalıcı oluyor.*"
Öğrt.5.D. "*S. Bilgiler, trafik, insan hakları. Toplumsal yaşantımızda uyulması gereken değerleri bilmeliyiz.* "

Tablo 7: Kontrol grubu öğretmenlerinin kullandıklar değer öğretimi yaklaşımına ilişkin kodlamalar ve yükleme sayıları

Kodlamalar	f
• Değer açıklama ve analizi	2
• Doğrudan öğretim	1
• Gözlem yoluyla	1
• Rol model	1
• Yaşantı yoluyla	1
Toplam	**6**

Kullanılan değerler öğretimi yaklaşımlarına ilişkin olarak kontrol grubu öğretmenlerinin görüşleri incelendiğinde beş farklı kodlama ortaya çıkmıştır. Bu kodlamalara ilişkin öğrenci görüşleri aşağıdaki gibidir.

Öğrt.1.K. "*Adalet, yardımseverlik, güven, sevgi, saygı, doğruluk, dürüstlük saydığım değerler yaşanır ve yaşantılarla her şey daha güzel.*"
Öğrt.2.K. "*Değerleri açıklama ve değer analizi yaklaşımını kullanıyorum. Çünkü bu yaklaşımlarda çocuğun bireysel kimliği her şeyin üstünde tutularak kendi kararlarını vermesi sağlanır.*"
Öğrt.3.K. "*Değer açıklaması yaklaşımı; öğrencinin kendi değerlerinin farkına varması için insanların davranışlarındaki değerleri örnek alarak öğrenmeyi gözlem yoluyla öğrenme özellikle öğrencilere kendisinden büyük ve akran olan öğrencileri gözlemletiyorum.*"
Öğrt.4.K. "*Örnekleme, model olma, değerlerin kazandıırlıp günlük hayatta kullanılacak hale gelmesi için.*"
Öğrt.5.K. "*Değerlerin doğrudan öğretimi. Çevre verileri ve imkanlarının örneklemeye uygun olması.*"

Tablo 8: Deney grubu öğretmenlerinin kullandıklar değer öğretimi yaklaşımına ilişkin kodlamalar ve yükleme sayıları

Kodlamalar	f
• Rol model	2
• Değer açıklama	1
• Doğrudan öğretim	1
• Telkin yoluyla	1
• Yaşantı yoluyla	1
Toplam	**6**

Kullanılan değerler öğretimi yaklaşımlarına ilişkin olarak deney grubu öğretmenlerinin görüşleri incelendiğinde beş farklı kodlama ortaya çıkmıştır. Bu kodlamalara ilişkin öğrenci görüşleri aşağıdaki gibidir.

Öğrt.1.D. "*Saygı, sevgi, yardımlaşma, hoşgörü insanlarda varsa her şey doğru ve düzenli olur.*"
Öğrt.2.D. "*Dürüstlük. Dürüstlüğün olduğu yerde yalan, hile, aldatma olmaz. Sonra sevgi ve sorumluluk bilinci verilmelidir.*"
Öğrt.3.D. "*Değerlerin açıklanması, rol model belirleme/önerme.*"
Öğrt.4.D. "*Yaşanan olaylar ve bunların sonuçları üzerinden değerler öğretimi yapmak daha etkili oluyor.*"
Öğrt.5.D. "*Rol modeller üzerinden değerlerin doğrudan öğretimi. Davranışlar üzerinden somutlaştırmak.*"

Tablo 9: Kontrol grubu öğretmenlerinin değer öğretimi sırasında kullandıkları yöntem ve tekniklere ilişkin kodlamalar ve yükleme sayıları

Kodlamalar	f
• Drama	3
• Görselleştirme	3
• Anlatım/telkin	2
• Soru cevap	2

• Beyin fırtınası	1
• Doğrudan öğretim	1
• Grup çalışması	1
• Hikayeleştirme	1
• Örnekleme	1
• Rol model	1
Toplam	**16**

Kontrol grubu öğretmenlerinin değer öğretimi sırasında kullandıkları yöntem ve tekniklere ilişkin olarak verdikleri cevapları incelendiğinde on farklı kodlama ortaya çıkmıştır. Bu kodlamalara ilişkin öğrenci görüşleri aşağıdaki verilmiştir.
Öğrt.1.K. "*Beyin fırtınası, drama, afiş, soru cevap, görseller, örneklemelerle.*"
Öğrt.2.K. "*Anlatım (telkin), grup çalışması, canlandırma-drama, pano hazırlama.*"
Öğrt.3.K. "*Görsel yöntemlerden; ders verici hikaye anlatma, öğüt verme, telkinlerde bulunma, kendi değerlerinin farkına varmaları için soru sorma, film seyrettirme.*"
Öğrt.4.K. "*Model olma: Verilen değerin okul ve çevrede görülmesi (uygulama). Drama: Verilecek değerle ilgili örnek olay oluşturup canlandırma. Örnekleme: Değerlerle ilgili günlük hayattan örnekler verme.*"
Öğrt.5.K. "*Değerlerin doğrudan öğretimi.*"

Tablo 10: Deney grubu öğretmenlerinin değer öğretimi sırasında kullandıkları yöntem ve tekniklere ilişkin kodlamalar ve yükleme sayıları

Kodlamalar	**f**
• Örnek olay	3
• Beyin fırtınası	2
• Drama	2
• Soru cevap	2
• Anlatım	1
• Biyografi	1
• Görselleştirme	1
• Gözlem	1
• Hikayeleştirme	1
• Rol model	1
• Yaparak yaşayarak	1
Toplam	**16**

Deney grubu öğretmenlerinin değer öğretimi sırasında kullandıkları yöntem ve tekniklere ilişkin olarak verdikleri cevapları incelendiğinde onbir farklı kodlama ortaya çıkmıştır. Bu kodlamalara ilişkin öğrenci görüşleri aşağıdaki verilmiştir.
Öğrt.1.D. "*Drama, afiş, soru-cevap, beyin fırtınası, örnek olay, resimleme.*"
Öğrt.2.D. "*Hikayeleştirerek anlatım. Sınıfta olumsuz davranışları düzeltmek için anlatma, örnek verme, drama şeklinde işleme.*"
Öğrt.3.D "*Örnek olay veya kişi-anlatım-beyin fırtınası-biyografi.*"
Öğrt.4.D. "*Soru-cevap, yaşanmış olaylardan ders çıkarma, konu ile ilgili film izleme, farkına varma, çözüm yolu bulma.*"
Öğrt.5.D. "*Gözlem, rol-model, yaparak yaşayarak öğrenme.*"

Tablo 11: Kontrol grubu öğretmenlerinin değer öğretimi sırasında karşılaştıkları sorunlara ilişkin kodlamalar ve yükleme sayıları

Kodlamalar	**f**
• Okul-çevre uyuşmazlığı	3
• Davranışa/uygulamaya dönüştürememe	2
• Zaman yetersizliği	1

• Herhangi bir sorun yaşamadım	1
Toplam	**7**

Kontrol grubu öğretmenlerinin değer öğretimi sırasında karşılaştıkları sorunlara ilişkin olarak verdikleri cevapları incelendiğinde dört farklı kodlama ortaya çıkmıştır. Bu kodlamalara ilişkin öğrenci görüşleri aşağıdaki gibidir.

Öğrt.1.K. "*Okulda, evde ve çevrede değerler öğretimi benzer olmazsa çelişki yaşanır.*"
Öğrt.2.K. "*Yaşamıyorum.*"
Öğrt.3.K. "*Yaşıyorum. Benim en büyük sıkıntım aile ve bulunduğumuz mahalle.*"
Öğrt.4.K. "*En temel sorun öğrenilenlerin günlük hayattaki kullanımının olmaması. Çevredeki değerlere zıt cazip örneklerin olması, zaman yetersizliği.*"
Öğrt.5.K. "*Öğretim ve öğrenme gerçekleşiyor fakat uygulama yetersiz kalıyor.*"

Tablo 12: Deney grubu öğretmenlerinin değer öğretimi sırasında karşılaştıkları sorunlara ilişkin kodlamalar ve yükleme sayıları

Kodlamalar	**f**
• Okul-çevre uyuşmazlığı	3
• Öğrencilerin beklentisini karşılayamama	2
• Davranışa/uygulamaya dönüştürememe	1
Toplam	**6**

Deneygrubu öğretmenlerinin değer öğretimi sırasında karşılaştıkları sorunlara ilişkin olarak verdikleri cevapları incelendiğinde üç farklı kodlama ortaya çıkmıştır. Bu kodlamalara ilişkin öğrenci görüşleri aşağıdaki gibidir.

Öğrt.1.D. "*Aile içi ve okuldaki öğretim aynı olmazsa sorun yaşanır.*"
Öğrt.2.D. "*Davranışa dönüştürmekte zorlanıyoruz. Çünkü aileler ve yakın çevre değer yargılarına gereken özeni göstermiyor.*"
Öğrt.3.D. "*Evet. Çocukların hayal dünyasındaki değerlerin çeşitliliği ve zor somutlaştırılması.*"
Öğrt.4.D. "*Evet yaşıyoruz. Bizim verdiğimiz değerler kısa sürede çevrenin etkisiyle kaybediliyor.*"
Öğrt.5.D. "*Çocukların yaşantıları ve beklentilerim farklılaşması.*"

Tablo 13: Kontrol grubu öğretmenlerinin değer öğretimine yönelik önerilerine ilişkin kodlamalar ve yükleme sayıları

Kodlamalar	**f**
• aile-çevre-okul uyumu	3
• medya desteği	2
• aktif katılım sağlama	1
• üzerinde daha fazla durma	1
• görsel materyaller ile zenginleştirme	1
Toplam	**8**

Kontrol grubu öğretmenlerinin değer öğretimine yönelik önerilerine ilişkin olarak verdikleri cevapları beş farklı kodlama ortaya çıkmıştır. Bu kodlamalara ilişkin öğrenci görüşleri aşağıda verilmiştir.
Öğrt.1.K. "*TV dizilerindeki olumsuzluklar. Değerlerimizi yansıtmıyor. Bu dizilerdeki yaşantılar bireyler üzerinde olumsuz davranışların oluşumuna neden olmaktadır. Bireylere kültürümüzü yaşatacak programlar yapılmalıdır.*"
Öğrt.2.K. "*Öğrenciyi değer eğitimi işleniş sürecinde etkinliklere katılması konusunda teşvik edebiliriz. Bazı konularda aile ile işbirliği yapılabilir.*"
Öğrt.3.K. "*Değer öğretimini daha ciddiye almalıyız. Okulda bize verilen bir sorumluluğun dışında düşünmeliyiz. Elimizdeki malzemenin bizim geleceğimiz olduğunu aklımızdan çıkarmamalıyız. Sadece ben diyen ve ne olursa olsun beni ilgilendirmez tutum ve davranışlarımızdan bir an evvel vazgeçmeliyiz. Her geçen gün bencil, tembel ve*

neme lazımcı bir toplum oluşuyor. Tamamen kaybetmemek için harekete geçmeliyiz. Öncelikle büyüklere yaptıkları yanlışları göstermeliyiz. Onları uyarırsak çocukları da kurtarmış oluruz. Bence değerlerin eksikliği toplumun kanayan bir yarası gibi."
Öğrt.4.K. "*Değer öğretimi ders olarak değil de yaşamın her alanında çevre-okul-aile uyum u ile uygulanması durumunda hedefine ulaşacaktır. Unutmayalım ki her büyük; çocuklara birer örnektir. En büyük değer eğitimi model olarak büyüklere verilir.*"
Öğrt.5.K. "*Medya kullanılmalı. Anne-baba eğitimlerine yönelik öncelik verilmeli. Yerel yaşanmışlıklardan örnekler görselleştirilip sürekli sergilenmeli.*"

Tablo 14: Deney grubu öğretmenlerinin değer öğretimine yönelik önerilerine ilişkin kodlamalar ve yükleme sayıları

Kodlamalar	**f**
• ayrı bir ders haline getirme	1
• üzerinde daha fazla durma	1
• doğru yönlendirme	1
• güncel ve evrense olmalı	1
• medya desteği	1
Toplam	**5**

Deney grubu öğretmenlerinin değer öğretimine yönelik önerilerine ilişkin olarak verdikleri cevapları beş farklı kodlama ortaya çıkmıştır. Bu kodlamalara ilişkin öğrenci görüşleri aşağıda verilmiştir.
Öğrt.1.D. "*Türk milleti yanlış yeniliklere yönlendirilirse değerler öğretiminin faydası olmaz.*"
Öğrt.2.D. "*İlkokulda öğretimden önce eğitim öne alınmalıdır. Sevgi, saygı, yardımlaşma, hoşgörü, sorumluluk gibi kavramlar üzerinde ısrarla durulmalıdır.*"
Öğrt.3.D. "*Zamana uygun değer oluşumuna açık olunmalı. Yerellikten kurtarılıp evrenselliğe taşınmalı.*"
Öğrt.4.D. "*Bu konuda en çok değişmesi gereken medyanın bu değerleri koruyucu ve destekleyici yayınlar yapmaları gerekir.*"
Öğrt.5.D. "*Müstakil ders olarak ilkokulda da okutulması.*"

Tablo 15: Kontrol grubu öğretmenlerinin üstbilişsel becerileri geliştiren stratejileri kullanma durumlarına ve nedenlerine ilişkin alt temalar ve yükleme sayıları

Alt Temalar	**f**
Evet	**11**
• eksiklerin tespiti	2
• terim ve kavram öğretimi	1
• neden sonuç	1
• yaparak yaşayarak öğrenmeyi sağlama	1
• öğrenilenleri uygulama	1
• farklı fikirleri ön plana çıkartma	1
• yeni bilgileri öncekilerle bağdaştırma	1
• planlama	1
• izleme	1
• değerlendirme	1
Hayır	**1**
Toplam	**12**

Veriler incelendiğinde kontrol grubu öğretmenlerinin üstbilişsel becerileri geliştiren stratejileri kullanma durumlarına ve nedenlerine ilişkin olara "Evet" ve "Hayır" temaları şeklinde 2 alt tema ortaya çıkmıştır. Bu alt temalara ilişkin öğrenci görüşleri aşağıdaki gibidir.

Öğrt.1.K. "*Sosyal Bilgiler, Fen Bilimleri, Türkçe, Matematik derslerindeki terim ve kavramları verilerek anlamlandırmaları yapılarak konuya hazırlık yapılır. Konuları işleme sürecinde ön bilgi sahibi olunur.*"
Öğrt.2.K. "*Kullanıyorum. Özellikle Sosyal Bilgiler dersinde olaylar arasındaki sebep sonuç ilişkisini kestirme ve yaparak yaşayarak öğrenme açısından üst bilişsel becerileri kullanmayı önemli buluyorum.*"
Öğrt.3.K. "*Henüz kullanmadığım için bir şey diyemeyeceğim. Belki de kullanıyorumdur da adını koymamışımdır.*"
Öğrt.4.K. "*Kullanıyorum. Beyin fırtınası: farklı fikir ve düşünceleri alma, ön hazırlık, tekrar. Soru-cevap: Konuyu ne kadar kavradıkları eksiklerin tespiti. Drama: Öğrendiklerini uygulama ve kullanma.*"
Öğrt.5.K. "*Evet. 1-Yeni bilgileri öncekilerle birleştirme. 2-Neyi bilip neyi bilmediğini belirleme. 3-planlama-izleme-değerlendirme.*"

Tablo 16: Deney grubu öğretmenlerinin üstbilişsel becerileri geliştiren stratejileri kullanma durumlarına ve nedenlerine ilişkin alt temalar ve yükleme sayıları

Alt Temalar	f
Evet	**11**
• farklı fikirleri ön plana çıkartma	3
• problem çözme	2
• planlama	1
• değerlendirme	1
• neden sonuç	1
• empatik düşünebilme	1
• eleştirel düşünebilme	1
• öğretimi çeşitlendirme	1
Toplam	**11**

Veriler incelendiğinde deney grubu öğretmenlerinin üstbilişsel becerileri geliştiren stratejileri kullanma durumlarına ve nedenlerine ilişkin olara "Evet" teması ortaya çıkmıştır. Bu alt temaya ilişkin öğrenci görüşleri aşağıdaki gibidir.
Öğrt.1.D. "*Sosyal Bilgiler dersinde yapılan çalışmanın devamı olarak kullanıyorum. Konunun kelimeleri verilir, konunun sorunu ve çözümü bulunur.*"
Öğrt.2.D. "*Okuma, anlama, anlatma, tekrar etme, soru sorma, özetleme, rol yapma, model oluşturma gibi stratejileri derslerde kullanıyorum. Türkçe, Matematik, fen ve Sosyal derslerinde.*"
Öğrt.3.D "*Evet kullanıyorum. Planlama: İşlenecek konunun planlanması ve sistemli işlenişi için. Beyin fırtınası: Konu hakkında farklı düşünce biçimleri üretmek. Değerlendirme: İşlenen konunun anlaşılma oranını belirlemek.*"
Öğrt.4.D. "*Evet kullanıyorum. Siz olsaydınız bu durumda ne yapardınız? Bu sorunu böyle çözebilir miyiz? Neden? Burada sorun nedir? Sorunun farkına varma, soruna çözüm bulma, nasıl yapılır? Başka çözüm yolu var mı? gibi stratejiler ve düşünme, üretme amaçları için kullanırım.*"
Öğrt.5.D. "*Eleştirel düşünceyi Türkçe derslerinde kullanmaya çalışıyorum. Beyin fırtınası en çok başvurduğumuz yöntemler.*"

Tablo 17: Deney grubu öğretmenlerinin IMPROVE yöntemine ilişkin alt temalar ve yükleme sayıları

Alt Temalar	f
Olumlu Görüşler	**17**
• heyecan verici	3
• problem çözme becerisini arttırma	3
• merak uyandırıcı	2
• kullanışlı	1
• düşünme becerisini arttırma	1
• kalıcı	1
• motive edici	1
• empati	1
• özgüven	1
• anlatma becerisi	1

• aktif katılım	1
• eğlenceli/keyifli	1
Olumsuz Görüşler	**6**
• zaman sıkıntısı	2
• başlarda zorlayıcı	2
• düşünceyi yazıya aktarma zorluğu	1
• sıkıcı	1
Toplam	**23**

Deney grubu öğretmenlerinin görüşleri incelendiğinde IMPROVE yöntemine ilişkin olarak "Olumlu Görüşler" ve "Olumsuz Görüşler" şeklinde iki alt tema ortaya çıkmıştır. Bu alt temalara ilişkin olarak öğrenci görüşleri aşağıda verilmiştir.

- Olumlu Görüşler

Öğrt.1.D. "*Çok faydalı oldu. Sorunları ve çözümleri anladılar. Öğrenciler kendi aorunlarına bile artık çözüm bulmaya başladılar.*"
Öğrt.2.D. "*Öğrenciler için farklı bir deneyim oldu. Grup çalışmaları onlar için heyecan verici idi. Birlikte yaptığımız çalışma benim için de heyecan vericiydi.*"
Öğrt.3.D. "*Öğrenmeye motive etmesi. Empati duygusunu geliştirmesi. Sorunun çözümünde analiz ve farklı düşünce kalıpları yaratması. Akıl yürütmeye önem verdiler. Sorunların çözümünde güven duygusu edindiler. Kendi düşüncelerini ifade etme becerisi edindiler.Bu çalışma bende ve öğrencilerimde heyecan yarattı. Her hafta yeni örnek olayı merak ettik. Açık uçlu sorular anlatım becerisini geliştir.*"
Öğrt.4.D. "*İyi ve kullanışlı bir yöntem. Düşünme ve problem çözme yeteneğini arttırıyor. Yapılan çalışmalarda öğrenciler sonuca kendileri ulaştıkları için daha etkili ve kalıcı oldu.Öğrencilerin zevk aldıklarını gözlemledim. İyi materyal hazırlanarak bu yöntem uygulanırsa düşünen ve düşündüklerini paylaşan, özgün çözüm yolları üreten gençler yetiştirmemize yardımcı olacağını düşünüyorum.*""
Öğrt.5.D. "*IMPROVE yönteminin en belirgin olumlu yönü tüm öğrencilerin etkinliğe aktif katılması. Etkinliklerin yapıldığı süre içinde öğrencilerde bir heyecan olduğu kesin. Farklı bir etkinlik öğrenme merakını arttırıyor.*"

- Olumsuz Görüşler

Öğrt.1.D. "*Eksik yanları yok fakat çocuklar daha önce bu yöntemle çalışmadıkları için zorlandılar.*"
Öğrt.2.D. "*Yapılandırıcı eğitim sistemi içinde düşünülebilir. Ancak programın çok fazla olması derslerin yetiştirilmesinde sıkıntılı oluyor. Ders sonlarında yapılan değerlendirme testleri onlara sıkıcı geliyordu.* "
Öğrt.4.D. "*Başlangıçta yöntemde biraz zorlanıldı.* "
Öğrt.5.D. "*Eksik yönü zaman yönetimi, uzun süreli olması.*"

Tablo 18: Deney grubu öğretmenlerinin IMPROVE yöntemini diğer derslerde kullanma isteklerine ve nedenlerine yönelik alt temalar ve yükleme sayıları

Alt Temalar	**f**
Evet	**6**
• probleme alternatif çözüm sunması	2
• düşünme becerisini arttırması	1
• grup çalışması	1
• kavram öğretimi	1
• öğrenmeyi hızlandırması	1
Hayır	**1**
• zaman yetersizliği	1
Toplam	**7**

IMPROVE yönteminin diğer derslerde kullanılma isteklerine ve nedenlerine yönelik olarak deney grubu öğretmenlerinin görüşleri incelendiğinde "Evet" ve "Hayır" şeklinde iki alt tema ortaya çıkmıştır. Bu alt temalara ilişkin olarak öğrenci görüşleri aşağıda verilmiştir.

Öğrt.1.D. "*Kazanımlar çok olduğu için zaman yetersiz kalıyor. Önce denedik sonra bıraktık.*"
Öğrt.2.D. "*Kullanılabilir. Grup çalışmaları heyecan vericiydi.*"
Öğrt.3.D. "*Evet düşündüm. Daha önceleri bu yöntemi bilmeden kullandığımı fark ettim. Öğrenmeyi hızlandırıyor. Problemi çözümlüyor. Alternatif yaratıyor.* "

Öğrt.4.D. "*Evet düşünüyorum. Çünkü bu yöntem düşünme, özgün çözüm bulma yeteneklerini güçlendiriyor.*"
Öğrt.5.D. "*Yararlanmayı düşünüyorum. Kavramların öğretilmesinde daha etkin yöntemlerden biridir.* "

Tablo 19: Deney grubu öğretmenlerinin IMPROVE yöntemi ile ilgili tavsiyelerine ilişkin alt temalar ve yükleme sayıları

Alt Temalar	f
Sınıf Mevcudu Az Olmalı	**2**
Farklı Materyallerle Desteklenmeli	**2**
Değerlendirme Soruları	**2**
• Farklı sorular eklenmeli	1
• Soru sayısı azaltılmalı	1
Farklı Tekniklerle Desteklenmeli	**1**
Kazanımın Az Olduğu Derslerde Kullanılmalı	**1**
Toplam	**8**

IMPROVE yöntemi ile ilgili tavsiyeler ilişkin deney grubu öğretmenlerinin görüşleri incelendiğinde "Sınıf Mevcudu Az Olmalı", "Farklı Materyallerle Desteklenmeli", "Değerlendirme Soruları", "Farklı Tekniklerle Desteklenmeli" ve "Kazanımın Az Olduğu Derslerde Kullanılmalı" şeklinde dört alt tema ortaya çıkmıştır. Bu alt temalara ilişkin olarak öğrenci görüşleri aşağıda verilmiştir.

Öğrt.1.D. "*Sınıf mevcudu az olan sınıflarda daha verimli olacağını düşünüyorum….*Kazanımı *az olan derslerde de daha iyi olabilir*"
Öğrt.2.D. "*Değerlendirme yöntemi hep aynı sorulardan oluşması bir süre sonra cazibesini kaybediyordu. Farklı soru tipleri olabilirdi.*"
Öğrt.3.D. "*Konu işlenişinde görsellere ağırlık verilebilirdi.. Örnek olay drama yöntemiyle daha etkileyici hale getirilebilinirdi.*"
Öğrt.4.D. "*İyi materyal hazırlanarak bu yöntem uygulanırsa düşünen ve düşündüklerini paylaşan, özgün çözüm yolları üreten gençler yetiştirmemize yardımcı olacağını düşünüyorum.*"
Öğrt.5.D. "*Bu yöntemin az mevcutlu sınıflarda daha etkin yararlanılır görüşündeyim …Formlardaki soru adetinin azaltılması öğrenci seviyesine ve anlamasına yardımcı olmalı.* "

Sonuç

Araştırmadan elde edilen sonuçlara göre, sınıf öğretmenlerinin değer öğretimini toplumsal değerlerin aktarılması olarak tanımladıkları söylenebilir. Ayrıca öğretmenlerin tamamına yakınının değer öğretimini gerekli gördükleri belirlenmiştir. Öğretmenlerin genel olarak Sosyal Bilgiler dersinde değer öğretimi yaptıkları ve en çok değer açıklama ile rol model olmayı benimsedikleri sonuçlarına ulaşılmıştır. Öğretmenler, değer öğretiminde en çok okul ve çevre arasındaki uyumsuzluktan dolayı sorun yaşadıklarını belirtmişlerdir.
Son olarak deney grubu öğretmenlerinin derste kullanılan IMPROVE yöntemine ilişkin genel olarak olumlu yönde görüş bildirdikleri belirlenmiştir. IMPROVE yöntemi ile ders işleyen öğretmenler en çok zaman yetersizliğinden kaynaklı sorun yaşadıklarını belirtmişlerdir.

Kaynaklar

Akbaş, O. (2008). Değer Eğitimi Akımlarına Genel Bir Bakış. *Değerler Eğitimi Dergisi,* 6 (16), 9-27.

Aydın, M. (2011). Değerler, İşlevleri ve Ahlak. *Eğitime Bakış Dergisi,* 7 (19), 39-45.

Büyüköztürk, Ş.,Kılıç Çakmak, E., Akgün, Ö. A., Karadeniz, Ş. ve Demirel, F. (2012). *Bilimsel Araştırma Yöntemleri (12. Baskı)*. Ankara, PegemA Yayıncılık.

Cihan, N. (2014). Okullarda Değerler Eğitimi ve Türkiye'deki Uygulamaya Bir Bakış. *Turkish Studies,* 9(2), 429-436.

Ersoy, F. (2016). Fenomenoloji, Ahmet Saban ve Ali Ersoy (Editör). *Eğitimde Nitel Araştırma Desenleri*. Ankara, Anı Yayıncılık, s. 51-105.

Gliner, J. A., Morgan, G. A., ve Leech, N. L. (2015). *Uygulamada Araştırma Yöntemleri: Desen ve Analizi Bütünleştiren Yaklaşım* (Çev. Ed.: Selahattin Turan). İkinci baskıdan çeviri. Ankara: Nobel Yayın Dağıtım.

Hacker, D.J., Dunlosky, J. (2003). Not All Metacognition is Created Equal. *New Directions for Teaching and Learning*, 95, 73-79.

Johnson, P. G. (2002). *A Metacognitive-Affective Approach to Values Education.* PhD Thesis. University of Melbourne, Melbourne.

Katrancı, M. ve Yangın, B. (2013). Üstbiliş Stratejileri Öğretiminin Dinlediğini Anlama Becerisine ve Dinlemeye Yönelik Tutuma Etkisi. *Adıyaman Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 6(11), 734-771.

Özsoy, G. (2007). *İlköğretim Beşinci Sınıfta Üstbiliş Stratejileri Öğretiminin Problem Çözme Başarısına Etkisi.* Yayımlanmamış doktora tezi, Gazi Üniversitesi, Ankara.

Schwartz, S. H. (1994). Are there universal aspects in the structure and contents of human values? *Journal of Social Issues.* 50(4) 19-45.

Sarı, E. (2005). Öğretmen Adaylarının Değer Tercihleri: Giresun Eğitim Fakültesi Örneği. *Değerler Eğitimi Dergisi,* 3(10), 73-88.

Yeşil, R ve Aydın, D. (2007). Demokratik Değerlerin Eğitiminde Yöntem ve Zamanlama. *Türkiye Sosyal Araştırmalar Dergisi,* 11(2), 65-84.

Yurdakul, B. ve Demirel, Ö. (2011). Yapılandırmacı Öğrenme Yaklaşımının Öğrenenlerin Üstbiliş Farkındalıklarına Katkısı. *Uluslararası Eğitim Programları ve Öğretim Çalışmaları Dergisi,* 1(1), 71-85.

IMPACT OF A CEREAL PESTICIDE (ANTHRAQUINONE) ON RODENTS

BOUCHENAK OUAHIBA
o.bouchenak@univ-boumerdes.dz

YAHIAOUI KARIMA
yahiaoui_karima2005@yahoo.fr

BENHABYLES NARIMEN
benhabylesnarimen@gmail.com

LAOUFI Razika
hibalaou@yahoo.fr

ARAB Karim
ka.arab@univ-boumerdes.dz

Abstract

Pesticides accumulate along the food chain to concentrate in the last links of this chain, hence the indirect effects that pesticides can have on certain organisms. Our work focused on the evaluation of the acute toxicity of a repellent pesticide, anthraquinone on the white rat. According to our results the administration of doses: 1562.5mg / kg, 3125mg / kg and 6250mg / kg, during15 days does not cause any change in weight in treated animals but causes a disruption of the intake and food. No mortality was recorded for the animals treated with dose 1, however 50% of the individuals died among the animals treated with the dose 2 and 75% with the dose 3. The assay of the biochemical parameters revealed a modification of the rates of plasma urea. The results corresponding to the histological study of the organs made it possible to observe a modification of the appearance of the renal parenchyma, disorganization of the hair pellets, decrease in the number of glomeruli as well as empty Bowman spaces and haemorrhages at the renal cortex level. At the hepatic level, there is disorganization of the parenchyma which is manifested by an increase in the size of the liver lobules, vasodilatation of the central vein and the presence of haemorrhagic zones.

IN SILICO ANALYSIS FOR CHARACTERIZING THE STRUCTURE AND BINDING PROPERTIES OF ALA-HIS-LYS (AHK) TRIPEPTIDE

Serda Kecel-Gunduz[a*], Esra Koc[b], Bilge Bicak[a,b], Yagmur Kokcu[b], Aysen E. Ozel[a] and Sevim Akyuz[c]

[a]Istanbul University, Faculty of Science, Physics Department, 34134, Istanbul, Turkey
[b]Institute of Graduate Studies in Sciences, Istanbul University,34452, Istanbul, Turkey
[c]Physics Department, Science and Letters Faculty, Istanbul Kultur University, Atakoy Campus, Bakirkoy 34156, Istanbul, Turkey.

Abstract: AHK (Alanine-Histidine-Lysine) tripeptide, known as an antioxidant because of its amino acid properties, has been clinically developed for the treatment of hair loss and skin rash. The copper complex of this tripeptide (AHK-Cu) is an analog with a stronger effect than the Gly-His-Lys (GHK-Cu) tripeptide which is used for hair growth. The effects of AHK-Cu on human hair growth were evaluated by *in vitro* studies (Pyo, 2007) and the results showed that AHK-Cu promotes the growth of human hair follicles. In addition, Vitamin C conjugated AHK has been developed to increase collagen synthesis and promote human dermal fibroblast growth. These results provided important data for the development of peptide-based bone regenerative agents for the treatment of bone-related disorders (Jung, 2018).

The aim of this study is to determine the most stable geometric structure of AHK tripeptide by using theoretical methods with different approaches to determine the binding properties with proteins that can act in the body.

Firstly, the most stable molecular structure of tripeptide was determined with the help of quantum mechanical method, which included electronic interactions in the calculation. Then, the most efficient structure of the tripeptide in the water medium such as the human body was determined using Molecular Dynamic (MD) analysis. In addition; the binding properties of title tripeptide was investigated by molecular docking technique. The discovery and improvement of the structure and activity of cosmetic peptide is an active field of study, particularly in biochemistry and pharmacology.

Keywords: AHK, L-Alanine-L-Histidine-L-Lysine, tripeptide-copper complex, DFT, MD, Molecular Docking

Introduction

Drugs are a very important factor that affect human life and health. Unfortunately, the discovery of molecules result in safe and effective drugs involves a process that has high cost, production, development and testing stages; they must go through certain stages as a result of the experiments performed in the laboratory, and then include clinical research. Designing and developing the most effective drug in a short time and with lower costs attracts the attention of many scientists working in different fields. In the process of designing the most effective drug, *in silico* methods are preferred because it minimizes time and cost. The appropriate drug structures obtained in accordance with the calculations made with *in silico* methods also allow more rational drug designs by reducing the processes of organic synthesis with high budget. The aim of molecular modeling methods that define molecular systems at the atomistic level is to show how atoms and molecules can interact with a three-dimensional image and simulation, and to determine the structure of these interaction mechanisms. These models can also be used to interpret existing observations or to predict new chemical behaviors. In the drug design process, in silico methods have become a valuable and necessary tool for the modeling of molecular structures that have been nominated for drugs, for increasing the effectiveness of drugs, and for the design of new drug molecules with unknown molecular structure. With these methods, it is possible to examine the relationship between chemical structure and function from small systems to large biologic molecules and material groups. The contribution of modern computer-aided drug design to the discovery of drugs is an indisputable fact and is understood to have been used by large pharmaceutical companies in many commercially available drugs. Modern computer-aided drug design has contributed to the discovery and development of many medicines such as Captopril, Dorzolamide, Saquinavir, Zanamivir, Oseltamivir, Aliskiren, Boceprevir, Nolatrexed, Rupintrivir, and NVP-AUY922.

AHK (Alanine-Histidine-Lysine) tripeptide which shows antioxidant effect because of its amino acid properties, has been clinically developed for the treatment of hair loss and skin rash (Rushton, 2002 and Shimura, 2017). It is claimed that copper peptides can increase hair follicle size and create a healthier environment for the growth of scalp hairs. AHK copper complex (AHK-Cu) is an analog of Gly-His-Lys copper complex (GHK-Cu), which has antioxidant and anti-inflammatory effects, is recommended for wound healing, enhancing the effect of immune cells, stimulating collagen synthesis, skin fibroblasts and the growth of blood vessels. The effects of AHK-Cu on human hair growth were evaluated many *in-vitro* and *ex-vivo* studies (Pyo, 2007) and it also promotes the growth of human hair follicles (Patt, 2009). It provides an increase dermal cell multiplication and viability to help to production of collagen (Patt, 2010). It has also stronger effect than GHK-Cu for hair growth. Vitamin C conjugated AHK has been developed to increase collagen synthesis and promote human dermal fibroblast growth. These results provided important data for the development of peptide-based bone regenerative agents and for the treatment of bone-related disorders (Jung, 2018). The aim of this study is to determine the most stable molecular structure of AHK tripeptide, which is a very effective field of cosmetic use, and to identify the binding mechanisms by proteins with which it acts.

Materials and Methods

Molecular Dynamic Method

Molecular Dynamic Simulation was performed using the GROMACS software (version 5.1.2) (Van Der Spoel, 2005) to determine the conformational change in the water medium on the optimized geometry, calculated at DFT/B3LYP level of theory with the 6-311++ G (d,p) basis set, of the AHK in the vacuum medium obtained by the Gaussian 09 software program (Frisch, 2009**.** Initially, the GROMOS96 54a7 force field (van Gunsteren, 1996) was chosen where the topology file would be created to perform molecular dynamic simulation. AHK tripeptide was placed at the center, a distance of 1.0 nm between the outside of the molecule and the edge of the solvent box, and simulated with water medium. The cubic box was filled with 978 moles of SPC (simple point charge**)** water (Smith, 1993) mediums and two Na+ and three Cl- ions were added in the cubic box to neutralize the system. The steepest descent method was chosen for the energy minimization at 200 ps for water medium. To equilibrate the temperature and pressure of the systems, NVT (50 ps) and NPT (500 ps) ensembles were carried out for 310 K temperature using a V-rescale thermostat (Bussi, 2007) and 1 bar pressure using the isotropic Parrinello-Rahman barostat (Parrinello, 1981). To obtain the trajectory files during 5 ns for analysis the systems behaviors', Molecular dynamics (MD) simulations were performed by applying periodic boundary conditions in all three directions. Leap-frog algorithm was used in equation of motion was united in order to generate time-dependent trajectories. All bond lengths were constrained with the LINCS (linear constraint solver) algorithm (Hess, 1997**.** The Particle Mesh Ewald (PME) method (Darden, 1993) was used to calculate the long-range electrostatic interaction with a grid width of 0.16 nm and a fourth order cubic interpolation. Verlet cut-off scheme (Verlet, 1967) was used with a 0.8 nm cut-off radius for identified the cut-off distances, the van der Waals and the short-range electrostatic interactions. The atom coordinates, velocities and energies were saved every step and obtained the trajectory files. The resulting of trajectory files were viewed and analyzed with the VMD software (Humphrey, 1996).

Molecular Docking Method and ADME Analysis

The molecular structure of the AHK tripeptide, which was subjected to molecular dynamics simulation in the water medium for 5 ns at GROMACS program introduced to Schrödinger Maestro program for use as a ligand in the calculation of docking. Schrödinger Lig Prep module was used to prepare ligand to docking analysis. AHK was prepared for docking calculations using the OPLS3 force field (Harder, 2015). A maximum of 24 stereoisomers were produced for the ligand after the ionization states at pH 7.0 ± 2.0 were selected. The tripeptide-copper complex, defined as a growth factor, stimulates the proliferation of dermal fibroblasts and increases vascular endothelial growth factor production, while at the same time decreasing the secretion of transformed growth factor-beta1 by dermal fibroblasts. For this reason, Vascular endothelial growth factor receptor 2 (pdb code: 3VO3) (Miyamoto, 2013) was prefered as a receptor and was prepared with Protein preparation wizard tool (Sastry, 2013) in Schrödinger software. The docking analysis of AHK tripeptide onto a vascular endothelial growth factor receptor-2 was performed. The receptor was obtained from the PDB database but due to the lack of residues in the protein structure, the crystal structure was obtained using the SWISS-MODEL server (Bienert, 2016). All waters, metals and ions except protein were deleted from the data file. The polar hydrogens were added to the heavy atoms in the protein. The bond orders were assigned, charges were defined at pH 7.0 and the selected receptor was optimized using PROPKA (Søndergaard, 2011). The heavy atoms in the receptor were converged by preferring 0.3A˚ RMSD and the OPLS3 force field. After the grid was generated using glide grid generation tool, drug candidate molecule was docked to the receptors using Glide SP (standard precision) module of the Maestro version 11.4 (Friesner, 2006; Friesner, 2004; Halgren,2004). Determination of the pharmacokinetic properties of drug candidate molecules is very important for the design and synthesis of drugs with better bioavailability. The drug candidate compounds which easily absorbed orally, easily transported to the target region (skin, stomach, blood brain barrier) in the body and easily removed from the body are determined by ADME profiles which are required by the FDA in the drug approval process (Ntie-Kang,2013). The Qik-Prop module was used to determine the ADME profile of the AHK tripeptide.

Results and Discussion

Molecular Dynamics Results

Molecular Dynamic Simulation was performed using the GROMACS software (version 5.1.2) to determine the conformational change in the water medium on the optimized geometry, calculated at DFT/B3LYP level of theory with the 6-311++ G (d,p) basis set, of the AHK in the vacuum medium obtained by the Gaussian 09 software program. The AHK tripeptide was trapped in 978 moles of water molecule and two Na+ and three Cl- ions were added to ensure system neutralization in **Fig.1**. For the energy minimization, the steepest descent method was chosen at 200 ps for water medium in **Fig. 2.** Using the NVT (50 ps) and NPT (500 ps) assemblies, the temperature and pressure of the system were brought to 310 K and 1 bar, respectively, and a 5 ns Molecular dynamic (MD) simulation was performed, thereby examining the conformational change of the peptide in a similar environment to the human body. During the simulation, the RMSD value of AHK tripeptide in water medium was found to be in the range of 0.02 - 0.1 nm in **Fig. 3.** A rmsd of about 0.2 nm or less indicates that the peptide is in its original crystal form. The Rg change graph was also plotted for 5 ns. According to this graph, the constant Rg value to a relatively constant mean tells us that the peptide has stable structure in the water medium in **Fig.4.**

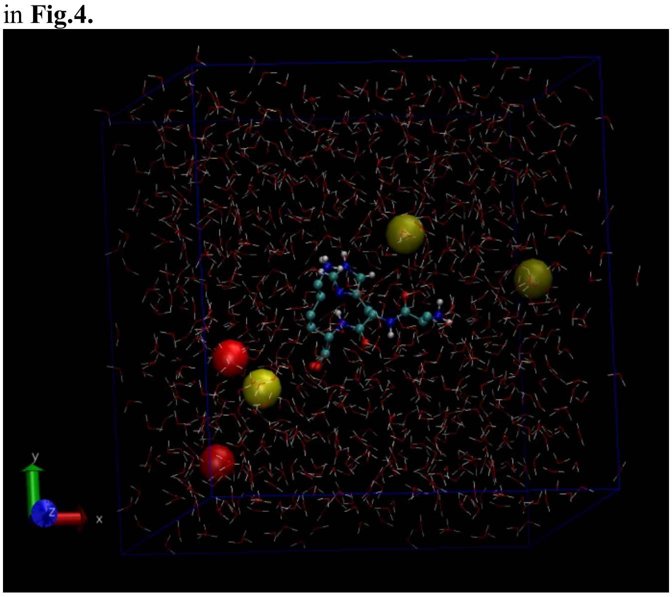


Figure 1: AHK tripeptide in a cubic box solvated with 978 SPC water molecules with two Na^+ and three Cl^- ions.

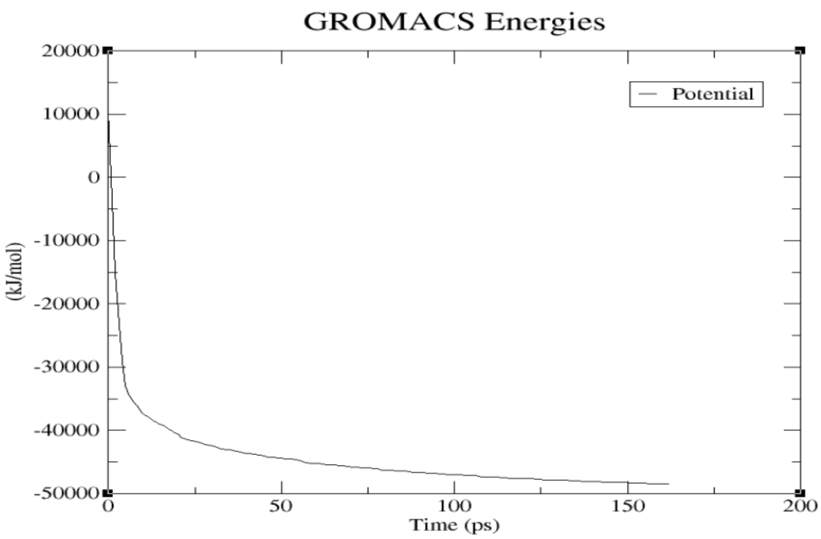


Figure 2: The potential energy minimization of the system using the Steepest Descent algorithm for water medium system of AHK tripeptide.

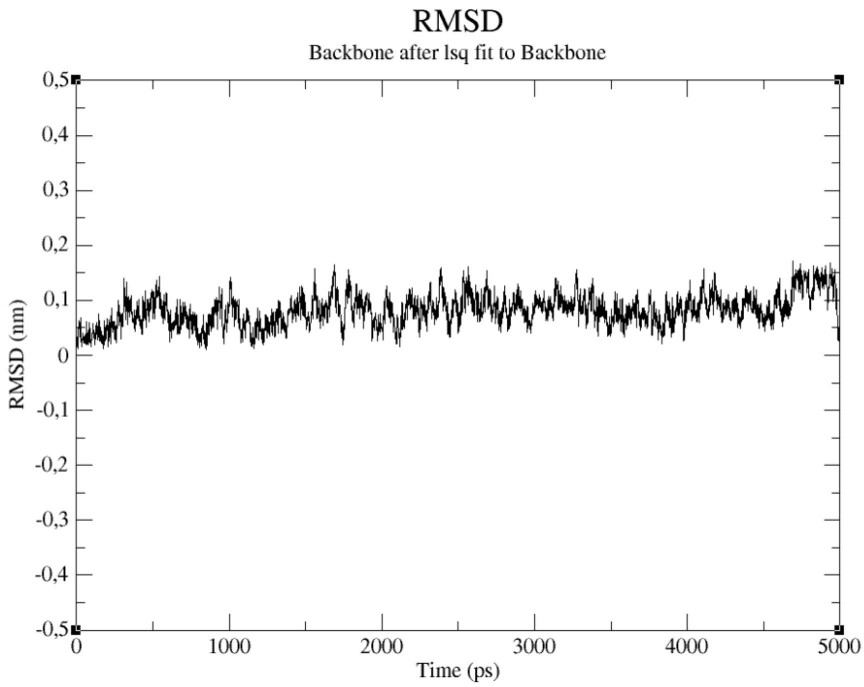


Figure 3: The RMSD values of the water medium system of AHK tripeptide.

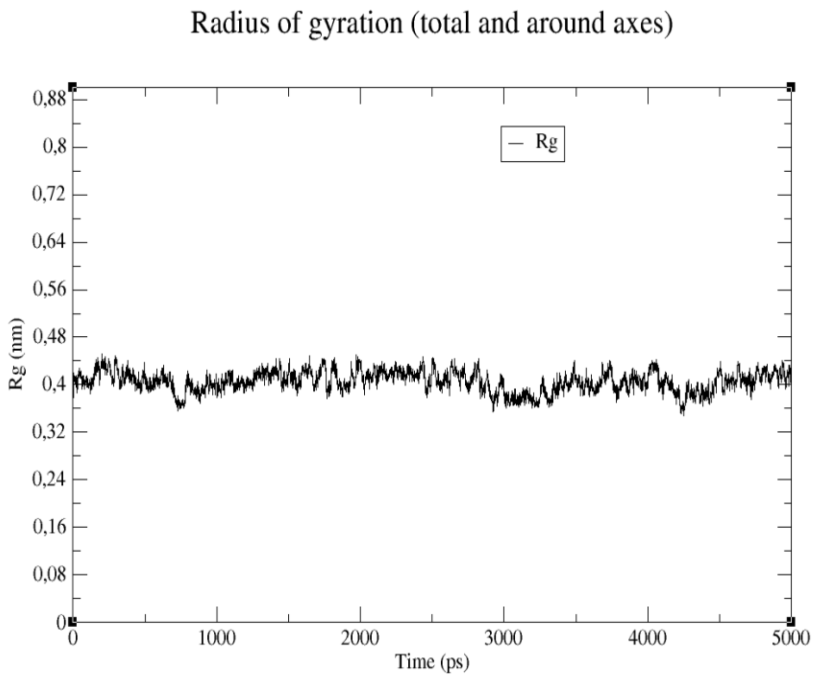


Figure 4: The Radius of gyration valuesof the water medium system of AHK tripeptide.

Molecular Docking and ADME Results

The docking analysis of AHK tripeptide onto a vascular endothelial growth factor receptor 2 (pdb code: 3VO3) was performed and the most possible binding energies were calculated at
-7.769 kcal / mol in **Fig. 5and Fig. 6**. In the active region of the protein in which the AHK tripeptide interacts with, the green, blue, dark blue and orange colored parts represent regions of hydrophobic, polar, positively charged and negatively charged amino acids, respectively in **Fig.7.** The strong hydrogen bonds formed resulted in the formation of stable binding poses between AHK tripeptide and protein. As shown in **Fig.7**. and **Fig.8,** the hydrogen bonds formed with LEU-37 (1,81 Å and 2.39 Å), LYS-117 (1.62 Å), CYS-116 (1.67 Å) and ASN-120 (1.79 Å and 2.18 Å) residues for vascular endothelial growth factor receptor 2. The electrostatic potential of the vascular endothelial growth factor receptor 2 and the docked pose of the AHK was shown in **Fig.9.** The ADME profile, in which the pharmacokinetic properties of AHK was determined by Qikprop tool of the Maestro software in **Table 1.** Pharmacokinetic parameters which are required for predicting the drug-like properties of molecules were defined based on Lipinski 5s rule. According to this rule; the molecular weight should not be greater than 500Mw, no more than 5 hydrogen bond donors, no more than 10 hydrogen bond acceptors, and the octanol / water partition coefficient should not be greater than 5. AHK tripeptide has 354 g/mol molecular weight, 6.5 hydrogen bond donors and 9.5 hydrogen bond acceptors, and the calculated value of octanol / water partition coefficient was-3.615. The rate of skin permeability (SP) is a very important pharmacokinetic property for the transdermal effect of drugs and cosmetics, especially in the fields of medicine and cosmetics. The calculated QP log Kp for skin permeability (Kp in cm/hr) value of AHK tripeptide was -9.743. It is also important to know the ability to cross the blood brain barrier. The calculated brain/blood partition coefficient (QPlogBB) is -2.635 and is within the recommended range of value (-3.0 – 1. 2).

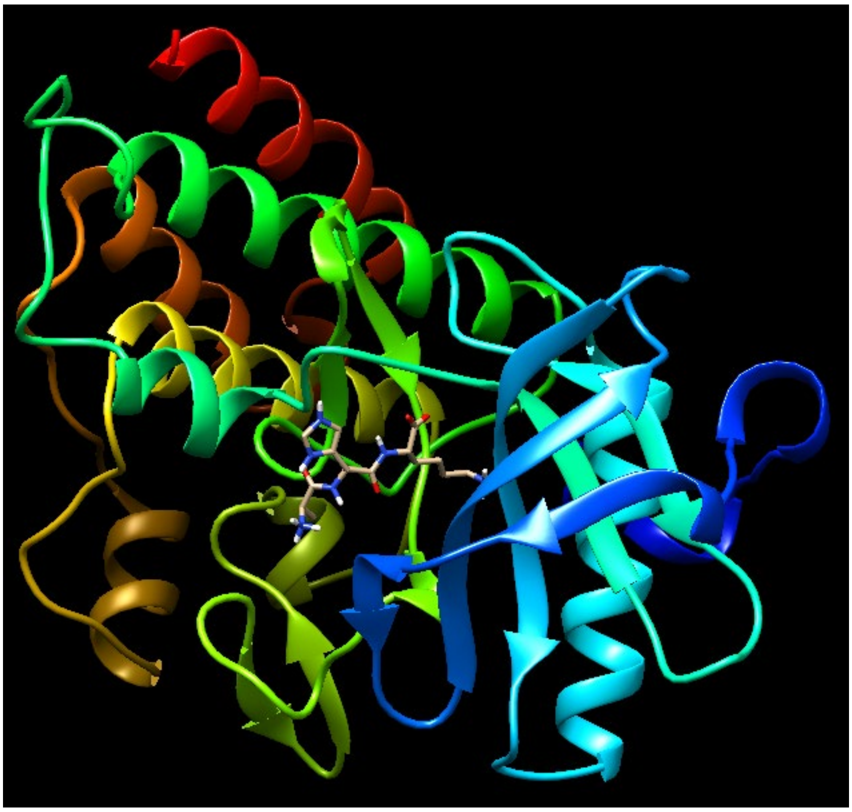


Figure 5: The binding poses between the active site of the vascular endothelial growth factor receptor 2 and AHK tripeptide.

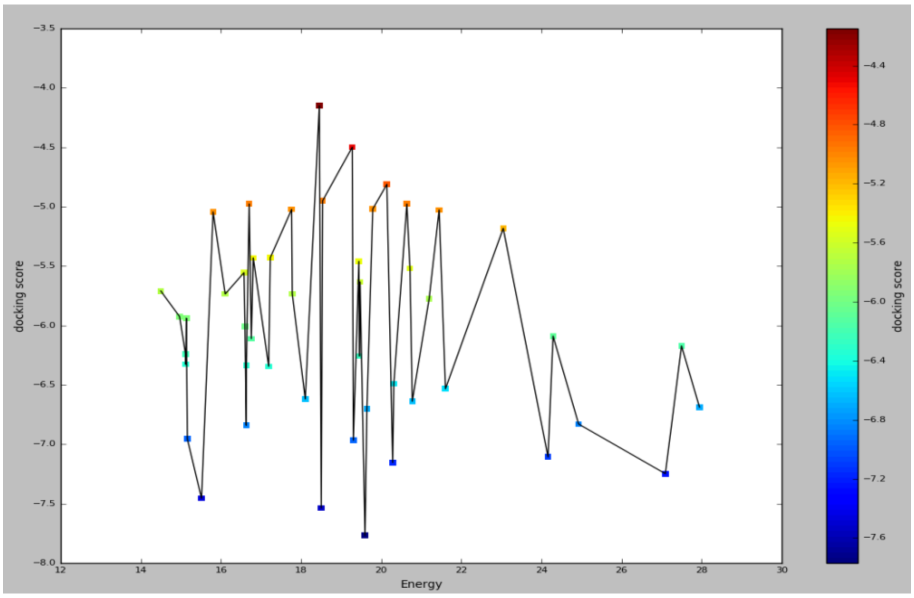


Figure 6: The possible docking score values and their energies between the vascular endothelial growth factor receptor 2 and AHK tripeptide.

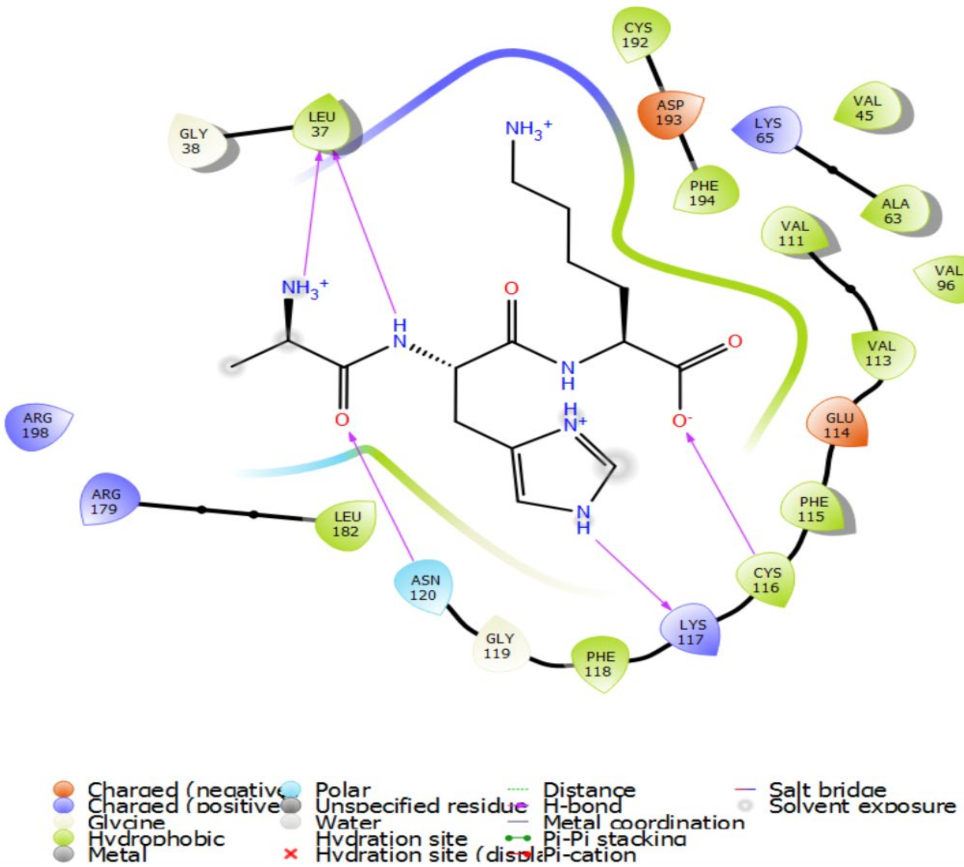


Figure 7: 2D ligand interaction of AHK tripeptide in the active side of the vascular endothelial growth factor receptor 2.

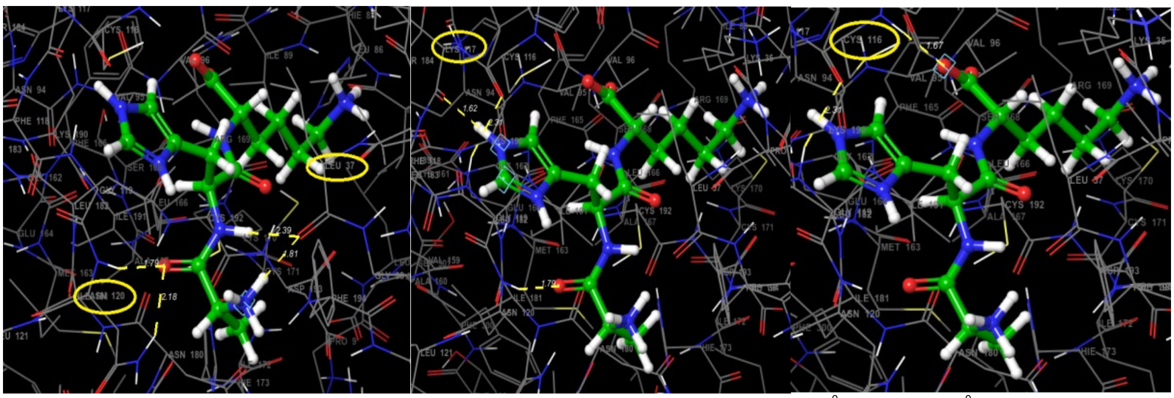


Figure 8: The hydrogen binding interactions of AHK with LEU-37 (1,81 Å and 2.39 Å), LYS-117 (1.62 Å), CYS-116 (1.67 Å) and ASN-120 (1.79 Å and 2.18 Å) residues for vascular endothelial growth factor receptor 2

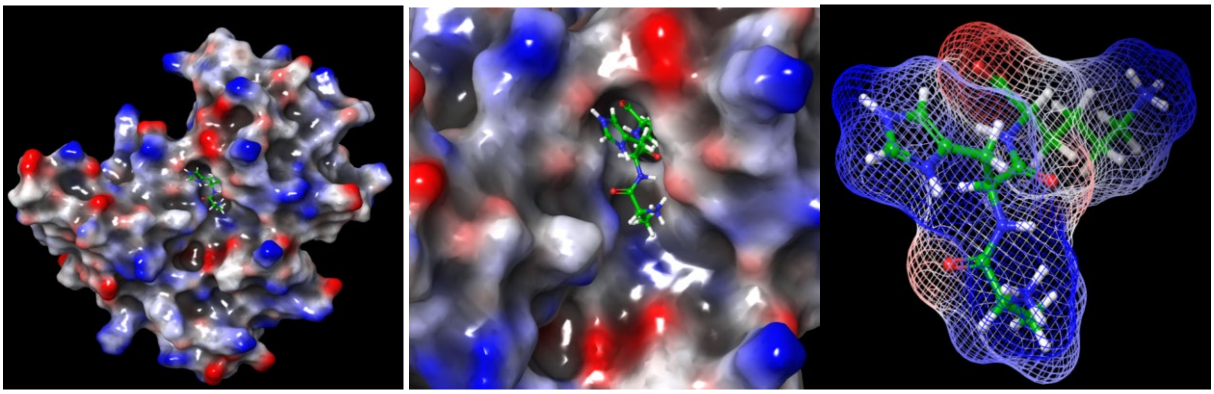


Figure 9: The electrostatic potential of the vascular endothelial growth factor receptor 2 and the docked pose of the AHK.

Table 1: The calculated ADME properties of AHK tripeptide.

Principal Descriptors:		***Values***	***Recommended Values***
Solute Molecular Weight	=	354.408	(130.0 / 725.0)
Solute Dipole Moment (D)	=	10.434	(1.0 / 12.5)
Solute Total SASA	=	680.653	(300.0 /1000.0)
Solute Hydrophobic SASA	=	284.204	(0.0 / 750.0)
Solute Hydrophilic SASA	=	307.16	(7.0 / 330.0)
Solute Carbon Pi SASA	=	89.289	(0.0 / 450.0)
Solute Weakly Polar SASA	=	0	(0.0 / 175.0)
Solute Molecular Volume (A^3)	=	1191.368	(500.0 /2000.0)
Solute vdW Polar SA (PSA)	=	195.19	(7.0 / 200.0)
Solute No. of Rotatable Bonds	=	13	(0.0 / 15.0)
Solute as Donor - Hydrogen Bonds	=	6.5	(0.0 / 6.0)*
Solute as Acceptor - Hydrogen Bonds	=	9.5	(2.0 / 20.0)
Solute Globularity (Sphere = 1)	=	0.798	(0.75 / 0.95)
Solute Ionization Potential (eV)	=	9.357	(7.9 / 10.5)
Solute Electron Affinity (eV)	=	-0.183	(-0.9 / 1.7)
Predictions for Properties:			
QP Polarizability (Angstroms^3)	=	34.030M	(13.0 / 70.0)
QP log P for hexadecane/gas	=	13.579M	(4.0 / 18.0)
QP log P for octanol/gas	=	27.160M	(8.0 / 35.0)
QP log P for water/gas	=	23.858M	(4.0 / 45.0)
QP log P for octanol/water	=	-3.615	(-2.0 / 6.5)*
QP log S for aqueous solubility	=	0.5	(-6.5 / 0.5)*
QP log S - conformation independent	=	0.548	(-6.5 / 0.5)
QP log K hsa Serum Protein Binding	=	-1.479	(-1.5 / 1.5)
QP log BB for brain/blood	=	-2.635	(-3.0 / 1.2)
No. of Primary Metabolites	=	8	(1.0 / 8.0)
Predicted CNS Activity (-- to ++)	=	--	
HERG K+ Channel Blockage: log IC50	=	-2.114	(concern below -5)

Apparent Caco-2 Permeability (nm/sec)	=	0	(<25 poor. >500 great)
Apparent MDCK Permeability (nm/sec)	=	0	(<25 poor. >500 great)
QP log Kp for skin permeability	=	-9.743	(Kp in cm/hr)
Jm. max transdermal transport rate	=	0	(micrograms/cm^2-hr)
Lipinski Rule of 5 Violations	=	1	(maximum is 4)
Jorgensen Rule of 3 Violations	=	2	(maximum is 3)
% Human Oral Absorption in GI (+-20%)	=	0	(<25% is poor)
Qual. Model for Human Oral Absorption	=	low	(>80% is high)

Conclusion

Along with its high antioxidant properties, AHK tripeptide is used in the treatment of hair loss and skin rashes, and it also has an important potential in cosmetics because it helps collagen production and increases dermal cell proliferation and viability. AHK tripeptide which has such important fields of application has been modeled for the first time using *in silico* methods, the most stable geometric structure has been determined, the conformational variations tripeptide in body conditions (water medium) has been examined and also the mechanism of interaction of AHK tripeptide with possible receptor that can effect in the body has been revealed. The discovery and development of peptide structures with a more active and improved mechanism of action is an active field of study, particularly in biochemistry and pharmacology and cosmetic. This study, which reveals the molecular structure, conformational change and mechanism of action of AHK tripeptide, is an original study.

Acknowledgements

This study consists of the results of the master thesis study and was supported by the Scientific Research Project Coordination Unit of Istanbul University [**FYL-26314**]. Authors are very thankful to Rita Podzuna for allowing to use the docking program with Schrödinger's Small-Molecule Drug Discovery Suite.

References

Bienert, S., Waterhouse, A., de Beer, T.A., Tauriello, G., Studer, G., Bordoli, L., et al., 2016, The SWISS-MODEL Repository—new features and functionality, *Nucleic acids research*, *45*(D1), D313-D9.

Bussi, G., Donadio, D., & Parrinello, M.,2007, Canonical sampling through velocity rescaling, *The Journal of chemical physics*, *126*(1), 014101.

Darden, T., York, D., & Pedersen, L., 1993, Particle mesh Ewald: An N. log (N) method for Ewald sums in large systems, *The Journal of chemical physics*, *98*(12), 10089-10092.

Friesner, R.A.,Murphy, R.B., Repasky, M.P., Frye, L.L., Greenwood, J.R., Halgren, T.A., et al., 2006, Extra precision glide: Docking and scoring incorporating a model of hydrophobic enclosure for protein− ligand complexes, *Journal of medicinal chemistry*, *49*(21), 6177-96.

Friesner, R.A., Banks, J.L., Murphy, R.B., Halgren, T.A., Klicic, J.J., Mainz, D.T., et al., 2004, Glide: a new approach for rapid, accurate docking and scoring. 1. Method and assessment of docking accuracy, *Journal of medicinal chemistry*, *47*(7), 1739-49.

Frisch, M., Trucks, G., Schlegel, H., Scuseria, G., Robb, M., Cheeseman, J., Scalmani, G., Barone, V., Mennucci, B., Petersson, G., Gaussian 09, revision a. 02, gaussian. Inc., Wallingford, CT 2009;200.

Halgren, T. A., Murphy, R. B., Friesner, R. A., Beard, H. S., Frye, L. L., Pollard, W. T., & Banks, J. L. (2004). Glide: a new approach for rapid, accurate docking and scoring. 2. Enrichment factors in database screening. *Journal of medicinal chemistry*, *47*(7), 1750-1759.

Harder, E., Damm, W., Maple, J., Wu, C., Reboul, M., Xiang, J.Y., et al., 2015, OPLS3: a force field providing broad coverage of drug-like small molecules and proteins, *Journal of chemical theory and computation*,*12*(1):281-96.

Hess, B., Bekker, H., Berendsen, H. J., & Fraaije, J. G., 1997, LINCS: a linear constraint solver for molecular simulations, *Journal of computational chemistry*, *18*(12), 1463-1472.

Humphrey, W., Dalke, A., & Schulten, K., 1996, VMD: visual molecular dynamics, *Journal of molecular graphics*, *14*(1), 33-38.doi: 10.1016/0263-7855(96)00018-5.

Jung, J. I., Park, K. Y., Lee, Y., Park, M., & Kim, J. (2018). Vitamin C-linker–conjugated tripeptide AHK stimulates BMP-2-induced osteogenic differentiation of mouse myoblast C2C12 cells. Differentiation, 101, 1-7.

Miyamoto, N., Sakai, N., Hirayama, T., Miwa, K., Oguro, Y., Oki, H., ... & Yamasaki, S. (2013). Discovery of N-[5-({2-[(cyclopropylcarbonyl) amino] imidazo [1, 2-b] pyridazin-6-yl} oxy)-2-methylphenyl]-1, 3-dimethyl-1H-pyrazole-5-carboxamide (TAK-593), a highly potent VEGFR2 kinase inhibitor. *Bioorganic & medicinal chemistry*, *21*(8), 2333-2345.

Ntie-Kang, F., Lifongo, L. L., Mbah, J. A., Owono, L. C. O., Megnassan, E., Mbaze, L. M. A., ... & Efange, S. M. (2013). In silico drug metabolism and pharmacokinetic profiles of natural products from medicinal plants in the Congo basin. *In silico pharmacology*, *1*(1), 12.

Parrinello, M., & Rahman, A., 1981, Polymorphic transitions in single crystals: A new molecular dynamics method, *Journal of Applied physics*, *52*(12), 7182-7190.

Patt, L. M., & Procyte, A. (2009). Neova® Advanced Essential Eyelash™ Conditioner Renews Health and Restores Vitality to Natural Lashes. skin, 1, 2.

Patt, L. M., & Procyte, A. (2010). Neova® Refining Eye Lift Reduces the Appearance of Periorbital Wrinkles with DNA Repair and Copper Peptide Technologies. skin, 1, 2.

Pyo, H. K., Yoo, H. G., Won, C. H., Lee, S. H., Kang, Y. J., Eun, H. C., ... & Kim, K. H. (2007). The effect of tripeptide-copper complex on human hair growth in vitro. Archives of pharmacal research, 30(7), 834-839.

Rushton, D. H. (2002). Nutritional factors and hair loss. Clinical and Experimental Dermatology: Clinical dermatology, 27(5), 396-404.

Sastry, G.M., Adzhigirey, M., Day, T., Annabhimoju, R., Sherman, W., 2013, Protein and ligand preparation: parameters, protocols, and influence on virtual screening enrichments, *Journal of computer-aided molecular design*, *27*(3):221-34.

Shimura, H., Tanaka, R., Shimada, Y., Yamashiro, K., Hattori, N., & Urabe, T. (2017). Glycyl-alanyl-histidine protects PC12 cells against hydrogen peroxide toxicity. BMC biochemistry, 18(1), 14.

Smith, P. E. & van Gunsteren, W. F.,1993, The viscosity of SPC and SPC/E water at 277 and 300 K, *Chemical physics letters*, *215*(4), 315-318.

Søndergaard, C. R., Olsson, M. H., Rostkowski, M., & Jensen, J. H. (2011). Improved treatment of ligands and coupling effects in empirical calculation and rationalization of p K a values. *Journal of chemical theory and computation*, *7*(7), 2284-2295.

Van Der Spoel, D., Lindahl, E., Hess, B., Groenhof, G., Mark, A. E., Berendsen, H. J.,2005, *Journal of computational chemistry*, *26*(16), 1701-1718.

van Gunsteren, W. F.; Billeter, S. R.; Eising, A. A., Hünenberger, P. H., Krüger, P., Mark, A. E., Scott, W. R., Tironi, I. G., 1996,*Biomolecular simulation: The {GROMOS96} manual and user guide*.

Verlet, L., 1967, Computer "experiments" on classical fluids. I. Thermodynamical properties of Lennard-Jones molecules, *Physical review*, *159*(1), 98.

IN SILICO ANALYSIS FOR CHARACTERIZING THE STRUCTURE, VIBRATION ASSIGNMENT, AND BINDING PROPERTIES OF ALA-HIS-LYS (AHK) TRIPEPTIDE

Serda Kecel-Gunduza*, Esra Kocb, Bilge Bicaka,b, Yagmur Kokcub, Aysen E. Ozela and Sevim Akyuzc

aIstanbul University, Faculty of Science, Physics Department, 34134, Istanbul, Turkey

bInstitute of Graduate Studies in Sciences, Istanbul University,34452, Istanbul, Turkey

cPhysics Department, Science and Letters Faculty, Istanbul Kultur University, Atakoy Campus, Bakirkoy Istanbul, Turkey.

Abstract:

AHK (Alanine-Histidine-Lysine) tripeptide, known as an antioxidant because of its amino acid properties, has been clinically developed for the treatment of hair loss and skin rash. The copper complex of this tripeptide (AHK-Cu) is an analog with a stronger effect than the Gly-His-Lys (GHK-Cu) tripeptide which is used for hair growth. The effects of AHK-Cu on human hair growth were evaluated by in vitro studies (Pyo, 2007)and the results showed that AHK-Cu promotes the growth of human hair follicles. In addition, Vitamin C conjugated AHK has been developed to increase collagen synthesis and promote human dermal fibroblast growth. These results provided important data for the development of peptide-based bone regenerative agents for the treatment of bone-related disorders (Jung, 2018).

The aim of this study is to determine the most stable geometric structure of AHK tripeptide by using theoretical methods with different approaches to determine the binding properties with proteins that can act in the body.

Firstly, the most stable molecular structure of tripeptide was determined with the help of quantum mechanical method, which included electronic interactions in the calculation. Then, the most efficient structure of the tripeptide in the water medium such as the human body was determined using Molecular Dynamic (MD) analysis. In addition; the binding properties of title tripeptide was investigated by molecular docking technique. The discovery and improvement of the structure and activity of cosmetic peptide is an active field of study, particularly in biochemistry and pharmacology.

Keywords: AHK, L-Alanine-L-Histidine-L-Lysine, tripeptide-copper complex, DFT, MD, Molecular Docking

INTERACTIONS BETWEEN BANKING CREDITS AND DOMESTIC CREDITS: EMPIRICAL EVIDENCE FROM EUROPEAN UNION

Setareh Katırcıoglu

setareh.katircioglu@kyrenia.edu.tr

Aysem Celebi

aysem.celebi@adakent.edu.tr

Salih Katırcıoglu

salihk@emu.edu.tr

Abstract:

The present study aims to investigate the effects of banking credits on domestic savings in the banking industry of European Union (EU) member countries. Results using data period of 1992-2017 confirm cointegration relationship between credits and savings in the EU. Furthermore, results of the present study reveal that changes in credits are likely to have adverse effects on savings in the overall panel and in 16 out of 28 member countries. Results of this study also suggest that credits and savings in the EU are interrelated across member countries.

JEL Codes: C33; E21; E51.

INVESTIGATING FAN PURCHASE INTENTION: THE CASE OF TURKISH SPORT CLUBS

Tolga KATLAV

tolga.katlav@emu.edu.tr

Abstract
The fans in Turkey, the love of football and basketball, the interest, embrace and integration of the country is due to the demand. This intense interest has brought success in football and basketball with the support of supporters. Football and basketball, which are identified with fans in Turkey, are seen as an economic potential for sports clubs, the degree of adherence to the clubs of fans, the increasing population and the ratio of economic value to success. The purpose of this study is to investigate the purchase intention of licensed products of sports clubs of fans in Turkey, using the theory of planned behavior. The sample of the study consisted of 310 randomly selected people living nearby the city center of Istanbul city in Turkey. According to the results of research evidenced that attitude toward behavior, subjective norms, and perceived behavioral control positively influenced the fans buying intentions. A significant difference was found in the examination of the gender with a subjective norm variable between the variables. This difference can be said that the sports club, where female participants are fans of men, is the result of separate social environmental factors and normative beliefs in the purchase of licensed sports products. The effect of perceived behavioral control on purchase intention was found stronger than the first two predictors. Although perceived control appeared to have a relatively strong effect on purchase intentions of fans, it can change over time and thus, affect the future purchase intentions. In this manner, it is of prime importance for sports clubs to integrate that into their sales strategies, because they rely heavily on the sale of their licensed products. Other implications and limitations are further discussed. On the other hand, the most important element in the purchase of licensed products of fans in sports clubs, ' ' Because I'm proud of my team ' ' is seen, ' ' To be noticed and to take care of ' ' as the least important purchasing element has been observed. When we look at the licensed products purchased by the fans, the most purchased and preferred product of the Besiktas, Fenerbahce and Galatasaray fans is the clothing, the least purchased product is the fan line.

METALİK ORANLI DİK ÜÇGENLER VE GENEL ÖZELLİKLERİ ÜZERİNE

Cemil Mert KARAKAŞ[1*], Tuna BATU[2], Engin CAN[3]

[1,2] Enka Schools, Sakarya, TURKEY
[3] Sakarya University of Applied Sciences, Faculty of Technology, Sakarya, TURKEY

cmert.karakas@stu.enka.k12.tr

Özet: Bu çalışmada, başlangıç noktası olarak $(x^2 - qx - 1 = 0)$ genel denklemi ile elde edilen φ_q Metalik Oranları baz alınmış ve özellikle ilk üç oran olan; q = 1 için Altın Oran, q = 2 için Gümüş Oran ve q = 3 için Bronz Oran için incelenmiştir. Literatürden farklı olarak bu denklemlerin sadece pozitif kökleri değil, negatif köklerin mutlak değerleri de alınmıştır. Bu kökler kenarları tam sayı olan özel dik üçgenlerin üretildiği $|m^2 + n^2|^2 = |m^2 - n^2|^2 + |2mn|^2$ özdeşliğine yerleştirilerek özel dik üçgenler elde edilmiştir. Literatür taramalarında bu özel dik üçgenlerin tanımlanmadığı görüldüğünden, φ_q *bazlı metalik dik üçgenler* olarak isimlendirilmiş, sonrasında ise bu özel dik üçgenlerin kenar uzunlukları, alanları, çevreleri, iç teğet çemberlerinin yarıçapları, çevrel çemberlerinin yarıçapları ve dar açılarının tanjantları gibi değerleri; φ_q Metalik Oranları ve Metalik Oranların elde edildiği denklemlerin Δ_q diskriminantları cinsinden bulunmuştur. Sonuç olarak bu özel üçgenlerin araştırılan özellikleri arasındaki bağıntılar incelenip, özel sayı dizileriyle *n*. terime ulaşılarak genelleştirilmiş ve formüle edilmiştir. Araştırma kapsamı ilk üç Metal Oranla sınırlı olmakla birlikte, ağırlıklı olarak geometrik özellikler incelenmiştir.

Anahtar Kelimeler: Metalik Oranlar, Metalik Dik Üçgenler, Dik Üçgenlerde Temel Bağıntılar, Pisagor Teoremi

Giriş

Dik üçgenlerde kenar bağıntısını veren, M.Ö. 570 yılında doğmuş Yunan matematikçi ve felsefeci Pisagor, şu teoremi ile ünlüdür. "Bir dik üçgende, üçgenin kenarları arasında özel bir bağıntı vardır: Eğer hipotenüs olarak isimlendirilen en uzun kenar a, diğer kenarlar b ve c olarak alınırsa, $a^2 = b^2 + c^2$ dir" (Knott, n.d.).

Pisagor bağıntısı ilk olarak Öklid'in "*Elementler*" isimli kitabında geçmektedir. Günümüze kadar üzerinde çok durulmuş ve bugüne kadar 400' ün üzerinde bilinen ispatı yapılmıştır. Bunun yanında, birçok matematik alanında da uygulamaları vardır (Maor, 2010).

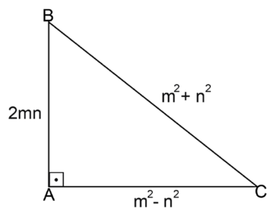
Pisagor teoreminde $a^2 = b^2 + c^2$ cebirsel ifadesi için m, $n \in \mathbb{Z}^+$ ve $m > n$ olmak üzere,

$$a = m^2 + n^2$$
$$b = m^2 - n^2$$
$$c = 2mn$$

olarak seçilirse, bu durumda

$$(m^2 + n^2)^2 = (m^2 - n^2)^2 + (2mn)^2 \tag{1}$$

elde edilir (Şekil 1).



Şekil 1. m ve n ye göre Pisagor bağıntısı

Bunun yanında $m > n$ şartını sağlayan irrasyonel sayılarda da bu bağıntı kullanılabilir. Örnek olarak; $m = 2\sqrt{2}$ ve $n = \sqrt{2}$ alındığında 3 - 4 - 5 üçgeninin bir katı olan 6 - 8 -10 üçgeni elde edilmektedir (Knott, n.d.). Diğer taraftan, Altın oran, günümüzde φ (fi) harfiyle tanımlanan irrasyonel bir sayıdır. Altın oranın ilk tanımı MÖ 3. yy' da Öklid tarafından şu şekilde ifade edilmiştir:

AC bir doğru parçası olsun ve B de bunun üzerinde bir nokta olsun.

Şekil 2. AC doğru parçası ve üzerindeki B noktası

AB doğru parçasının uzunluğu 1 birim ve AC doğru parçasının uzunluğu *x* birim olarak alındığında, BC doğru parçasının uzunluğu *x*-1 birim olacaktır (Şekil 2). Eğer burada, AC doğru parçasının uzunluğu yani *x* birimin, büyük parça olan AB doğru parçasına yani 1'e oranı, aynı şekilde büyük parça olan AB doğru parçasının BC doğru parçasına yani *x*-1'e oranına eşitlenirse,

$$\frac{x}{1} = \frac{1}{x-1}$$

elde edilir ve bu eşitlik,

$$x^2 - x - 1 = 0 \quad (2)$$

biçiminde yazılabilir. Bu denklem, Fibonacci denklemi olarak isimlendirilir ve kökleri ***altın oranı*** verir. Bu ikinci dereceden denklemin kökleri,

$$x_1 = \frac{1+\sqrt{5}}{2} = \varphi$$

$$x_2 = \frac{1-\sqrt{5}}{2} = \frac{-1}{\varphi}$$

olarak elde edilir (Dunlap, 1997).

Eğer yukarıda elde edilen (2) denklemi genelleştirmek için, *x*'in katsayısı *q* olarak alınırsa,

$$x^2 - qx - 1 = 0 \quad (3)$$

denklemi elde edilir. Bu denklemdeki *q*' nun değerine göre Metalik Oranlar elde edilir. Elde edilen metal oran φ_q olarak ifade edilir ve *q* katsayısına bağlı olarak aşağıdaki şekilde yazılır (Spinadel, 1999):

$q = 1$ için $x^2 - x - 1 = 0$ denklemi ve $\varphi_1 = \frac{1+\sqrt{5}}{2}$ yani *Altın Oran*, (4)

$q = 2$ için $x^2 - 2x - 1 = 0$ denklemi ve $\varphi_2 = 1 + \sqrt{2}$ yani *Gümüş Oran,* (5)

$q = 3$ için $x^2 - 3x - 1 = 0$ denklemi ve $\varphi_3 = \frac{3+\sqrt{13}}{2}$ yani *Bronz Oran* (6)

Amaç

Bu çalışmada, *Altın Oran*, *Gümüş Oran* ve *Bronz Oran* gibi φ_q Metalik Oranların Pisagor Teoreminin temel alındığı ve dik üçgenlerin elde edildiği özdeşliklerden biri olan $|m^2 + n^2|^2 = |m^2 - n^2|^2 + |2mn|^2$ özdeşliğine yerleştirilerek elde edilen üçgenler ve genel özelliklerini tanımlanmak ve formüle etmek amaçlanmıştır.

Yöntem

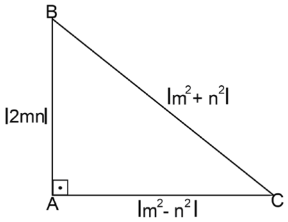
Şekil 1 de belirtilen üçgenin kenarlarının pozitif reel sayı olabilmesi için $m > n$ olması şartı koşulmuştu.

$$a = |m^2 + n^2|$$
$$b = |m^2 - n^2|$$
$$c = |2mn|$$

olarak alındığında, üçgenin kenarları her reel m ve n değeri için pozitif olur. Böylece, $m > n$ şartı bir zorunluluk olmaktan çıkar ve artık negatif m ve n değerleri de alınabilir. Dolayısıyla, dik üçgen kenar uzunlukları arasında

$$|m^2 + n^2|^2 = |m^2 - n^2|^2 + |2mn|^2 \tag{7}$$

yazılabilir (Şekil 3).



Şekil 3. Mutlak değerli m ve n ye bağlı Pisagor bağıntısı

Metalik Oranların elde edildiği denklemlerin diğer köklerinin bulunması

Metalik oranlardan ilki olan *altın oranın* elde edildiği denklem (4) de belirtildiği gibi

$$x^2 - x - 1 = 0$$

dır. $\Delta > 0$ olduğu için denklemin 2 reel kökü vardır, bunlar

$$x_1 = \tfrac{1+\sqrt{5}}{2} = \varphi_1 \text{ ve } x_2 = \tfrac{1-\sqrt{5}}{2} = \varphi_1',$$

benzer şekilde, *gümüş oran* için (5) denklemin reel kökleri

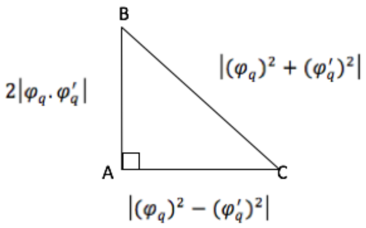
$$x_1 = 1 + \sqrt{2} = \varphi_2 \text{ ve } x_2 = 1 - \sqrt{2} = \varphi_2',$$

ve *bronz oran* için (6) denklemin reel kökleri de

$$x_1 = \tfrac{3+\sqrt{13}}{2} = \varphi_3 \text{ ve } x_2 = \tfrac{3-\sqrt{13}}{2} = \varphi_3'$$

dirler.

Elde edilen bu değerler sırayla Şekil 3. deki ABC üçgenine yerleştirilebilir (Şekil 4).



Şekil 4. Metalik denklem kökleri ile dik üçgenin kenar uzunlukları

Literatürde Şekil 4. den elde edilen dik üçgen çeşitleri için bir tanımlama bulunmamaktadır. Bu nedenle aşağıdaki tanımı verelim:

Tanım: $q \in \mathbb{Z}^+$ olmak üzere, Metalik Oranların elde edildiği $x^2 - qx - 1 = 0$ genel denkleminin kökleri, metalik oran olan kökü φ_q ve diğer kökü φ_q' olsun. $m = \varphi_q$ ve $n = \varphi_q'$ seçilmek üzere ($|m^2 + n^2|^2 = |m^2 - n^2|^2 + |2mn|^2$) eşitliğini sağlayan dik üçgenlere φ_q *bazlı Metalik Dik Üçgenler* denir ve ilk üç metalik orana göre:

$q = 1$ için φ_1 bazlı *Altın Dik Üçgen*,
$q = 2$ için φ_2 bazlı *Gümüş Dik Üçgen*,
$q = 3$ için φ_3 bazlı *Bronz Dik Üçgen*

olarak isimlendirilir.

Çalışmanın bundan sonraki kısmında bu tanımlamaya göre elde edilen dik üçgen isimleri kullanılarak devam edilecektir.

Metal Oran Denklemlerinin Köklerinin Pisagor Teoremine Uygulanması

a) Altın Oran denkleminin kökleri için

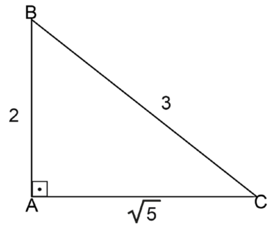
Tanımda verildiği gibi, (4) denkleminin kökleri φ_1, φ_1' ve $m = \varphi_1$, $n = \varphi_1'$ olsun. (7) denkleminde yerine konularak;

$$a = |m^2 + n^2| = |(\varphi_1)^2 + (\varphi_1')^2| = \left|(\frac{1+\sqrt{5}}{2})^2 + (\frac{1-\sqrt{5}}{2})^2\right| = 3\ br$$

$$b = |m^2 - n^2| = |(\varphi_1)^2 - (\varphi_1')^2| = \left|(\frac{1+\sqrt{5}}{2})^2 - (\frac{1-\sqrt{5}}{2})^2\right| = \sqrt{5}\ br$$

$$c = |2mn| = |2\varphi_1.\varphi_1'| = \left|2.\frac{1+\sqrt{5}}{2}.\frac{1-\sqrt{5}}{2}\right| = 2\ br$$

olarak bulunur, böylece Şekil 5. deki φ_1 bazlı *Altın Dik Üçgen* elde edilir.



Şekil 5. φ_1 bazlı Altın Dik Üçgen

b) Gümüş Oran denkleminin kökleri için

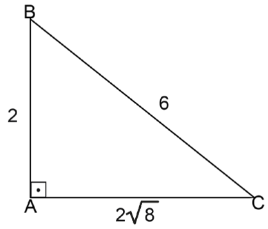
(5) denkleminin kökleri φ_2, φ_2' ve $m = \varphi_2$, $n = \varphi_2'$ olsun. (7) denkleminde yerine konularak;

$$a = |m^2 + n^2| = |(\varphi_2)^2 + (\varphi_2')^2| = \left|(1+\sqrt{2})^2 + (1-\sqrt{2})^2\right| = 6\ br$$

$$b = |m^2 - n^2| = |(\varphi_2)^2 - (\varphi_2')^2| = \left|(1+\sqrt{2})^2 - (1-\sqrt{2})^2\right| = 2\sqrt{8}\ br$$

$$c = |2mn| = |2\varphi_2.\varphi_2'| = \left|2.(1+\sqrt{2})(1-\sqrt{2})\right| = 2\ br$$

olarak bulunur, böylece Şekil 6. deki φ_2 bazlı *Gümüş Dik Üçgen* elde edilir.



Şekil 6. φ_2 bazlı Gümüş Dik Üçgen

c) Bronz Oran denkleminin kökleri için

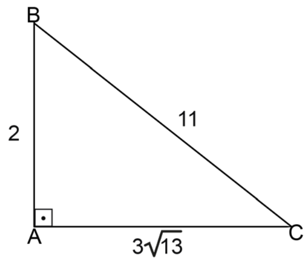
(6) denkleminin kökleri φ_3, φ_3' ve $m = \varphi_3$, $n = \varphi_3'$ olsun. (7) denkleminde yerine konularak;

$$a = |m^2 + n^2| = |(\varphi_3)^2 + (\varphi_3')^2| = \left|(\frac{3+\sqrt{13}}{2})^2 + (\frac{3-\sqrt{13}}{2})^2\right| = 11\ br$$

$$b = |m^2 - n^2| = |(\varphi_3)^2 - (\varphi_3')^2| = \left|(\frac{3+\sqrt{13}}{2})^2 - (\frac{3-\sqrt{13}}{2})^2\right| = 3\sqrt{13}\ br$$

$$c = |2mn| = |2\varphi_3.\varphi_3'| = \left|2.\frac{3+\sqrt{13}}{2}.\frac{3-\sqrt{13}}{2}\right| = 2\,br$$

olarak bulunur, böylece Şekil 7. daki φ_3 bazlı *Bronz Dik Üçgen* elde edilir.



Şekil 7. φ_3 bazlı Bronz Dik Üçgen

Metalik Dik Üçgenlerin Genel Özellikleri

Bu bölümde φ_q bazlı Metalik dik üçgenlerin alan, çevre, iç teğet çemberinin yarıçapı, çevrel çemberinin yarıçapı ve tanjant değerleri incelenmektedir.

Altın dik Üçgenin Genel Özellikleri
Alanı ve Çevresi

$$\text{Alan (ABC)= } \frac{b.c}{2} = \frac{2.\sqrt{5}}{2} = \sqrt{5}\,br^2$$

dir ve $x^2 - x - 1 = 0$ denkleminin diskriminantı $\Delta_1 = 5$ olduğundan

$$\text{Alan(ABC)= } \sqrt{\Delta_1}\,br^2$$

yine aynı şekilde

$$\text{Çevre(ABC)= } a + b + c = 2 + 3 + \sqrt{5} = 5 + \sqrt{5}\,br$$

ve dolayısıyla

$$\text{Çevre(ABC)= } \Delta_1 + \sqrt{\Delta_1}\,br$$

şeklinde genelleştirilebilir.

İç Teğet Çemberinin Yarıçapı

r_1, φ_1 bazlı *Altın Dik Üçgenin* iç teğet çemberin yarıçapı olsun, iç teğet çemberinin yarıçapı bilinen üçgenin alanı,

$$\text{Alan(ABC)= } u.r_1 \text{ ve } u = \frac{a+b+c}{2}$$

olduğundan,

$$u = \frac{a+b+c}{2} = \frac{2+3+\sqrt{5}}{2} = \frac{5+\sqrt{5}}{2}\,br$$

ve

$$\text{Alan(ABC)=}\left(\frac{5+\sqrt{5}}{2}\right).r_1 = \sqrt{5}$$

Olduğundan

$$r_1 = \frac{2}{\sqrt{5}+1}\,br$$

elde edilir. Buradan genelleme yaparak, (4) denkleminde altın oran $\varphi_1 = \frac{1+\sqrt{5}}{2}$ olduğundan

$$r_1 = \frac{1}{\varphi_1}$$

biçiminde yazılabilir.

Çevrel Çemberinin Yarıçapı
Çevrel Çemberinin yarıçapı R_1 olan bir üçgen için Sinüs teoreminden, $2R_1 = \frac{a}{sinA}$ olduğundan,

$$2R_1 = \frac{3}{1} \text{ ve } R_1 = \frac{3}{2} br$$

elde edilir.

Pisagor teoreminden; $2^2 + \sqrt{5}^2 = 3^2$ yani $4 + 5 = 3^2$ dir.

$\Delta_1 = 5$ olduğundan, genel olarak ifade edilmek istersek;

$$4 + \Delta_1 = 3^2, \quad \sqrt{4 + \Delta_1} = 3$$

biçiminde yazılabilir. Bu durumda,

$$R_1 = \frac{\sqrt{4 + \Delta_1}}{2} br$$

elde edilir.

Dar Açılarının Tanjant Değerleri
Kolayca,

$$tanC = \frac{2}{\sqrt{5}} = \frac{2}{\sqrt{\Delta_1}}$$
$$tanB = \frac{\sqrt{5}}{2} = \frac{\sqrt{\Delta_1}}{2}$$

olarak genelleştirilebilir.

Gümüş Dik Üçgenin Genel Özellikleri
Alanı ve Çevresi

$$\text{Alan(ABC)} = \frac{b.c}{2} = \frac{2.2\sqrt{8}}{2} = 2\sqrt{8}\, br^2$$

dir ve yani $x^2 - 2x - 1 = 0$ denkleminin diskriminantı $\Delta_2 = 8$ olduğundan,

$$\text{Alan(ABC)} = 2\sqrt{\Delta_2}\, br^2$$

yine aynı şekilde

$$\text{Çevre(ABC)} = a + b + c = 2 + 6 + 2\sqrt{8} = 8 + 2\sqrt{8}\, br$$

ve dolayısıyla

$$\text{Çevre(ABC)} = \Delta_2 + 2\sqrt{\Delta_2}\, br$$

şeklinde genelleştirilebilir.

İç Teğet Çemberinin Yarıçapı
r_2, φ_2 bazlı *Gümüş Dik Üçgenin* iç teğet çemberin yarıçapı olsun, iç teğet çemberinin yarıçapı bilinen üçgenin

alanı,

$$\text{Alan(ABC)= } u.r_2 \text{ ve } u = \frac{a+b+c}{2}$$

olduğundan,

$$u = \frac{a+b+c}{2} = \frac{2+6+2\sqrt{8}}{2} = \frac{8+2\sqrt{8}}{2} = 4+2\sqrt{2}\, br$$

ve

$$\text{Alan(ABC) = } (4+2\sqrt{2}\ ).r_2 \ = 2\sqrt{8} = 4\sqrt{2}$$

olduğundan

$$r_2 \ = \frac{2}{1+\sqrt{2}}\, br$$

elde edilir. Buradan genelleme yaparak, (5) denkleminde gümüş oran $\varphi_2 = 1+\sqrt{2}$ olduğundan

$$r_2 \ = \frac{2}{\varphi_2}$$

biçiminde yazılabilir.

Çevrel Çemberinin Yarıçapı
Çevrel Çemberinin yarıçapı R_2 olan bir üçgen için Sinüs teoreminden, $2R_2 = \frac{a}{sinA}$ olduğundan,

$$2R_2 = \frac{6}{1} \text{ ve } R_2 = 3\, br$$

elde edilir.

Pisagor teoreminden; $2^2 + (2\sqrt{8})^2 = 6^2$ yani $4 + 4.8 = 6^2$ dir. $\Delta_2 = 8$ olduğundan, genel olarak ifade edilmek istersek;

$$4+\ 4.\Delta_2 = 6^2,\ \sqrt{4+\ 4.\Delta_2} = 6$$

biçiminde yazılabilir. Bu durumda,

$$R_2 \ = \frac{\sqrt{4+\ 4.\Delta_2}}{2}\, br$$

elde edilir.

Dar Açılarının Tanjant Değerleri
Kolayca,

$$tanC = \frac{2}{2\sqrt{8}} = \frac{2}{2\sqrt{\Delta_2}}$$

$$tanB = \frac{2\sqrt{8}}{2} = \frac{2\sqrt{\Delta_2}}{2}$$

olarak genelleştirilebilir.

Bronz Dik Üçgenin Genel Özellikleri
Alanı ve Çevresi

$$\text{Alan(ABC)= } \frac{b.c}{2} = \frac{2.3\sqrt{13}}{2} = 3\sqrt{13}\, br^2$$

dir ve $x^2 - 3x - 1 = 0$ denkleminin diskriminantı $\Delta_3 = 13$ olduğundan

$$\text{Alan(ABC)} = 3\sqrt{\Delta_3}\, br^2$$

yine aynı şekilde

$$\text{Çevre(ABC)} = a + b + c = 2 + 11 + 3\sqrt{13} = 13 + 3\sqrt{13}\ \ br$$

ve dolayısıyla

$$\text{Çevre(ABC)} = \Delta_3 + 3\sqrt{\Delta_3}\, br$$

şeklinde genelleştirilebilir.

İç Teğet Çemberinin Yarıçapı

r_3, φ_3 bazlı *Bronz Dik Üçgenin* iç teğet çemberin yarıçapı olsun, iç teğet çemberinin yarıçapı bilinen üçgenin alanı,

$$\text{Alan(ABC)} = u.r_3\ ve\ \ u = \frac{a+b+c}{2}$$

olduğundan,

$$u = \frac{a+b+c}{2} = \frac{2+11+3\sqrt{13}}{2} = \frac{13+3\sqrt{13}}{2}\ br$$

ve

$$\text{Alan(ABC)} = \left(\frac{13+3\sqrt{13}}{2}\right).r_3\ = 3\sqrt{13}$$

olduğundan

$$r_3\ = \frac{6}{3+\sqrt{13}}\ br$$

elde edilir. Buradan genelleme yaparak, (6) denkleminde bronz oran $\varphi_3 = \frac{3+\sqrt{13}}{2}$ olduğundan

$$r_3\ = \frac{3}{\varphi_3}\ br$$

biçiminde yazılabilir.

Çevrel Çemberinin Yarıçapı

Çevrel Çemberinin yarıçapı R_3 olan bir üçgen için Sinüs teoreminden, $2R_3 = \frac{a}{sinA}$ olduğundan,

$$2R_3 = \frac{11}{1}\ \ \text{ve}\ R_3 = \frac{11}{2} br$$

elde edilir. Pisagor teoreminden; $2^2 + (3\sqrt{13})^2 = 11^2$ yani $4 + 9.13 = 11^2$ dir.

$\Delta_3 = 13$ olduğundan, genel olarak ifade edilmek istersek;

$$4 +\ 9.\Delta_3 = 11^2,\ \sqrt{4 +\ 9.\Delta_3} = 11$$

biçiminde yazılabilir. Bu durumda,

$$R_3 = \frac{\sqrt{4 +\ 9.\Delta_3}}{2}\ br$$

elde edilir.

Dar Açılarının Tanjant Değerleri
Kolayca,

$$tanC = \frac{2}{3\sqrt{13}} = \frac{2}{3.\sqrt{\Delta_3}}$$
$$tanB = \frac{3\sqrt{13}}{2} = \frac{3.\sqrt{\Delta_3}}{2}$$

olarak genelleştirilebilir.

Bulgular

Elde edilen her bir φ_q bazlı Metalik Dik Üçgenin alanı ve çevresi, iç teğet çemberlerinin yarıçapı, çevrel çemberlerinin yarıçapı ve dar açılarının tanjantları, metalik oran ve denklemlerinin diskriminantı(Δ_q) cinsinden yazılabilmektedir.

Diğer taraftan Metalik Dik Üçgenlerin hepsi için alan, çevre, iç teğet çemberinin yarıçapı, çevrel çemberinin yarıçapı, tanjant değerleri ve kenar uzunlukları ile ilgili genel bir formül elde etmek için özel sayı örüntüleri kullanılabilir. Şimdi bu genelleştirmeleri dizi formatında verelim:

Metalik Dik Üçgenler için

a) **Genelleştirilmiş alan ve çevre formülü**

φ_1 bazlı Altın Dik Üçgen için Alan(ABC) = $\sqrt{\Delta_1}\, br^2$,
φ_2 bazlı Gümüş Dik Üçgen için Alan(ABC) = $2\sqrt{\Delta_2}\, br^2$,
φ_3 bazlı Bronz Dik Üçgen için Alan(ABC) = $3\sqrt{\Delta_3}\, br^2$

olarak hesaplamıştık.

Görüldüğü gibi kökün katsayısı ile metalik oranın indisi aynıdır ve aritmetik olarak artmaktadır. Bu durumda özel sayı örüntülerinden aritmetik dizi elde edillir (Güzel, 2016). Dolayısıyla, φ_n bazlı Metalik Dik Üçgenler için genel alan formülü

Alan(ABC) = $n\sqrt{\Delta_n}\, br^2$

dir. Yine,

φ_1 bazlı Altın Dik Üçgen için Çevre (ABC) = $\Delta_1 + \sqrt{\Delta_1}\, br$,
φ_2 bazlı Gümüş Dik Üçgen için Çevre (ABC) = $\Delta_2 + 2\sqrt{\Delta_2}\, br$,
φ_3 bazlı Bronz Dik Üçgen için Çevre (ABC) = $\Delta_3 + 3\sqrt{\Delta_3}\, br$

olarak hesaplamıştık.

Görüldüğü gibi kökün katsayısı ile metalik oranın indisi burada da aynıdır. Dolayısıyla, φ_n bazlı Metalik Dik Üçgenler için genel çevre formülü,

Çevre (ABC) = $\Delta_n + n.\sqrt{\Delta_n}\, br$

olarak verilebilir.

b) **Genelleştirilmiş iç teğet çemberinin yarıçapı formülü**

φ_1 bazlı Altın Dik Üçgen için $r_1 = \frac{1}{\varphi_1}\, br$,
φ_2 bazlı Gümüş Dik Üçgen için $r_2 = \frac{2}{\varphi_2}\, br$,
φ_3 bazlı Bronz Dik Üçgen için $r_3 = \frac{3}{\varphi_3}\, br$

olarak hesaplamıştık.

İç teğet çemberinin yarıçapının payı ile metalik oranın indisi aynıdır. φ_n bazlı Metalik Dik Üçgenler için genel iç teğet çemberinin yarıçapı formülü

$$r_n = \frac{n}{\varphi_n}\ br$$

olur.

c) Genelleştirilmiş çevrel çemberinin yarıçapı formülü

φ_1 bazlı Altın Dik Üçgen için $R_1 = \frac{\sqrt{4+\Delta_1}}{2} = \frac{\sqrt{4+1^2.\Delta_1}}{2}\ br,$

φ_2 bazlı Gümüş Dik Üçgen için $R_2 = \frac{\sqrt{4+4.\Delta_2}}{2} = \frac{\sqrt{4+2^2.\Delta_2}}{2}\ br,$

φ_3 bazlı Bronz Dik Üçgen için $R_3 = \frac{\sqrt{4+9.\Delta_3}}{2} = \frac{\sqrt{4+3^2.\Delta_3}}{2}\ br$

olarak hesaplamıştık.

Burada kök içindeki diskriminantın katsayısı, metalik oranın indisinin karesine eşittir. Metalik oranın indisi özel sayı örüntülerinden aritmetik dizi olarak ilerlerken, diskriminantın katsayısı özel sayı örüntülerinden karesel sayı dizisi olarak ilerlemektedir (Güzel, 2016). φ_n bazlı Metalik Dik Üçgenler için genel çevrel çemberinin yarıçapı formülü

$$R_n = \frac{\sqrt{4+\ n^2.\Delta_n}}{2}\ br$$

olur.

d) Genelleştirilmiş Dar Açılarının Tanjant Değerleri

φ_1 bazlı Altın Dik Üçgen için dar açıların tanjantlarını sırasıyla, $tanC = \frac{2}{\sqrt{\Delta_1}}$, $tanB = \frac{\sqrt{\Delta_1}}{2}$,

φ_2 bazlı Gümüş Dik Üçgen için dar açıların tanjantlarını sırasıyla, $tanC = \frac{2}{2\sqrt{\Delta_2}}$, $tanB = \frac{2\sqrt{\Delta_2}}{2}$,

φ_3 bazlı Bronz Dik Üçgen için dar açıların tanjantlarını sırasıyla, $tanC = \frac{2}{3\sqrt{\Delta_3}}$, $tanB = \frac{3\sqrt{\Delta_3}}{2}$

olarak hesaplamıştık.

Görüldüğü gibi, kök ifadesinin katsayısı ile metalik oranın indisi aynıdır ve özel sayı örüntülerinden aritmetik dizi olarak ilerlemektedir. Böylece

$$tanC = \frac{2}{n\sqrt{\Delta_n}}\ , tanB = \frac{n\sqrt{\Delta_n}}{2}$$

genel formülü kullanılabilir.

e) Genelleştirilmiş kenar uzunlukları formülü

Elde edilen veriler ışığında, φ_q üçgenlerinin kenarları arasında da bir bağıntı elde edilebilir:

Altın Dik Üçgen için kenarlar $a = \sqrt{4+\Delta_1}\ br,\ b = \sqrt{\Delta_1}\ br,\ c = 2\ br$

Gümüş Dik Üçgen için kenarlar $a = \sqrt{4+4\Delta_2}\ br,\ b = 2\sqrt{\Delta_2}\ br,\ c = 2\ br$

Bronz Dik Üçgen için kenarlar $a = \sqrt{4+9\Delta_3}\ br,\ b = 3\sqrt{\Delta_3}\ br,\ c = 2\ br$

a kenarında diskriminantların katsayıları metalik oranın indisinin karesi olarak ilerlemekte ve özel sayı örüntülerinden karesel sayı dizisi, *b* kenarında ise kökün katsayısı metalik oranın katsayısıyla aynı ve özel sayı örüntülerinden aritmetik dizi oluşturmaktadır. *c* kenarı ise her zaman 2 dir ve sabit bir dizidir (Güzel, 2016). Bu durumda *n*. üçgen için,

Metalik Dik Üçgenler için kenar uzunlukları

$$a = \sqrt{4 + n^2.\Delta_n}\, br, \qquad b = n.\sqrt{\Delta_n}\, br, \qquad c = 2\, br$$

olarak elde edilir.

Sonuç ve Tartışma

Bu çalışmada, metalik oranlardan ve denklemlerden yola çıkarak hazırlanan φ_n bazlı Metalik Dik Üçgenlerin alan ve çevre, iç teğet çemberinin yarıçapı, çevrel çemberinin yarıçapı ve dar açılarının tanjantları Δ_n ve φ_n cinsinden hesaplanmıştır. Buna bağlı olarak, özel sayı örüntüleri olan diziler kullanılarak elde edilen sonuçlar genelleştirilerek formüle edilmiştir. Elde edilen genel formüller $n = q$ için alındığında,

φ_q bazlı Metalik Dik Üçgenler için;

alan formülü Alan (ABC) = $q\sqrt{\Delta_q}\, br^2$

çevre formülü Çevre (ABC) = $\Delta_q + q\sqrt{\Delta_q}\, br$

iç teğet çemberinin yarıçapı formülü, $r_q = \frac{q}{\varphi_q}\, br$

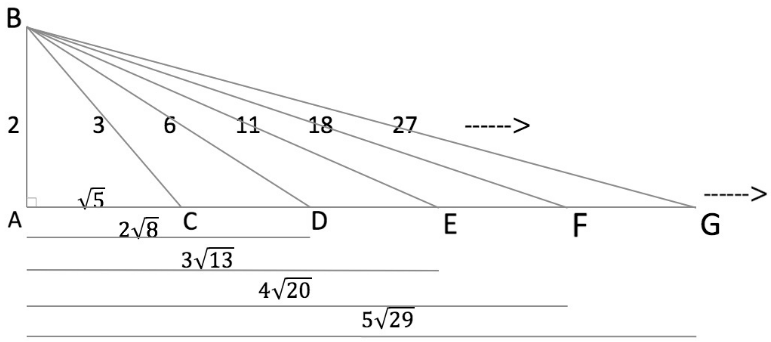
çevrel çemberinin yarıçapı $R_q = \frac{\sqrt{4+q^2.\Delta_q}}{2}\, br$

dar açıların tanjantları için, $tanC = \frac{2}{q.\sqrt{\Delta_q}}$, $tanB = \frac{q\sqrt{\Delta_q}}{2}$

kenar uzunlukları $a = \sqrt{4 + q^2\Delta_q}\, br,\ b = q\sqrt{\Delta_q}\, br,\ c = 2\, br$

olarak ifade edilebilir. *c* kenarı sabittir ve diğer kenarlar aralarında örüntü oluşmaktadır. Böylece, Metalik Dik Üçgenler Şekil 8 deki gibi iç içe dik üçgen örüntüsü şeklinde gösterilebilirler.

Bu çalışmanın genelinde, (Spinadel, 1999) tarafından tanımlanan metalik oranlar temel yapıyı oluşturmakla beraber, (4),(5),(6) denklemlerinin sadece pozitif kökleri değil, negatif köklerinin de mutlak değeri işleme alınmış, dolayısıyla üçgen üzerinde uzunluk olarak kullanılabilir hale gelmesi sağlanmıştır.



Şekil 8. Metalik Dik Üçgenlerin Şekilsel Örüntüsü

Daha çok metalik oranların geometrik yorumuna ağırlık verilmiştir. Elde edilen dik üçgen çeşitleri, literatür taramasına rağmen bulunamadığı için isimlendirilmiş ve tanımlanmıştır. Üçgenlerin temel özellikleri araştırılırken, ortak özellikler yine metalik oranlar φ_q ve bunların elde edildiği üçgenlerin diskriminantı Δ_q cinsinden bulunarak iki değişkene yani Δ_q ve φ_q ya indirgenmiştir.

Öneriler

Çalışmanın sonucunda elde edilen ve tanımlanan üçgenler için olabildiğince fazla bağıntı bulunmaya çalışıldı. Kaynaklarda özel isimlendirmeye sahip ilk üç metalik oranların dışında, diğer metalik oran ailesi, zaman ve sayfa sınırı kısıtlamalarından dolayı kullanılamamış, sadece ilk üç metalik oran kullanıldığı için çalışma zorunlu olarak sınırlandırılmıştır. Bundan sonraki aşamalarda, bu çalışmadan yola çıkılarak akademik olarak lise düzeyinin üzerinde, ileri bir matematik diliyle φ_q bazlı Metalik Dik Üçgenler incelenirse, bu üçgenlere ait daha farklı özellikler ve örüntüler elde edilebilir, konu içeriği diğer konularla ilişkilendirilerek genişletilebilir. Doğada

Fibonacci ve diğer oranlarla ilgili üçgenlerde olduğu gibi Metalik Dik Üçgenlerin de kullanılabileceği yeni örüntüler veya modeller oluşturulabilir.

Teşekkür

Bu çalışmanın olgunlaşmasında başından beri tecrübe ve yönlendirmeleri ile bana destek olan Matematik öğretmenim Sayın Tuna Batu'ya, sonrasında çalışmamı akademik formata çeviren Sayın Dr. Öğr. Üyesi Engin Can'a ve bana her zaman maddi manevi desteklerini esirgemeyen annem Arzu Karakaş ve babam Özgür Karakaş'a sonsuz teşekkürlerimi sunarım.

Kaynaklar

Dunlap, R. A. (2013). *The golden rotil ant Fibonacci numbers*. Singapore: World Scientific Publishing.

Güzel, E.B. (2016). *Dizi ve Örüntü, Öğrenen ve Öğretenler İçin Temel Matematik Kavramlar ve Uygulamaları*, İzmir: Dokuz Eylül Üniversitesi

Knott, R. (n.d.). Pythagorean Right-Angled Triangles. Retrieved from http://www.maths.surrey.ac.uk/hosted-sites/R.Knott/Pythag/pythag.html#gfibcalc

Maor, E. (2010). *The Pythagorean theorem: A 4,000-year history*. Princeton, NJ: Princeton University Press.

Spinadel, V. W. (1999). *The metallic means family and multifractal spectra*, Nonlinear Analysis, vol. 36 (pp. 721-745).

MULTISECRET-SHARING SCHEMES WITH SYMMETRIC DESIGNS

Selda ÇALKAVUR

selda.calkavur@kocaeli.edu.tr

Cenap Özel

cenap.ozel@gmail.com

Abstract:

Secret sharing schemes have been studied since 1979. The coding theory has been used in the constructing of the secret sharing schemes. In this paper, we work on the code of a symmetric (v, k, lambda)-design. It is known that this code is a linear code and useful to construct a secret sharing scheme. We use Blakley's algorithm to explain how the secret is recovered and determine the access structure of this scheme. Finally we obtain a security cryptosystem.

NUMERICAL MODELING OF A PHREATIC AQUIFER FLOW IN WESTERN BURSA

Serdar KORKMAZ, Muhammed Zakir KESKİN

Bursa Uludağ University, Department of Civil Engineering, Bursa, Turkey

skorkmaz06@gmail.com

Abstract: The aim of this study is to develop a numerical model of groundwater flow in the lower part of Susurluk Basin located within the boundaries of Karacabey and Mustafakemalpaşa districts of Bursa, Turkey. For this purpose, daily groundwater levels from 5 observation wells were acquired for years between 2013 and 2015. Daily precipitation and evapotranspiration values of several stations in the region were obtained from the General Directorate of Meteorology. In GIS environment, the wells were marked as points and boundaries of the basin were determined using a topographic map and a Digital Elevation Model. Shapefiles containing aquifer boundaries and well locations were transferred to MODFLOW interface. The groundwater flow simulations were performed for years between 2013- 2015 and the groundwater level distribution was obtained. Hydrologic parameters were also estimated.

Keywords: Groundwater, MODFLOW, Numerical Model

Introduction

Various software are available in the field of groundwater modeling. MODFLOW (McDonald and Harbaugh 1988), MIKE-SHE (Refsgaard and Storm 1995) and MODHMS (Panday and Huyakorn 2004) can be given as example. MODFLOW is the most widely used model. For example, Gaur et al. (2011) used Geographic Information Systems (GIS) for watershed management and MODFLOW for groundwater modeling in the study of the Banganga River basin. Wang et al. (2015) modeled the effect of precipitation density on groundwater levels with MODFLOW. Korkmaz et al. (2016) modeled the underground and surface water flow of Eskişehir basin with MODFLOW for transient conditions. Nkhonjera et al. (2017) investigated the importance of direct and indirect effects of climate change on groundwater of the Olifants River basin by basin modeling. Boughariou et al. (2018) modeled the aquifer behavior in the Sfax region of Tunisia by using GIS and MODFLOW 2000 under climate change and high consumption conditions. Liu et al. (2018) conducted basin modeling with MODLFOW in order to investigate the effects of intensive agricultural activities on the groundwater dynamics in the oasis regions of the arid inland river basins in northwestern China.

MODFLOW is a 3D, cell-centered, finite difference, saturated flow model developed by the United States Geological Survey (McDonald and Harbaugh, 1988). MODFLOW can perform both steady state and transient analyses and has a wide variety of boundary conditions and input options. MODFLOW uses a combination of three-dimensional water balance equation and Darcy's law as the governing equation:

$$\frac{\partial}{\partial x}\left(K_{xx}\frac{\partial h}{\partial x}\right)+\frac{\partial}{\partial y}\left(K_{yy}\frac{\partial h}{\partial y}\right)+\frac{\partial}{\partial z}\left(K_{zz}\frac{\partial h}{\partial z}\right)+W=S_s\frac{\partial h}{\partial t} \quad (1)$$

where K_{xx}, K_{yy} ve K_{zz} are the hydraulic conductivity values along the x, y and z coordinate axes, h is the potentiometric aquifer head, S_s represents the specific storage, W is the source/sink term (per unit volume) and t represents the time. In the steady state conditions, the right-hand side of Eq. (1) equals zero.

In this study PEST was used for parameter estimation. PEST is a general purpose parameter estimation utility developed by Doherty (2013). The purpose of PEST is to assist in data interpretation, model calibration, and predictive analysis. GMS provides a custom interface to the PEST utility offering a simple way to set model parameters and a graphical user interface to run the model and visualize the results.

The aim of this study is to develop a numerical model of groundwater distribution in the part of Susurluk Basin located within the boundaries of Karacabey and Mustafakemalpaşa districts of Bursa, Turkey. Within this scope, daily water levels of 5 observation wells between 2013 and 2015 were acquired. Daily precipitation and evapotranspiration values of the stations in the region were obtained from the General Directorate of Meteorology. In GIS environment, the wells were marked as points and boundaries of the basin were determined using a topographic map and Digital Elevation Model. Maps of aquifer boundaries and well locations were transferred to MODFLOW and a grid with a resolution of 150 m x 150 m was generated. By entering precipitation and evapotranspiration values of the years between 2013 and 2015, the groundwater level distribution of the basin was computed. Hydrologic parameters were estimated.

Materials and Methods

The basin used in the study is the part of the Susurluk basin within Karacabey and Mustafakemalpaşa districts of Bursa, Turkey. Uluabat Lake to the east of the basin, Mustafakemalpaşa Stream to the southeast, Mount Çataldağı to the south, Manyas Lake to the west, Marmara Sea to the north. Susurluk River passes through the basin and continues towards north and flows into the Sea of Marmara. However, the modeled basin is bounded by Susurluk River in the north and west and Mustafakemalpaşa Stream in the southeast (Figure 1). The geology of the study area is mainly composed of alluvial plains and river sediments. In general, the topography consists of low plains in the north and the height increases to the south.

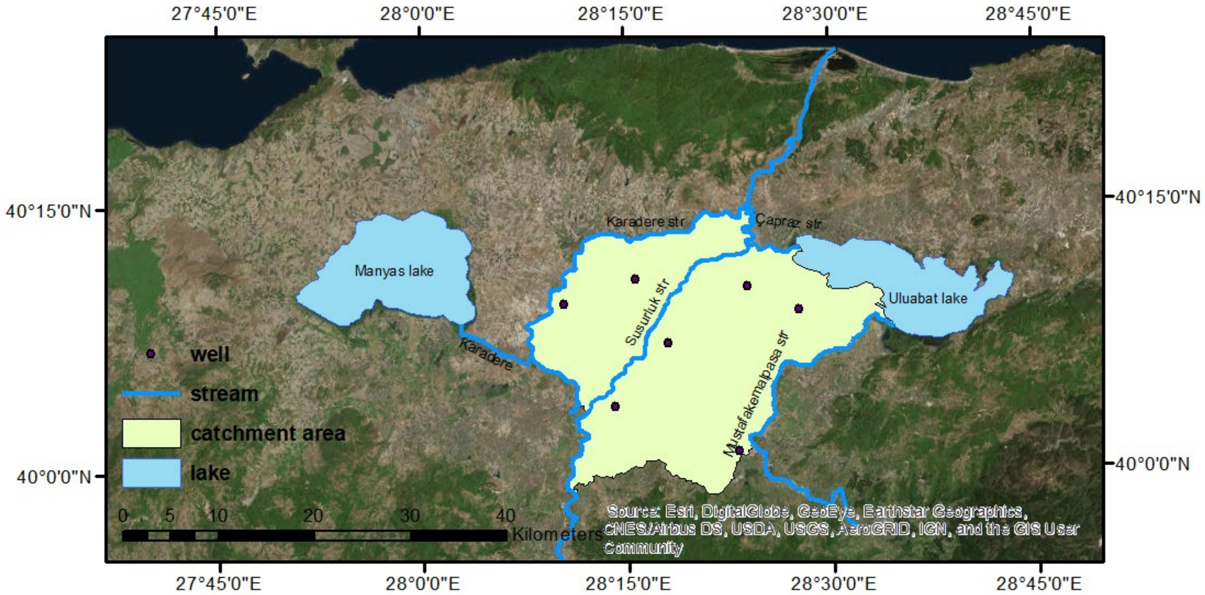


Figure 1. Study Area

Initially, the data of 5 observation wells were acquired from State Hydraulic Works. 3 of these wells are located in Karacabey and 2 in Mustafakemalpaşa districts in Bursa. The data includes hourly water and barometric pressures recorded between 2013-2015. The external parameters that affect the groundwater level of the basin are precipitation and evapotranspiration. Daily precipitation and evapotranspiration values measured between 2013-2015 at observation stations in Karacabey and Mustafakemalpaşa were obtained from the General Directorate of Meteorology.

Basin delineation was done in GIS environment. Aster GDEM raster files with a resolution of 30 m x 30 m were used to determine the basin area. The raster file was converted to point heights for use in MODFLOW. Hydrological analysis of the basin was performed using the ArcHydro toolbar. Shape files were created and the wells, rivers, lakes and meteorological stations in the basin are plotted on the map.

A diagram for modeling process is given in Figure 2:

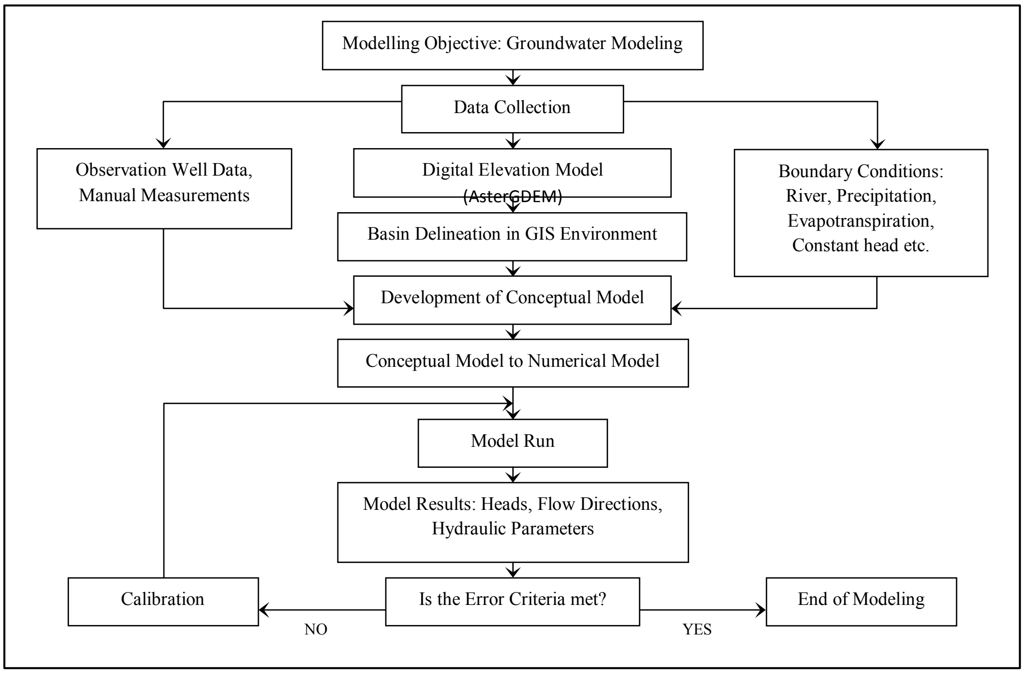


Figure 2. Work flow diagram of modeling

Numerical modeling was done in GMS program. GMS is a program that provides graphical interface for MODFLOW. GMS generates and records input data for and visualizes the output from MODFLOW. Files transferred from the GIS environment to the GMS appear as shape files. These files were transferred to the newly created conceptual model in order to transfer the spatial data to MODFLOW grid. In the generated grid cell size was 150 m x 150 m on x-y plane, and it composed of 1 layer in z direction.

MODFLOW 2005 was selected as version and model type was selected as steady state. LPF (Layer Property Flow) was selected as the flow package and PCGN was selected as the solver. Point elevations were used as surface elevations in MODFLOW. The rivers in the basin were modeled with the RIV1 package. In order to use the RIV1 package, the conductivity value (C, m^2/day) must be entered. In addition, water surface elevation and river bottom elevation should be entered for the river. The water surface elevation of the lake in the northeast of basin was entered as specified head using the CHD1 package. DRN1 package is used to model the drains in the basin. In DRN1 package, the conductivity value (C) of the channel and the bottom elevation of the drain must be specified. RCH1 package was used for precipitation in the basin and EVT1 package was used for evapotranspiration (ET). EVT1 package requires the maximum ET rate and the extinction depth to which the evapotranspiration will be applied.

The constant head boundary condition was used for rivers along the eastern, northern, and southeastern boundaries of the basin. Other boundaries were specified as impermeable boundary. Hydraulic conductivity was determined by calibration using the PEST (Parameter Estimation) model within the range of 5 to 500 m/day. In PEST simulations, the observed groundwater levels were compared with the values calculated by MODFLOW. After the calibration was completed, the groundwater distribution of the basin was determined for all years.

Results and Discussion

Groundwater distribution of study area for years 2013, 2014 and 2015 are given in Figures 3, 4 and 5 respectively. The calculated heads of each well were compared with the observed heads are also given for years 2013, 2014 and 2015 in Table 1, 2 and 3 respectively.

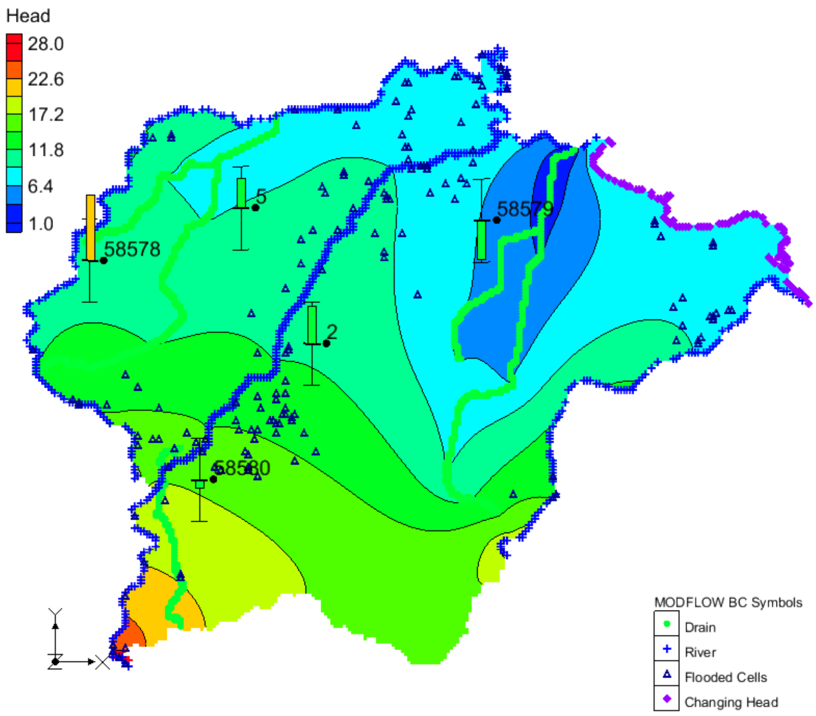


Figure 3. Groundwater level distribution of the basin for 2013

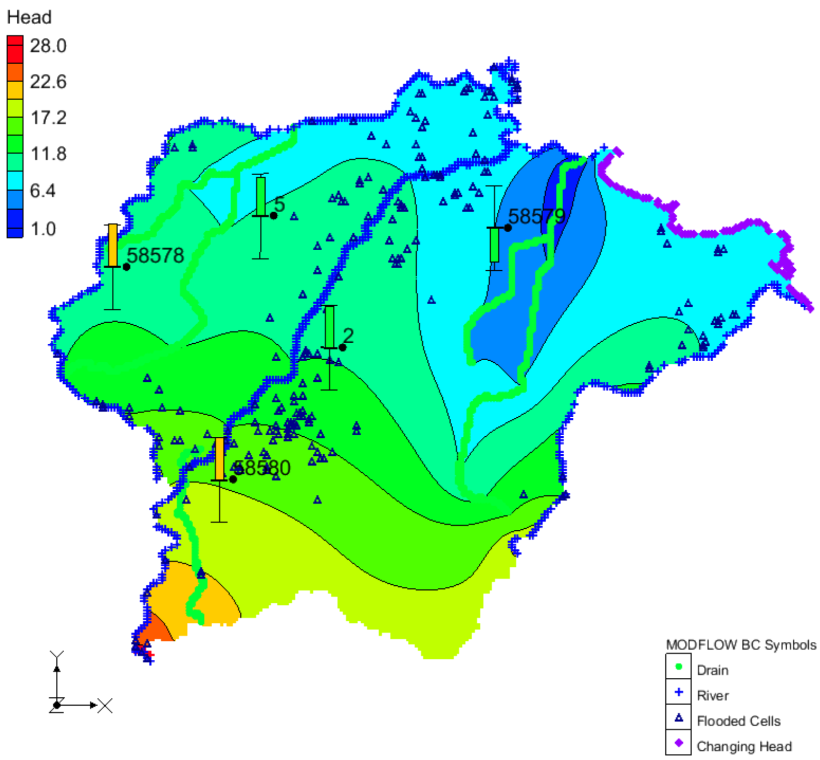


Figure 4. Groundwater level distribution of the basin for 2014

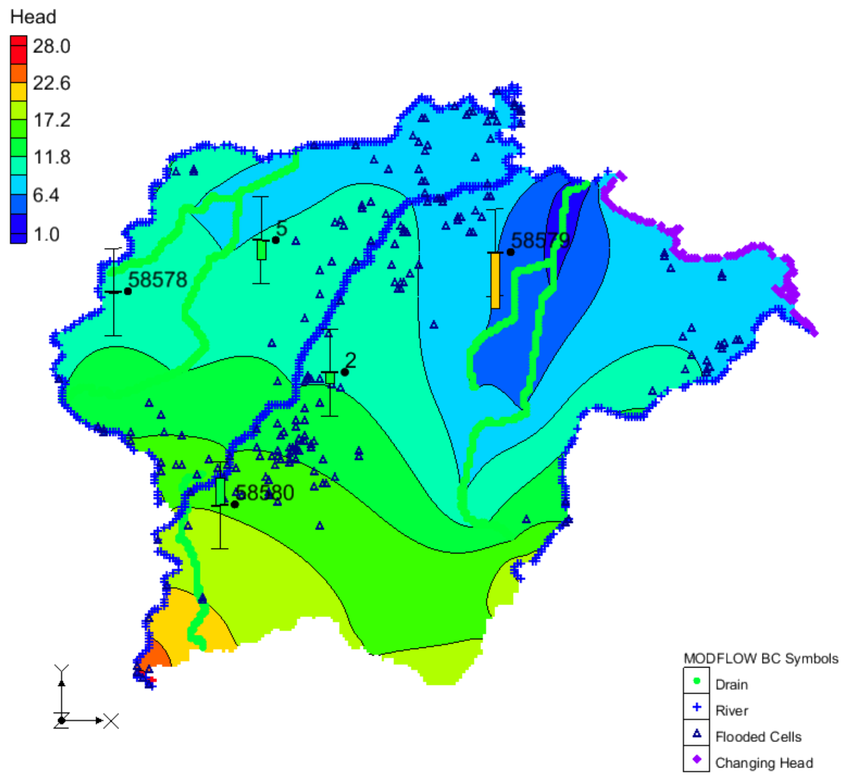


Figure 5. Groundwater level distribution of the basin for 2015

After PEST run and calibration hydraulic conductivity is found 50 m/day. From the residuals it can be seen that the accuracy of the model is high. In the year 2014, when the rainfall was higher and the evapotranspiration was lower, it is observed that the water level is slightly higher compared to the year 2013.

In 2013 it is observed that the highest errors were detected in the northwest of the basin, while the lowest error occurred in the southern part with high elevations. In 2014, the errors are higher in the eastern part of the basin and the calculated values are generally higher than the measured ones. In the year 2014, when the rainfall is highest and the evapotranspiration is lowest, it is seen that the water level is slightly higher compared to other years, as expected. In 2015, when the evapotranspiration value increased compared to the previous year, it is observed that the errors are high in the northeastern part with the lowest elevations in the basin. The water levels obtained for 2015 are generally lower than those observed.

Table 1. Residual errors of each well in the basin for simulation year 2013

Well code	Observed Data (m)	Computed Data (m)	Residual (m)
5	7.8891	9.3256	-1.44
58578	7.8243	10.9697	-3.15
58579	7.4748	5.6273	1.85
58580	16.9079	16.5209	0.39
2	9.3069	11.1109	-1.80

Table 2. Residual errors of each well in the basin for simulation year 2014

Well code	Observed Data (m)	Computed Data (m)	Residual (m)
5	7.6238	9.4706	-1.85
58578	8.9973	11.0282	-2.03
58579	7.3584	5.7836	1.57
58580	14.7926	16.7947	-2.00
2	9.4538	11.3974	-1.94

Table 3. Residual errors of each well in the basin for simulation year 2015

Well code	Observed Data (m)	Computed Data (m)	Residual (m)
5	10.3528	9.4611	0.89
58578	11.1206	11.0257	0.09
58579	8.3511	5.7725	2.58
58580	15.4729	16.7174	-1.24
2	11.8770	11.3577	0.52

Conclusion

In this study, a numerical model of groundwater distribution in the Susurluk basin within the boundaries of Karacabey and Mustafakemalpaşa districts of Bursa province was developed. The basin hydrological features were drawn as shape files in GIS environment and then they were transferred to the MODFLOW interface, namely, GMS. The necessary data was mapped to MODFLOW grid. Modeling of the basin was made in steady state. Hydraulic conductivity values were determined using the PEST model. Generally, an agreeable fit was observed between simulated and observed hydraulic heads. In days of excessive precipitation and low evapotranspiration groundwater levels increased. An important part of the basin is composed of alluvial lands and hence the high hydraulic conductivity caused the water to spread more easily in the aquifer resulting in a very slight annual fluctuation. Model errors may decrease further by calibrating the hydraulic conductivity regionally considering the geological structure. It is believed that more realistic results can be obtained if modeling is done in transient state conditions. It would be advantageous to include these results in the planning of the water supply in the study area.

Acknowledgements

The authors would like to express their gratitude to the 1st Regional Directorate of State Hydraulic Works for providing support in field studies and data acquisition.

References

Boughariou, E., Allouche, N., Jmal, I., Mokadem, N., Ayed, B., Hajji, S., Khanfir, H., and Bouri, S. (2018). *Modeling aquifer behaviour under climate change and high consumption: Case study of the Sfax region, southeast Tunisia.* Journal of African Earth Sciences, Volume 141, May 2018, Pages 118-129.

Doherty, J., (2013). *PEST: Model-independent parameter estimation*, Watermark Numerical Computing, Brisbane, Australia.

Gaur, S., Chahar, B.R., and Graillot, D. (2011). *Combined use of groundwater modeling and potential zone analysis for management of groundwater.* International Journal of Applied Earth Observation and Geoinformation, Volume 13, Issue 1, February 2011, Pages 127-139.

Korkmaz, S., Pekkan, E., and Güney, Y. (2016). *Transient Analysis with MODFLOW for Developing Water-Diversion Function.* Journal of Hydrologic Engineering, Volume 21, Issue 6, June 2016.

Liu, M., Jiang, Y., Xu, X., Huang, Q., Huo Z., and Huang, G. (2018). *Long-term groundwater Dynamics affected by intense agricultural activities in oasis areas of arid inland river basins, Northwest China.* Agricultural

Water Management, Volume 203, 30 April 2018, Pages 37-52.
McDonald, M.G., and Harbaugh A.W. (1988). *A modular three-dimensional finite-difference ground-water flow model.* Techniques of water-resources investigations, U.S. Geological Survey, Denver, 586.
Nkhonjera, G.K., and Dinka, M.O. (2017). *Significance of direct and indirect impacts of climate change on groundwater resources in the Olifants River basin: A review.* Global and Planetary Change, Volume 158, November 2017, Pages 72-82.
Panday, S., and Huyakorn, P.S. (2004). *A fully coupled physically-based spatially-distributed model for evaluating surface/subsurface flow.* Advences in Water Resources, 27, 361-382.
Refsgaard, J.C., and Storm, B.J. (1995). MIKE SHE. *In: Computer Models of Watershed Hydrology* (ed. by V. P. Singh), 809-846. Water Resources Publications, Littleton, Colorado, USA.
Wang, H., Gao, J.E., Zhang, M., Li, X., Zhang, S., and Jia, L. (2015). *Effects of precipitation intensity on groundwater recharge based on simulated precipitation experiments and a groundwater flow model.* CATENA, Volume 127, April 2015, Pages 80-91.

OPTIMAL LOAD FLOW FOR CONNECTION OF TRANSMISSION NETWORK IN LAO PEOPLE'S DEMOCRATIC REPUBLIC USING PARTICLE SWARM OPTIMIZATION

Anant Oonsivilai

anant@sut.ac.th

Douangtavanh Khamkeo

tavanh12@yahoo.com

Abstract

This paper presents the concept of increasing the optimization of the power network in the Lao People's Democratic Republic. Considering the power, voltage and angle magnitude control by the connection between of 115kV central-I area transmission network and 115kV transmission network in southern Laos, the operation will be based on the best search method Particle Swarm Optimization, PSO. Because the Particle Swarm Optimization can be used to calculate to find optimal power flow. In addition, it will provide opportunities to improve calculation methods as well as to improve understanding of power systems networks in Laos. Therefore, in this paper, it includes optimal power production in the system. To simulate the performance of the system, it will be implemented by planning the production with 115kV central-I area transmission network in Lao PDR and 16 bus networks in southern Laos are the test case. The test results were then analyzed to determine the optimal minimum loss of the system.

ÖĞRENCİLERDE SIVI TÜKETİMİ VE PİTTSBURGH UYKU KALİTE İNDEKSİ ARASINDAKİ İLİŞKİNİN DEĞERLENDİRİLMESİ

Fatma Çetin
cetinfatma141@gmail.com
Esen Karaca
esen.karaca@acibadem.edu.tr
Nurhan DOĞAN
nurhandogan@hotmail.com
Dilek Toprak
dilekt66@yahoo.com
Damla Demir
zdamlademir@gmail.com
Melek Kılıçaslan
emelek.kilicaslan@gmail.com

Amaç: Bu çalışma bireylerin sıvı tüketimi ile uyku kalitesinin arasındaki ilişkiyi incelenmek üzere yapılmıştır.

Gereç ve Yöntem: Çalışma, Mart 2018–Mayıs 2018 tarihleri arasında Sağlık Bilimleri Fakültesi, Fen-Edebiyat Fakültesi, Mühendislik Fakültesi, Tıp Fakültesi, Eczacılık Fakültesi, Mimarlık Fakültesi, Hukuk Fakültesi, Güzel Sanatlar Fakültesi, Sağlık Meslek Yüksekokulu'nda öğrenim gören ve çalışmaya katılmayı kabul eden 450 kişilik lisans ve ön lisans öğrenci grubu ile yürütüldü. Öğrencilerin sıvı tüketim durumunu ölçmek için her içecekle ilgili sıklık ve miktar belirtilen bir anket uygulandı. Ayrıca öğrencilerin uyku kalitelerini saptamak amacıyla Pittsburgh Uyku Kalite İndeksi, duygu durumlarını saptamak içinde Beck Depresyon Ölçeği kullanıldı. Verilerin değerlendirilmesinde SPSS (Versiyon:16.0) paket programından yararlanıldı. Verilere ait frekans tablosu ve tanımlayıcı istatistikler (ortalama±standart sapma) elde edildi. Verilerin normallik kontrolünde Shapiro-Wilks testi, iki bağımsız grupların karşılaştırılmasında Student-t testi ve Mann-Whitney U testi, kategorik değişkenlerin analizinde ki-kare testi, değişkenler arası ilişkinin incelenmesinde ise Spearman Rank korelasyon katsayısı kullanıldı.İstatistiksel anlamlılık için p

Bulgular: Çalışmaya katılan bireylerin %68'i kafein içeren içecekleri tükettiklerini, %32'si ise tüketmediklerini belirtti. Katılımcıların günde ortalama 409.5 ml kahve, 333.3 ml çay, 440 ml enerji içeceği, 550 ml kola ve 695 ml gazlı içecekler tükettikleri saptandı. Kişilerin uyku kalitesi ile kafeinli içecek tüketim durumları arasındaki anlamlı bir fark yoktu ($p>0,05$). Bununla birlikte uyku kalitesi iyi olan kişilerin %67'si ve uyku kalitesi kötü olan kişilerin %69'u kafeinli içecek tüketmekteydi. Uyku kalitesi iyi olan kişilerin ortalama su tüketimleri anlamlı olarak uyku kalitesi kötü olan kişilerin su tüketiminden yüksekti ($t=2,969$; $p=0,003$). Kişilerin uyku kalitesi ile Beck Depresyon Ölçeği'nden alınan puanlar arasındaki ilişki anlamlı bulundu ($p<0,05$). Uyku kalitesi iyi olan kişilerin %64'ünün Beck Depresyon Ölçeği puanlarına göre normal düzeyde, uyku kalitesi kötü olan kişilerin %42'sinin ise hafif düzeyde depresyonlu olduğu belirlendi. Katılımcıların uyku kalitesi ile fiziksel aktivite durumları arasındaki anlamlı bir fark olduğu görüldü ($p=0,009$). Uyku kalitesi iyi olan kişilerin %41'i fiziksel aktivite yaparken, uyku kalitesi kötü olan kişilerin %70,5'i fiziksel aktivite yapmamaktaydı. Kişilerin uyku kalitesi ile cinsiyet arasında anlamlı bir fark olmadığı gözlendi($p>0,05$).

Sonuç: Uyku kalitesi ve sıvı tüketimi arasındaki ilişkiyi inceleyen bu çalışmada; uyku kalitesi ile su tüketimi arasında anlamlı ilişki bulunurken kafeinli içecekler ile anlamlı bir farklılık bulunmadı. Kaliteli uykuya sahip bireylerin ise su tüketiminin fazla olduğu saptandı. Sıvı tüketimi ve uyku kalitesi arasında ilişkiyi belirlemek için yapılan bu çalışmanın literatüre bu anlamda katkı sağlayabileceği düşünülmektedir.

PLATFORM TO REQUIRE MEDICAL HEALTHCARE ABOARD DOURO CRUISES

Vitor Rodrigues[1,2], Fernando Freitas[1], Diana Martins[1], Arsénio Reis[5,6], João Barroso[5,6], Carlos Almeida[1], João Castro[1], Maria João Monteiro[1,3], Amâncio Carvalho[1,4], Cristina Antunes[1], Vitor Filipe[5,6], Filomena Raimundo[1], Isabel Barroso[1], Conceição Rainho[1]

[1]University of Trás-os-Montes and Alto Douro, School of Health, Vila Real, Portugal
[2]Research Center in Sports Sciences, Health Sciences and Human Development, University of Trás-os-Montes and Alto Douro
[3]Center for Health Technology and Services Research, University of Porto, Portugal
[4]Research Centre on Child Studies, University of Minho, Braga, Portugal
[5]University of Trás-os-Montes and Alto Douro, School of Science and Technology, Vila Real, Portugal
[6]Institute for Systems and Computer Engineering - Technology and Science, Porto, Portugal
e-mail contact author: vmcpr@utad.pt

Abstract: Cruise tourism in the Douro is ever growing and ensuring the health and well-being of the tourists should be a priority amongst the organizers of the trips. After a cross-sectional field study, consisting on applying a survey during the cruise trips, was undertaken by the research team, it was shown that the majority of the participants were receptive to the idea of a mobile application to facilitate the requisition of specific medical care, before the trips. The research team then started developing a platform, consisting of the application mentioned above, a back-office website, and a shared database. The app is being built on android studio, utilizing its native programming language, java. The website is being developed on visual studio, using the ASP.NET framework. The database is built on SQL Server 2014, and will be deployed to a server to interact with both the application and the website. The client interacts with the app to request medical care aboard the cruise ship. The request will be submitted into the database and must then be validated by an admin through the website, although this is only necessary for requests that require the submission of a prescription.

Keywords: Mobile application; Tourists; Health care

Introduction

Tourism is constantly and consistently growing in Portugal. In 2016 alone, a total of 28,4 million international tourists visited Portugal (INE, 2017). The Douro region is one of the oldest in the country, having been named a UNESCO World Heritage in 2001.
One of the most important part of the region in regard to tourism is the Douro River, which is navigable, and its surrounding landscape (Sousa, Monte &Fernandes, 2013).
Mobile apps have been increasing in number in the health sector, either for specific diseases and conditions, medical providers, medical education, and even geared for the general public, although these apps are usually much less complex. Although most of them are related to weight loss, they can still be used for other areas, such as tourism (Boulos, Brewer, Karimkhani, Buller & Dellavalle, 2014).
The health and well-being of tourists who frequent river cruises on the Douro River should be a premise of vessels that perform such cruises (Guy, Henson & Dotson, 2015; Kim, Woo & Uysal, 2015).
If tourists who want to take cruises, can at the time of booking, request various health services according to their needs, utilizing a mobile application, there is no doubt that we will be contributing to the health promotion of tourists who visit the Douro region (Ker-Cheng et all, 2014).
After a field study realized by the research team, which involved a survey with questions about the opinion of users about the need for such an application, the conclusion was that the great majority (76,0% of all tourists) saw the application as something they would be favorable towards.
And, if so, this project is being developed and one of the objectives has to do with the development of a mobile application.

Materials and Methods

The platform is being developed by the research team. It will consist of a mobile app, a back-office website, and a shared database. Each of these elements require different platforms and technologies.

The app is being built on android studio. This creation kit is widely used for various types of apps, due to its existing support, consistent updates, and functions like the gradle system, an automation system that supports multi-project code builds. It is the most popular tool for android app design, making it a tool that has lots of technical support and simplicity of use (Arquitetura da plataforma|Android Developers, s.d.).
It utilizes an oauth2.0 protocol for user authentication. This protocol allows a certain website or app to access their information on other websites, without the need for password sharing (OAuth 2.0 - OAuth). The programming language utilized was java, the native coding language of the Android Studio kit, making it a simple and obvious choice. It has a built in json converter to read data received from the database, and to upload any changes.
The database is being developed on the SQL Server 2014 platform, and will be hosted on a server, to be accessed by both the website and the app. This platform allows the storing and treatment of data, while also allowing other applications like websites and mobile apps to have access to said data. The broad array of support for all kinds of software that require a database server, and the streamlined interface of the server, make it a good choice for a database support tool (Otey, 2014)
The website was built upon the Visual Studio programming platform, using the asp.net language and the bootstrap framework. Visual Studio was selected for its vast array of features, as well as being a familiar environment for the developers. Asp.net was chosen due to its scalability and speed (Visual Studio 2019 | Visual Studio), and due to it being familiar to the research team. Bootstrap was chosen due to its organisational ability, and the responsiveness it brings to the website (Bootstrap. the most popular HTML, CSS, and JS library in the world.) and its simplicity and easiness of use. Its purpose is to simply be a back-office platform.
All the elements of the platform will interact with each other. The app will receive information regarding the trips from the database, and, after the user confirms a request, it will be sent to the database, which will in turn send it to the website for validation. After the request is validated, the database state of the request will be altered. It is also possible for the user to cancel requests, which will be an immediate action and will require no validation from the website.

Results and Discussion

Initial testing of the app was mainly positive, although it was done in a local environment, with the database not being hosted on a server. Further tests will be completed with a fully online platform.

Front end users:

The user will be required to log in, utilizing the oauth2.0 protocol. From there, he can access all the features of the app. The login screen is as follows, see (Figure 1).
:

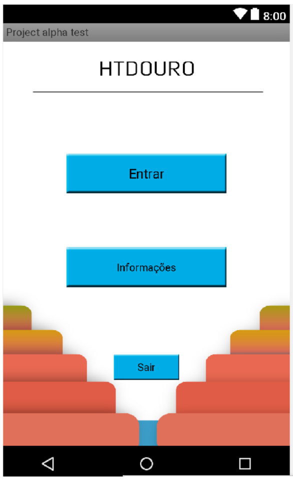


Figure 1 - Login Screen

Figure 2 - Home Page

This will take the user to the home page, where the user can view trips already linked, add new trips, or consult the contacts & information page, see (Figure 2).

On the trip list, the user can select from a list of trips linked (it's assumed that in most cases there will be a single trip), see (Figure 3).

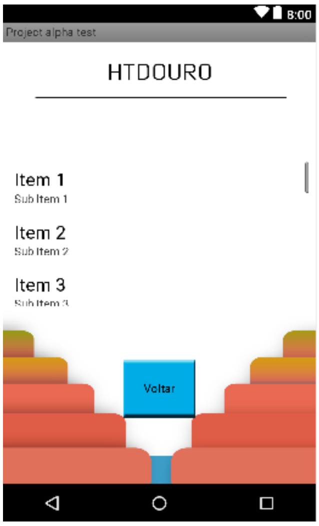


Figure 3 - Trip List

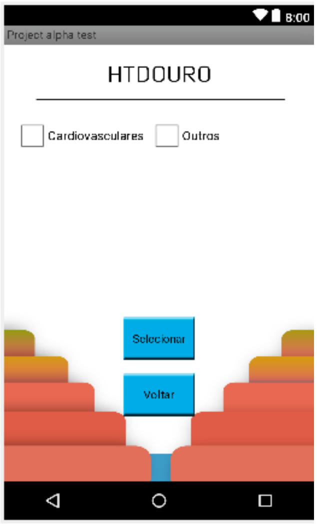


Figure 4 - Health Care Requirement Screen

The user then selects a trip, and can view its info, as well as select the option to request medical care. The user can then select from a list of offered medical care packages (some of them will require that a prescription be sent by email to an admin at a later date), see (Figure 4).

To link a new trip, the user must request a trip token when purchasing the ticket. Every ticket can only have 1 code, and every code can only link to 1 trip. The user will then enter the code in the respective field, and the trip will be linked to the active account. It is possible to request medical care for friends or family using the same account, as long as the user has the required codes for every ticket.
On the contacts and info page, the user will be able to learn a bit more about the company organizing the trip, see (Figure 5).

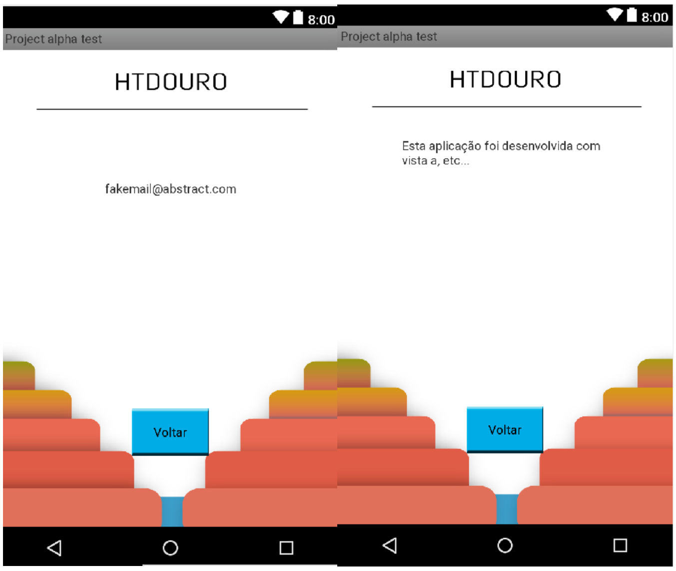


Figure 5 - Contacts and information screens

Back End Users:

Only the admins will interact with the website. The admins will receive a username and password from the database manager. The login function of the website is a more classical approach than the application. It simply requires the input of the username and password given to the admin, see (Figure 6).

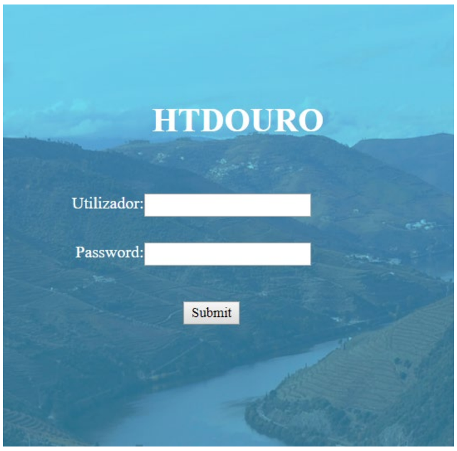


Figure 6 - Website's Login Page

Figure 7 - Website's Trip List Page

The admin will be taken to the home page after the login. Here, one can select from a list of trips from the company the admin belongs to, see (Figure 7).

Afterwards, the admin will view the trip page, where he can access the trip's information, and a list of passengers whom require medical care, see (Figure 8).

Figure 8 - Website's Trip Info Page

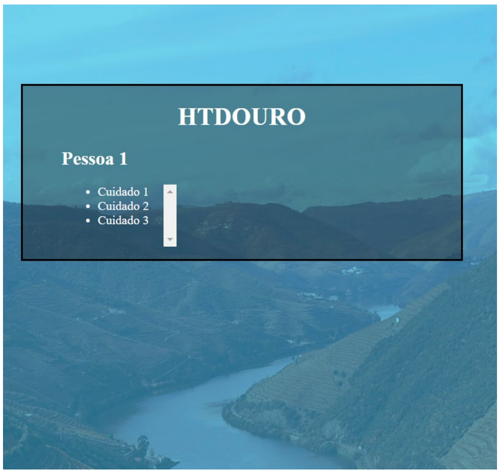


Figure 9 - Website's Health Care Requirements Page

He can then access the specific health care requirements of each passenger on the list. Here the admin will have the option to validate requirements, see (Figure 9).

The admin can also access the contacts and information page, see (Figure 10).

Figure 10 - Contacts and Information Pages

Conclusion

Technology application in healthcare has been arousing engineering's attention for a long time in support to health recovery and maintenance therapy practices.

In this regard, creating support systems to watch the fulfilling of the therapeutical plan, assisting healthcare professionals and informal caregivers on dependent elders' care may be an added value.

Acknowledgements

This work was supported by the project SAICT-POL/23434/2016 - Health TuriDouro - Health interventions focused on health needs of tourists from the Douro River cruises, with reference NORTE-01-0145-FEDER-023434, project financed by the Foundation for Science and Technology (FCT) and co-financed by the European Regional Development Fund (FEDER) through the Northern Regional Operational Program (NORTE2020).

References

Arquitetura da plataforma | Android Developers. (s.d.) Retrieved from https://developer.android.com/guide/platform

Booststrap. the most popular HTML, CSS, and JS library in the world. (s.d). Retrieved from https://getbootstrap.com/

Boulos, M, Brewer, A, Karimkhani, C, Buller, D & Dellavalle, R (2014) Mobile medical and health apps: state of the art, concerns, regulatory control and certification. Online Journal of public health informatics, 5(3):1-23. DOI: 10.5210/ojphi.v5i3.4814

Guy, B.; Henson, J. & Dotson, M. (2015). Characteristics of consumers likely and unlikely to participate in medical tourism. International Journal of Healthcare Management, 8(2), 68-76. DOI: 10.1179/2047971914Y.0000000076

Instituto Nacional de Estatística (2017). Turismo Internacional 2016. Serviço de Comunicação e Imagem. Instituto Nacional de Estatística, Lisboa.

Ker-Cheng, L., Lin-Sheng, C., Chien-Ming T., Hsuan-Hung L., Yung-Fu C. & Chien-Lei C. (2014). A Smartphone APP for Health and Tourism Promotion. Mathematical Problems in Engineering. Hindawi Publishing Corporation, 1-10. DOI: 10.1155/2014/583179

Kim, H., Woo, E. & Uysal, M. (2015). Tourism Experience and Quality of Life Among Elderly Tourists. Tourism Management, 46, 465-476. DOI: 10.1016/j.tourman.2014.08.002

OAuth 2.0 – OAuth (s. d). Retrieved from https://oauth.net/2

Otey, M. (2014, March) Top 10: New features in SQL Server 2014. Retrieved from https://www.itprotoday.com/sql-server/top-ten-new-features-sql-server-2014

Sousa, C., Monte, A., & Fernandes, P. (2013) - Impacto no turismo da região demarcada do Alto Douro vinhateiro, após a classificação de Património Mundial da Humanidade pela Unesco. In III Congresso Internacional de Turismo da ESG/IPCA. ESG/IPCA, Barcelos, 261-289.

Visual Studio 2019 | Visual Studio (s.d.). Retrieved from https://visualstudio.microsoft.com/vs//

PROGRAMLAMA ÖĞRETİMİNDE OTANTİK GÖREV ODAKLI UYGULAMALARIN KULLANILMASINA İLİŞKİN ÖĞRENCİ GÖRÜŞLERİ*

Emine Kübra PULLU
Kayseri Üniversitesi, Hüseyin Şahin MYO, Kayseri- Türkiye
ekubrafidan@gmail.com

Mehmet Nuri GÖMLEKSİZ
Fırat Üniversitesi, Eğitim Fakültesi, Elazığ- Türkiye
nurigomleksiz@yahoo.com

Özet: Bu çalışmanın amacı Bilgisayar Teknolojileri bölümü öğrencilerinin programlama öğretiminde otantik görev odaklı uygulamaların kullanılmasına ilişkin görüşlerini belirlemektir. Çalışmada nitel araştırma yöntemlerinden eylem araştırması deseni kullanılmıştır. Bu araştırmanın çalışma grubunu 2017-2018 eğitim-öğretim yılında Erciyes Üniversitesi Develi Hüseyin Şahin Meslek Yüksekokulu'nda Web Tasarımının Temelleri ile Araştırma Yöntem ve Teknikleri derslerini alanBilgisayar Teknolojileri bölümü 2. sınıf öğrencileri oluşturmaktadır.Öğrenciler Araştırma Yöntem ve Teknikleri Dersi'nde otantik görev odaklı uygulamalar yapmışlardır.Bu uygulamalar sekiz hafta sürmüştür.Sekiz haftalık otantik görevler ile yürütülen uygulama süreci sonunda öğrenciler ile görüşmeler yapılmıştır. Çalışma grubunun belirlenmesinde maksimum çeşitlilik örnekleme yöntemi kullanılmıştır. Üç başarı düzeyinden toplam 15 öğrenci ile görüşülmüştür.Görüşülen öğrencilerin 6'sı kadın 9'u erkektir. Öğrencilerin belirlenmesi aşamasında gönüllülük esası dikkate alınmıştır.Çalışmanın verileri için öğrenci görüşleri 11 sorudan oluşan yarı yapılandırılmış bir görüşme formuyla elde edilmiştir.Elde edilen veriler bilgisayar destekli nitel veri analiz program kullanılarak içerik analize uygun bir şekilde çözümlenmiştir. Araştırma sonucunda içerik analizine uygun bir şekilde çözümlenen veriler doğrultusunda programlama öğretiminde otantik görev odaklı uygulamaların kullanılmasına ilişkin olarak "Otantik görevler ile ilgili görüşler", "Otantik görevler ile ilgili yaşanan olumlu durumlar", "Otantik görevler ile ilgili karşılaşılan sorunlar", "Otantik görevlerin derse etkisi" ve "Otantik görevlerin diğer derslerde uygulanma isteği" temalarınıoluşturacak şekilde olumlu ve olumsuz görüşler elde edilmiştir. Nitel verilerin analizi sonucunda beş farklı ana tema ortaya çıkmıştır. Bu ana temalar kendi içlerinde alt temalara ve kodlamalara ayrılmıştır.Otantik görev odaklı uygulamalar ile ilgili görüşlere ilişkin olarak öğrenciler duygularını ve düşüncelerini hem olumlu hem de olumsuz bağlamda belirtmişlerdir. Öğrencilerin otantik görev odaklı uygulamalar ile ilgili bireysel, grup arkadaşlarıyla ve danışman ile yaşadıkları olumlu durumları ifade ettikleri belirlenmiştir. Otantik görev odaklı uygulamalarda öğrenciler karşılaştıkları sorunları bireysel, grup arkadaşlarıyla ve teknik sorunlar şeklinde kategorilendirmişlerdir. Öğrenciler otantik görev odaklı uygulamaların derse etkisini hem bilişsel hem de duyuşsal bağlamda olumlu bir şekilde ifade etmişlerdir. Son olarak öğrenciler otantik görev odaklı uygulamaları hem teknik hem de diğer derslerde kullanmak istediklerini belirtmişlerdir.

Anahtar Kelimeler: Otantik Görev, Programlama Öğretimi, Nitel Araştırma

Giriş

Bilgisayarların fiziksel kavramlarına işlevsellik kazandıran yazılım ve programlama kavramlarıdır. Programlama öğretimi modern toplumların gerektirdiği karmaşık problem çözme becerilerini geliştirmek için kullanılmaktadır (Nam, Kim ve Lee, 2010: 723). Bilgisayar programlama içinde bulunduğumuz dijital çağda gezegenimizin evrensel dili haline gelen temel bir okuryazarlıktır. Genç yaşta bilgisayar programlama öğrenme öğrencilerin günlük yaşamlarında yararlıdır. Genç öğrencilerin düşünme, işleme ve iletişimde avantaj kazanmalarına yardımcı olur (Jancheski, 2017: 55). Öğrencilerin sistemi araştırmaları ve onu kendi seviyelerine göre özümsemeleri önemlidir. Programlama dilini kullanmayı öğrenmek hem kullanılan dili hem de bir bütün olarak bilgisayar sistemini anlamayı gerektirir (Pea ve Kurland, 1984: 140). Programlamanın öğrenilmesi ve öğretilmesi farklı ve özel yaklaşımlar kullanmayı gerektirir (Gomes ve Mendes, 2007). Her gün yeni yazılımlar ortaya çıktığı için bu yeni uygulamaların çocuklar tarafından nasıl öğrenildiği önemlidir. Programlamanın hızlı yükselişi ile beraber

** Bu çalışma Fırat Üniversitesi Eğitim Bilimleri Enstitüsü'nde Prof. Dr. Mehmet Nuri Gömleksiz danışmanlığında Emine Kübra Pullu tarafından hazırlanan "Programlama Öğretiminde Otantik Görev Odaklı Uygulamaların Öğrencilerin Akademik Başarısına, Tutumlarına, Problem Çözme ve Yaratıcı Düşünme Becerilerine Etkisi" başlıklı doktora tezinden üretlmiştir.*

eğitimciler için programlamanın nasıl öğrenildiğini ve programlamanın öğrenilmesinin bilişsel sonuçlarının ne olduğunu anlamak kritik hale gelmiştir. Hangi programlama becerisi düzeylerine ihtiyaç duyulabileceği ve programlamayı öğrenmedeki bilişsel kısıtlamalar ile bunların sonuçları arasındaki ilişkinin ne olduğu sorularına cevaplar aranmaya başlamıştır (Pea ve Kurland, 1984: 139). Öğrenme sınıfın kültürüne yerleştirilememişse ve öğrencilerin gerçek dünyadaki problemlerle uğraşma deneyimi olmazsa, öğrenciler bilgilerini sınıf dışında kullanma ve uygulamada zorluk çekecektir (Moffett, 2012: 12). Ayrıca öğrendiklerini gerçek hayata aktarabilme becerisini edinebilmeleri de önemlidir. Günümüzde öğrencilerin bilgiyi almalarını, muhafaza etmelerini ve aktarmalarını iyileştirmek için, otantik öğrenme uygulamaları ön plana çıkmaktadır (Lombardi, 2007: 4). Otantik öğrenme bağlam, süreç ve içerik standartları ile benimsenir (Elliot, 2007: 35). Otantik öğrenmede amaç öğrencilerin bir konuyu direkt ezberleyerek öğrenmesi yerine süreç içerisinde aktif bir şekilde yer alıp gerçek dünya problemlerine çözüm üreterek bu çözümleri sonradan karşılaşabileceği durumlara transfer edebilmeyi öğrenmesidir (Aydın Aşk, 2016: 13). Otantik öğrenme gerçek olma, kendini daha bilinçli hale getirme, başkalarının beklentileri yerine kendi beklentilerini tanımlama ve diğer öğrencilerle etkileşime girme gibi özellikler içerir (Iucu ve Marin, 2014: 414).). Programlama öğretiminde öğrencilerin gerçek yaşam sorunlarından yola çıkarak problemlere çözüm aramaları önemlidir. Bu doğrultuda bu araştırmada öğrenciler ile sekiz hafta boyunca otantik görev odaklı uygulamalar yapılarak programlama öğretimi gerçekleştirilmiştir. Her hafta öğrencilere farklı otantik görevler sunulmuştur. Öğrenciler sekiz haftalık uygulama süreci sonunda proje olarak web sayfası tasarlamışlardır.

Yöntem

Bu araştırmanın amacı Bilgisayar Teknolojileri bölümü öğrencilerinin programlama öğretiminde otantik görev odaklı uygulamaların kullanılmasına ilişkin görüşlerini belirlemektir. Araştırmada eylem atraştırması deseni kullanılmıştır. Eylem araştırması, uygulamanın içerisinde yer alan bir uygulayıcının direkt kendisi veya bir araştırmacı ile beraber gerçekleştirdiği mevcut ortaya çıkmış veya uygulamada ortaya çıkabilecek bir sorunu anlayıp çözmeye yönelik olan bir araştırma yaklaşımıdır (Yıldırım ve Şimşek, 2008: 295). Gürgür (2016: 23) eylem araştırması sürecinin temel adımlarını; konunun betimlenerek sınıflandırılması, bilgi toplanması, ilgili literatürün taranması, araştırma planının geliştirilmesi, planın uygulanarak veri toplama ile veri analizi süreci ve sonuç raporunun yazılması şeklinde belirtmiştir. Eylem araştırmasında uzman araştırmacıların yürütücülüğünde, uygulayıcıların ve probleme taraf olanların katılımı ile var olan uygulamanın eleştirel bir değerlendirmesi yapılır. Durumu iyileştirmek adına alınması gereken önlemler tespit edilip uygulamaya aktarılır (Karasar 2018: 51). Araştırmada çalışma grubu belirlenirken maksimum çeşitlilik örnekleme yöntemi kullanılmıştır. Maksimum çeşitlilik örnekleme yönteminin amacın göreli olarak küçük bir örneklem oluşturularak bu örneklemde çalışılan probleme taraf olabilecek bireylerin çeşitliliğinin maksimum derecede yansıtılmasıdır (Yıldırım ve Şimşek, 2008). Öğrencilerin belirlenmesi aşamasında gönüllülük esası dikkate alınarak üç farklı başarı düzeyine göre öğrenciler gruplandırılmıştır. Deney ve kontrol gruplarının denkleştirilerek belirlenmesinde kullanılan ölçütler doğrultusunda beş üst grupta, beş orta grupta ve beş alt grupta olmak üzere deney grubunda yer alan toplam 15 öğrenci ile görüşmeler yapılmıştır.

Araştırmada nitel verilerin toplanması için görüşme formları kullanılmıştır. 11 sorudan oluşan yarı yapılandırılmış bir görüşme formuyla veriler toplanmıştır. Elde edilen verilerin değerlendirilmesinde içerik analizi yöntemi kullanılmıştır. İçerik analizinde temel amaç, elde edilen verilerin açıklanabileceği kavramlar ile ilişkilere ulaşmayı sağlamaktır. Veriler derinlemesine analizi sayesinde kavram ve temaların keşfedilmesi sağlanır. İçerik analizi, benzerlik gösteren verilerin belirli kavramlar ve temalar altında bir araya getirilip yorumlanması amacıyla verilerin kodlanması, temaların bulunması ve kavramsallaştırılması, kodların ve temaların sistematik bir şekilde düzenlenmesi, bulguların tanımlanması ve yorumlanması şeklinde yapılır (Yıldırım ve Şimşek, 2008: 227-228).

Bulgular ve Yorum

Araştırmanın nitel verileri öğrenci yarı yapılandırılmış görüşme formundan elde edilmiştir. İçerik analizine gore önce kodlamalar belirlenmiş ve kategorilendirilmiş, kategoriler doğrultusunda da ana ve alt temalar oluşturulmuştur. Elde edilen kodlamalar frekansları ile tablo şeklinde sunularak kodlamaların hangi alt başlıklar altında yer aldığı gösterilmiştir. Araştırma sonucunda programlama öğretiminde otantik görev odaklı uygulamaların kullanılmasına ilişkin olarak "Otantik görevler ile ilgili görüşler", "Otantik görevler ile ilgili yaşanan olumlu durumlar", "Otantik görevler ile ilgili karşılaşılan sorunlar", "Otantik görevlerin derse etkisi" ve "Otantik görevlerin diğer derslerde uygulanma isteği" şeklinde beş farklı ana tema ortaya çıkmıştır. Bu ana temalar kendi içlerinde alt temalara ve kodlamalara ayrılmıştır

Otantik Görevler İle İlgili Görüşlere İlişkin Nitel Veri Çözümlemeleri

Bu tema içerisinde iki alt tema ortaya çıkmıştır. Bu ana tema ve alt temalara yapılan yükleme sayıları aşağıdaki tabloda yer almaktadır.

Tablo 1: Otantik Görevler İle İlgili Görüşlere İlişkin Alt Temalar Ve Yükleme Sayıları

Alt Temalar	f
Hissedilen duygular	**59**
Olumlu duygular	49
• mutluluk	13
• merak	9
• başarı	9
• ilgi	6
• özgüven	5
• motivasyon	4
• yardımlaşma	3
Olumsuz duygular	10
• stres	6
• korku	4
Düşünceler	**55**
Olumlu düşünceler	50
• eğlenceli	14
• yaratıcı	10
• aktif katılım	10
• empati	9
• sosyal	7
Olumsuz düşünceler	5
• zor	4
• zaman kaybı	1
Toplam	**114**

Tablo 1 incelendiğinde otantik görevler ile ilgili görüşler temasına ilişkin olarak ortaya çıkan alt temaların "hissedilen duygular" (f=59) ve "düşünceler" (f=55) olduğu görülmektedir. Bu temalara ilişkin referans cümlelerine aşağıda yer verilmiştir.

Öğr 2-K. "Ne yalan söyliyim ilk duyduğumda çok zorlanacağımı düşünüp korktum. Drama yapmak, iş yerine gitmek, eğitimler almak… Kesin dersten kalırım diye korktum…"

Öğr 4-E. "Gerçekten işin mutfağındaki insanlar ile uygulamalar yapmak çok güzeldi. Başarılı sonuçlar elde ettik bence…"

Öğr 5-K. " İşyerlerine ziyarette bulunmak, gerçek ihtiyaçlara yönelik web sayfaları tasarlamak beni fazlasıyla mutlu etti… "

Öğr 7-E. "Klasik slayttan işlenen derslerden çok sıkılmıştık. Süreç çok eğlenceli geçti. Özellikle drama yapmak o kadar keyifliydi ki…"

Öğr 9-E. "Gerçek olaylara ve gerçek problemlere odaklanarak tasarımlar yapmanın çok ilgi çekici olduğunu düşünüorum…"

Öğr 10-E. "Bence çok farklıydı. Bizi bilgisayar gibi gören hocalarımız sürekli bizden ne amaca hizmet ettiğini düşünmeden tasarımlar yapmamızı istiyorlar. Ama bu uygulamalar ile neyi neden yaptığımızı nerde nasıl kullanacağımızı öğrendik. Örneğin ben çocuklara yönelik bir sayfa hazırladım ve onlar gibi düşünmeye çalıştım empati kurdum..."

Öğr 11-K. "Bizim için ders stresinden kaçıp nefes alabileceğimiz, işe yaradığımızı hissedebileceğimiz, aktif bir şekilde araştırmalar yapıp gerçek problemlere odaklanabileceğimiz etkinlikerdi…"

Öğr 14-K. "Web sayfası hazırlamayı hiç böyle düşünmemişti. Klasik hoca konuyu söyleyecek her zaman ki gibi ben de ordan buradan tasarımlara bakıp aynısını yapacağım diye düşünüyordum Ama her hafta gittiğimiz yerler sayesinde birilerine yönelik bir şeyler tasarlamak gerçek hayatta kullanılabilir şekilde düşünmek aktif bir şekilde sürece dahil olmak çok faydalı oldu…"

Öğr 15-K. "Drama etkinliğinde stres yaptığım için çok zorlandım. Kendimi yeterince etkinliğe veremedim…"

Otantik Görevler İle ilgili Yaşanan Olumlu Durumlara İlişkin Nitel Veri Çözümlemeleri

Bu tema içerisinde üç alt tema ortaya çıkmıştır. Bu ana tema ve alt temalara yapılan yükleme sayıları aşağıdaki tabloda yer almaktadır.

Tablo 2: Otantik Görevler İle İlgili Görüşlere İlişkin Alt Temalar Ve Yükleme Sayıları

Alt Temalar	f
Bireysel	**57**
• gerçekçi düşünme	11
• farklı düşünme	10
• sevme	9
• istek	8
• mesleki yönlendirme	7
• iyi vakit geçirme	7
• araştırmaya yönlendirme	5
Danışman	**24**
• güçlü iletişim	10
• güven	7
• rehber	7
Grup arkadaşları	**20**
• iletişim	9
• uyum	8
• işbirliği	3
Toplam	**101**

Tablo 2 incelendiğinde otantik görevler ile ilgili yaşanan olumlu durumlar temasına ilişkin olarak ortaya çıkan alt temalar “bireysel” (f=57), “danışman” (f=24) ve “grup arkadaşları” (f=20) şeklindedir. Bu temalara ilişkin referans cümleleri aşağıda yer almaktadır.

Öğr 4-E. “Sadece okul içinde değil okul dışında gerçek iş ortamlarında yapılan eğitimler sayesinde hocamızla da daha fazla vakit geçirme ve iletişim kurma şansımız oldu…”

Öğr 5-K. “Bu uygulamalar bizi araştırmaya sevk etti. Mesela biz anaokullarına gidip öğrenci ihtiyaçlarını belirlemeye yönelik araştırmalar yaptık…”

Öğr 6-E. “Drama etkinliğinde arkadaşlarımızla çok güzel iletişim kurduk. Önce birbirimizi daha sonra da yaptığımız işi ve paydaşları anlamaya çalıştık…”

Öğr 7-E. “ Liseden beri programlama eğitimi alıyorum. Hep aynı şekilde aynı şeyler yaptık. Ama bu uygulamalar ile daha önce hiç önemsemediğim yönlere düşüncelere yöneldim…”

Öğr 8-E. “Gerçek projeler yaptık. Özellikle yazılım şirketindeki etkinliğimiz bize olaylara projelere daha gerçekçi bakmayı kattı…”

Öğr 9-E. “Tüm etkinlikler çok önemliydi bence. Ama ben en çok eski mezun bir öğrencinin açmış olduğu yazılım şirketi ziyaretimizi ve ordaki eğitimlerimizi sevdim…”

Öğr 11-K. “İlk hafta tereddütlerim vardı ancak her hafta farklı bir uygulama ile karşılaşınca ve hoşuma gittikçe ilgi ve istek ile hepsine katıldım…”

Öğr 12-E. “Bu etkinliklerde grup arkadaşlarım ile sürekli telefonlaştık görüştük. Böylece süreçten kopmadan projelerimizi tamamlamış olduk…”

Öğr 13-K. “Bence bu sürecin en güzel yanlarında biri hocamız ile kurabildiğimiz güçlü bağ oldu. Kafamıza takılan her şeyi rahatça konuşup çok doğru yönlendirmeler aldık…”

Öğr 14-K. “Gerçekçi düşünme beraberinde kendimizi müşterilerin yerine koyarak düşünebilmeyi de getirdi…”

Otantik Görevler İle ilgili Karşılaşılan Sorunlara İlişkin Nitel Veri Çözümlemeleri

Bu tema içerisinde üç alt tema ortaya çıkmıştır. Bu ana tema ve alt temalara yapılan yükleme sayıları aşağıdaki tabloda yer almaktadır.

Tablo 3: Otantik Görevler İle İlgili Karşılaşılan Sorunlara İlişkin Alt Temalar Ve Yükleme Sayıları

Alt Temalar	f
Bireysel	**10**
• başaramama korkusu	4
• zaman sıkıntısı	3
• özgüven sorunu	3
Grup arkadaşları	**4**
• adaletsiz iş bölümü	2
• sorumsuz davranışlar	2
Teknik	**3**
• bilgisayarların yetersiz kalması	2
• bilgisayarların bozulması	1
Toplam	**17**

Tablo 3 incelendiğinde otantik görevler ile ilgili karşılaşılan sorunlar temasına ilişkin olarak "bireysel" (f=10), "grup arkadaşları" (f=4) ve "teknik" (f=3) şeklinde üç alt tema ortaya çıkmıştır. Bu temalara ilişkin referans cümlelerine aşağıda yer verilmiştir.

Öğr 4-E. "Uzman mühendis hocamız tarafından gerçekleştirilen kod yazma etkinliğinde bilgisayarımın hızı yetersiz kaldığı için yetişemediğim noktalar oldu…"

Öğr 7-E. "Bazı uygulamalar gözümü çok korkuttu. Başaramayacağımı düşündüm…"

Öğr 8-E. "Bir arkadaşımız görevlerde bizim kadar aktif rol almadı. Gerçek hayatta karşılaşabileceğimiz durumlarda yola çıkarak belirlemeye çalıştığımız ihtiyaçlarda yeterince görev almadı…"

Öğr 15-E. "Ben daha fazla araştırma yapmak isterdim ama zaman yeterli gelmedi. Aslında ben de ilk başlarda biraz önemsemedim ondan dolayı zamanı istediğim gibi kullanamadım…"

Kullanılan Otantik Görevlerin Derse Etkisine İlişkin Nitel Veri Çözümlemeleri

Bu tema içerisinde iki alt tema ortaya çıkmıştır. Bu ana tema ve alt temalara yapılan yükleme sayıları aşağıdaki tabloda yer almaktadır.

Tablo 4: Otantik Görevlerin Derse Etkisine İlişkin Alt Temalar Ve Yükleme Sayıları

Alt Temalar	f
Bilişsel Etki	**72**
• verimli öğrenme	13
• ders başarısı	11
• problem analizi	10
• kalıcı öğrenme	10
• yaratıcılık	9
• eksikliklerin farkında olma	7
• tekrar	7
• farkındalık	5
Duyuşsal Etki	**54**
• sevme	12
• ilgi	10
• özgüven	9
• motivasyon	9
• merak	8
• eğlenme	6
Toplam	**126**

Tablo 4 incelendiğinde otantik görevler ile ilgili görüşler temasına ilişkin olarak ortaya çıkan alt temaların "bilişsel etki" (f=72) ve "duyuşsal etki" (f=54) olduğu görülmektedir. Bu temalara ilişkin referans cümlelerine aşağıda yer verilmiştir.

Öğr 2-K. “Ben öğrenmemize çok fazla etkisi olduğunu düşünüyorum. Çünkü özellikle uzmanlarla yaptığımız kod yazma etkinlikleri bana çok şey kattı. Öğrendiklerimizin boşa gitmediğini söyleyebilirim…”

Öğr 4-E. “Gerçekten kullanılacakmış gibi bir projeye ve gerçek muhataplara odaklandık. Bu amaç çerçevesinde adım adım projemizi şekillendirdik. Önce ihtiyaçları belirledik, o ihtiyaçlar doğrultusunda algoritma tasarımını yaptık ve kodlayarak web sayfamızı oluşturduk…”

Öğr 5-K. “Hem yaptığımız görevleri çok sevdim (özellikle drama) hemde kodlamaya olan bakış açım değiştiği için kodlama eğitimini. Bu işi becerebilmek çok güzel bir duygu…”

Öğr 6-E. “Her hafta görevleri başarı ile tamamlayıp süreç sonunda da istediğimiz şekilde bir web sayfasını başarı ile hazırladık…”

Öğr 10-E. “Uzmanların yaptığı etkinlikler, birebir bizimle ilgilenmesi benim başarmama olan inancımı arttırdı…”

Öğr 13-E. “ Kendimiz yaptık uyguladık gerekli uzmanlar ile eğitimler aldık ve öğrenmelerimiz böylece daha kalıcı ve anlamlı hale geldi…”

Öğr 14-K. “Her hafta yaptığımız farklı uygulamalar ile artık bu dersi dört gözle merakla bekledim…”

Otantik Görevlerin Diğer Derslerde Uygulanma İsteğine İlişkin Nitel Veri Çözümlemeleri

Bu tema içerisinde iki alt tema ortaya çıkmıştır. Bu ana tema ve alt temalara yapılan yükleme sayıları aşağıdaki tabloda yer almaktadır.

Tablo 5: Otantik Görevlerin Diğer Derslerde Uygulanma İsteğine İlişkin Alt Temalar Ve Yükleme Sayıları

Alt Temalar	f
Teknik dersler	**23**
• Bilgisayar Yardımıyla Tasarım Ve Modelelme	9
• Sensörler	8
• Grafik Ve Animasyon	4
• Veritabanı	2
Diğer dersler	**7**
• İngilizce	5
• İnkılap Tarihi	2
Toplam	**30**

Tablo 5 incelendiğinde otantik görevlerin diğer derslerde uygulanması isteğine ilişkin olarak “teknik dersler” (f=23) ve “diğer dersler” (f=7) şeklinde iki alt tema ortaya çıkmıştır. Bu temalara ilişkin referans cümlelerine aşağıda yer verilmiştir.

Öğr 1-K. “Aslında bu uygulamalar Tarih dersine de çok uygun. Mesela kurtuluş savaşı ile ilgili müzeler ziyaret edilse, Çanakkale gezisi yapılsa, sinema filmleri izlense daha iyi aklımızda kalır ve benliğimize yerleşir…”

Öğr 2-E. “Tasarım ve modelleme yaparken bence gerçekçi düşünmeye çok ihtiyaç var. Mesela çizeceğimiz tasarımlar ile ilgili gerçekçi yaşantılar geçirsek, gidip canlı bir şekilde görsek, araştırsak, hem mimarlardan hem de tasarımcılardan bilgi ve eğitimler alsak çok faydalı olur…”

Öğr 6-E. “Veri tabanı dersinde de uygulanabilir. Çünkü gerçek bir veri tabanı oluşturabilmek için iş yerleri ziyaret edilip işletmelerin veritabanları incelenebilir, eğitimler düzenlenebilir…”

Öğr 10-E. “İngilizce dersinde çok faydalı olurdu. İşi pratiğe yani konuşmaya dökmek için sadece İngilizce konuşulan kültür gezileri hatta yurt dışı gezileri yapılarak ana dili İngilizce olanlarla öğrenme fırsatı sunulabilir…”

Öğr 11-K. “Grafik ve animasyon dersinde de etkili olabileceğini düşünüyorum. Çünkü bu ders üç boyutlu çizime dayalı. Yani hayal etmeye, gerçekçi düşünmeye ve tasarlamaya dayalı. Çizeceğim nesnenin veya yerin öncelikle ihtiyaçlarını gerçek paydaşlarla belirleyip, gerçekten gözlemleyerek çizmenin daha faydalı olacağına inanıyorum…”

Öğr 13-E. “Sensörler dersinde çok etkili olur. Devre tasarımının kağıt kalemle olması çok saçma. Uygulama sahasında gerçek uzmanlardan hatta elektrikçilerden seminerler almak ve iş yerlerinde tasarımları izleyip denemek çok etkili olur diye düşünüyorum…”

Sonuçlar

Nitel verilerin analizi sonucunda beş farklı ana tema ortaya çıkmıştır. Bu ana temalar kendi içlerinde alt temalara ve kodlamalara ayrılmıştır. Verilerin analizi sonucunda otantik görev odaklı uygulamalar ile ilgili görüşlere ilişkin öğrenciler duygularını ve düşüncelerini olumlu-olumsuz bağlamda belirtmişlerdir. Öğrencilerin otantik görevlere ilişkin olarak mutluluk, merak duyma, başarı hissetme, ilgi duyma, özgüveni arttırma, motivasyonu sağlama ve yardımlaşma isteğini arttırma şeklinde olumlu duygular hissettikleri belirlenmiştir. Bu duyguları destekleyecek nitelikte öğrenciler otantik görevleri eğlenceli, yaratıcı, aktif katılım yapmayı sağlayan, empati yeteneğini geliştiren ve sosyalleşmeye zemin hazırlayan uygulamalar şeklinde olumlu düşünceler geliştirmişlerdir. Bu olumlu duygu ve düşüncelerin yanı sıra bazı öğrencilerin otantik uygulamaları zor ve zaman kaybı olarak gördüğü bazı öğrenciler ise bu uygulamaların stres ve korku duygularını harekete geçirdiğini belirttikleri belirlenmiştir.

Öğrencilerin otantik görev odaklı uygulamalar ile ilgili bireysel, grup arkadaşlarıyla ve danışman ile yaşadıkları olumlu durumları ifade ettikleri belirlenmiştir. Öğrencilerin bireysel anlamda otantik görevler sayesinde daha gerçekçi ve farklı düşünebildiklerini, bu uygulamaları sevip istekle katıldıklarını, bu uygulamalar ile iyi vakit geçirdiklerini ve bu uygulamaların kendilerini hem mesleki anlamda hem de araştırmaya yönlendirdiğini ifade ettikleri belirlenmiştir. Öğrencilerin otantik görevler sayesinde grup arkadaşlarıyla iyi bir iletişim kurarak uyum ve işbirliği içerisinde çalıştıklarının belirlenmesidir. Öğrencilerin otantik görevler sayesinde danışman hocalarıyla da güven üzerine kurulu güçlü bir iletişim kurabildikleri ve danışmanlarının bu süreçte onlara rehberlik ettiğini düşündükleri sonucu elde edilmiştir. Bazı öğrencilerin bireysel olarak otantik görevlere ilişkin özgüven sorunu yaşadıklarını ve başaramama korkusu yaşadıklarını, bazı uygulamalarda da zaman sorunu yaşadıklarını ifade ettikleri belirlenmiştir. Bazı öğrencilerin de otantik görevlerde grup arkadaşları arasında adaletsiz iş bölümü yaptıklarından ve sorumsuz davranan arkadaşları olduklarından şikayet ettikleri belirlenmiştir. Bazı öğrencilerin ise uygulamalarda bilgisayarları ile ilgili teknik arızalardan kaynaklı sorunlar yaşadıklarını ifade ettikleri belirlenmiştir.

Elde edilen başka bir sonuç ise öğrencilerin otantik görev odaklı uygulamaların programlama öğretimine etkisi ile ilgili belirttikleri olumlu durumlardır. Öğrencilerin bilişsel anlamda otantik görevler sayesinde eksikliklerini fark edip tekrarlar yaparak ve daha yaratıcı düşünüp problemleri daha gerçekçi analiz ederek daha verimli ve kalıcı öğrenmeler gerçekleştirdiklerini, bu durumun da ders başarılarına olumlu yönde katkı sağladığını ifade ettikleri belirlenmiştir. Ayrıca otantik görevlerin programlama dersinin önemine ilişkin farkındalık kazandırdığı da belirlenmiştir. Öğrencilerin duyuşsal anlamda ise otantik görevler sayesinde programlama dersinde eğlendiklerini ve bu dersi daha fazla sevdiklerini, derse ilişkin ilgi ve meraklarının arttığını, bu dersi öğrenmeye ilişkin özgüvenlerinin ve motivasyonlarının arttığını ifade ettikleri belirlenmiştir. Elde edilen son sonuç ise öğrencilerin otantik görev odaklı uygulamaları başka derslerde kullanmak istediklerine yöneliktir. Bazı öğrencilerin otantik görev odaklı uygulamaları teknik derslerde, bazı öğrencilerin ise otantik görev odaklı uygulamaları gerçek hayatta pratik yapmaya dayalı olan İngilizce ve ezbercilikten kurtulunması gerektiğine inandıkları İnkılap Tarihi derslerinde kullanmak istedikleri belirlenmiştir

Kaynaklar

Aydın-Aşk, Z. (2016). Matematik Dersinde Otantik Görev Odaklı Öğrenme Süreçlerinin İncelenmesi: Bir Eylem Araştırması. Yayımlanmamış Doktora Tezi, Gaziantep Üniversitesi Eğitim Bilimleri Enstitüsü, Gaziantep.

Elliot, C. (2007). Action Research: Authentic Learning Transforms Student and Teacher Success. Journal of Authentic Learning, 4(1), 34-42.

Gomes, A. and Mendes, A. J. (2007, September). Learning to program – Difficultiesand Solutions. Paper presented at International conference on Engineering Education, Coimbra/ Portugal. Retrieved from http://icee2007.dei.uc.pt/proceedings/papers/411.pdf, (Retrieved November 12, 2018).

Gürgür, H. (2016). Eylem Araştırması, Ahmet Saban ve Ali Ersoy (Editör). Eğitimde Nitel Araştırma Desenleri. Ankara, Anı Yayıncılık, s. 3-50.

Iucu, R.B. and Marin, E. (2004). Authentic Learning in Adult Education. Procedia - Social and Behavioral Sciences, 142, 410-415.

Jancheski, M. (2017). Improving Teaching and Learning Computer Programming in Schools through Educational Software. Olympiads in Informatics, 11, 55–75.

Karasar, N. (2018). Bilimsel Araştırma Yöntemi. Ankara, Nobel Yayıncılık.

Lombardi, M. M. (2007). Authentic learning for the 21st century: An overview. Educause Learning Initiative. Retrieved from https://library.educause.edu/resources/2007/1/authentic-learning-for-the-21st-century-an-overview, (Retrieved December 12, 2018).

Moffett, P. (2012) Learning About Outdoor Education Through Authentic Activity. Mathematics Teaching, 227, 12-14.

Nam, D., Kim, Y. and Lee, T. (2010). The Effects of Scaffolding-Based Courseware for the Scratch Programming Learning on Student Problem Solving Skill. Paper presented at Proceedings of the 18th International Conference on Computers in Education, 723-727. Putrajaya, Malaysia: Asia-Pacific Society for Computers in Education. Retrieved from http://lexitron.nectec.or.th/public/ICCE%202010%20Putrajaya%20Malaysia/ICCE2010%20Main%20Proceedings/c6/short%20paper/C6SP153.pdf, (Retrieved April 2, 2019).

Pea, R.D. and Kurland, M. (1984). On The Cognitive Effects of Learning Computer Programming. Retrieved from https://telearn.archives-ouvertes.fr/hal-00190532/document, (Retrieved April 3, 2019).

Yıldırım, A. ve Şimşek, H. (2008). Sosyal Bilimlerde Nitel Araştırma Yöntemleri. Ankara, Seçkin Yayıncılık.

QUALITY OF LIFE AND CHILD YOGA IN PEDIATRIC ONCOLOGY PATIENTS

N. Ecem OKSAL GUNES
ecem1701@hotmail.com

Senay CETİNKAYA
senayg_202@hotmail.com

Özet: Onkolojik tanı ile hastaneye yatırılan çocuklar azalan hareket, denge gelişimi ve fonksiyonel aktivitenin azalmasından dolayı kas güçsüzlüğü yaşamaktadırlar. Kanser tedavisinde ilk basamak indüksiyon tedavisi olarak; kemoterapi, radyoterapi ve kök hücre naklini kapsamaktadır. Kemoterapinin yan etkileri arasında büyüme gelişmeyi geciktirme, depresyon, anksiyete, kronik ağrı, işitme kaybı, zayıf kemik yapısı bulunmaktadır. Ayrıca radyasyonlu kemoterapi, akciğer dokusunun enflamasyonu, enfeksiyonu, kas güçsüzlüğü ve alt ekstremitede denge kayıpları oluşturabilmektedir. Onkolojik tedavi gören çocukların fiziksel aktiviteleri ile ilgili rehber niteliğindeki bilgiler sınırlıdır. Bu hastaların bireysel ihtiyaçlarına uygun bir şekilde egzersiz yapabilecekleri güvenli bir ortam sağlanmalıdır. Pediatrik onkoloji hastalarına yönelik yapılan egzersizleri inceleyen çalışmalarda Yoganın; güç, denge, ağrı kontrolü ve yaşam kalitesi için pediatrik egzersiz programlarına dahil edilen bir egzersiz olduğu görülmüştür.

READING THE STREETS OF BALAT AND URBAN IDENTITY

Serdar Kasap[1], Sezer Yörük[2]

[1] Bilecik Şeyh Edebali University, Vocational school - Department of Interior Design, Bilecik- TURKEY

[2] Nişantaşı University, Faculty of Engineering and Architecture/ Student of Architecture, Istanbul- TURKEY

serdar.kasap@bilecik.edu.tr

Abstract: Being one of the biggest metropolises in the world, İstanbul is a peerless city with its natural beauties, history, archaeological heritage and socio-cultural life. These properties both create the rich identity of the city and provide a strong urban image. The skyline composed of the historical texture of the city and physical elements offers an extremely impressive view. Fener-Balat is an important element of the physical structure of the city of Istanbul. It plays an important role for historic and cultural values of Istanbul to take a shape. As an unforgettable part of the metropolis of Istanbul, Balat where Turkish, Rum, Armenian, Jewish and Bulgarian identities and mosques, churches and synagogues co-exist has the characteristic of a sub-region with strong elements forming its identity. It is observed that big changes have occurred in social textures and population compositions of these regions. The innermost parts of the city, where particularly the urbanized, settled upper-middle class families have left became the areas where poor or immigrant population became dense. The world continuously keeps changing within the frame of socio-cultural, physical, economical, political and technological dynamics and this change reflects on urban areas. The urban area which takes shape as a result of mutual interaction of these dynamics involves some differences and similarities in every age, every country and every city. Therefore no city is being shaped in the same way as others.

In the study, the relationships established by various social groups with the region are examined through printed texts and news on Internet. All sources are compared in the study and analyses of language, wording and ideological approaches are made and the meaning of Fener-Balat area for different groups is discussed. It s observed that the memory generated in the news on Internet regarding Fener-Balat region is composed of images generated by the groups from their ideological positions. In printed sources, on the other hand, it is observed that some kind of a popular history is narrated rather than generating a memory.

Keywords: Istanbul, Balat, Urban Identity, Roman, Culture.

Introduction

The geography, space, or human variant in the universe is unique to the entire world, the existing world, the understanding of human behavior may not be taken for many years, the reasons for neglecting the best interview, is actually looking for their own problems. In the field of psychology, it approaches the 60s, in its place of contents, or as a “relevant, confounding variable gereken that needs to be controlled, or at best, as a passive background to describe how it affects human behavior (Göregenli, 2010).

In the process of shaping the urban space, morphological, functional, visual or contextual features change in the urban built environment. Some of these changes cover a large area and may not be possible to observe. However, it is possible to observe concretely the changes taking place especially on the scale of single parcel or building block. In other words, the changes that can be observed directly in urban space appear as changes in morphological characteristics (building height, construction order, parcel dimensions, building form, etc.) (Ünlü, 2006).

How do spatial variables affect human behavior? In the broader sense, the science of psychology has always wondered and researched the effects of the environment on human behavior. However, to Kunt Lewin (1890-1947), the turning point in defining the environment-human relationship, the environment was generally criticized by psychology with a Skinner box or well-structured laboratory environment. The world of the 60s has shown that the world can no longer be "explained" by familiar epistomologies, so that it can no longer be "controlled". Life was much more complex than the one that could be controlled in a laboratory independent of time and space, and simulation was impossible (Göregenli, 2010).

Beginning in the 1960s, with the influence of major paradigms such as phenomenology, aesthetics, linguistic theory (semiotics, structuralism, poststructuralism, deconstruction), Marxism and feminism, which were internalized from other disciplines and reformed the disciplines of literature, philosophy, sociology, anthropology as well as architectural theories. and the interdisciplinary nature of architectural theory is strengthened. Architects have been working on determining the meaning in the linguistic field and adapting the acquired knowledge to architecture through linguistic analogy (Çağlar and Ultav, 2004).

In recent years, the relationship between human behavior and the physical environment has attracted the attention of researchers in the social sciences and environmental design disciplines and the field of study is rapidly evolving. The multidisciplinary character of environment - behavior studies and its application to real - world problems related to environmental design played an important role in the development of this field (Turgut, 1990).

Environmental Components

Environment and human relations are discussed in many disciplines such as sociology, psychology, philosophy, architecture and geography, especially social psychology, environment-behavior studies, human-environment relations, environmental psychology, environmental design research. The city, which is the stage of social relations networks, intellectual and cultural images, is also one of the basic elements of the social processes. Therefore, the history of mankind or world history is generally accepted as the history of cities and urban life and environment-human relations are examined through urban and urban spaces (Solak, 2017).

Different definitions and classifications of the concept of environment have been made in the Human - Environment interaction, which is dealt with from different perspectives in Environment - Behavior studies. For example, Rapoport defines the environment in the broadest sense as any condition or effect outside the ornagism, group or system being studied. Ittelson describes the environment as a system with seven components, such as perceptual, semantic, aesthetic, adaptive, integrative objective and general ecological relations of all these components. Lawton considers the environment as an ecological system with five components. Individual ; physical environment; personal environment, including important sources of behavior control such as family and friends; age, class, lifestyle, ethnic origin; social environment consisting of social norms and institutions (Turgut, 1990).

According to Rapoport, 'In human-environment relations, culture defines three different points of view that define each other. According to the first approach, culture is the lifestyle of a typical group. The second is based on the fact that culture is a system of cognitive schemes, symbols and meanings formed by symbolic codes. Thirdly, it is the point of view that culture is a set of adaptation strategies for survival in relation to ecology and resources. " (Batmaz, 2013).

Social rules, shared values, common experiences such as people's environmental experience, knowledge, learning and attitudes that determine the decisions of people in environmental choices or reshaping the environment reveal the inevitability of human-cultural interaction by creating a verse within themselves.

Kevin Lynch highlighted the use of five main components in creating the image of the environment in people's minds by highlighting urban images in identifying urban components: roads, boundaries, regions, nodes and sign elements. Lynch's work (1960) is based on cognitive interaction between urban space and users (Köseoğlu, 2011). The author wrote in his book: en I went back to the past when I was writing this book, and I met both myself and those old people again in the narrow, curved streets. I wandered again through the streets of my childhood and youth, fascinating with the people who served in the chirping bazaar of Balat, the music and the sounds of people coming from the taverns, the guilds, the summer cinemas and the unique ruins. Those relentless slopes stopped breathing again. I've always been proud to have a real value, a place that is truly unknown, and I am still talking about the general environmental fabric of balat (Tecim, 2017).

“The so-called Kant imaginary representation is the person who is reduced to the level of subjective representation of mental action and has said that the subject acting in the field of aisthesis cannot actually represent the idea. Images are fictions produced within the framework of priorities; instead of representing what they have sent, they rebuild it. In other words, the image of something is not its origin and this break between the image and what it refers to has unquestionably liberated the image. Kant, who no longer shows any sign, images by ıyla beautiful reflections ”(Schiller) - after the Kant independence - at least the Romantics call it independence and self-directionality - they only mark themselves” (Alemdar, 2009).

When I was talking about Balat, I wrapped up with pleasure in the mad wind that shuddered me and the cold that cut my face like a nail. My head is full of thoughts, my heart is full of emotions, my hands are in my pockets, I walk through the woods in the woods, narrow and pitch dark streets, hearing the weight of something both in my heart and my mind. It would give me a different melancholy when the stove walls that sprung out of the chimneys and swung in the wind wandered around me like ghosts and then disappeared. The blind pits of the houses that accumulate in my left and on my right would warm me a little. I have determined my route as Ayvansaray by avoiding the wrath of stray dogs and watching the garbage accumulated here and jumping over the puddles if there are any bal (Balim's socio-cultural structure clearly speaks of it) (Tecim, 2017).

The fact that the architectural environment started to be created, read and criticized by these "structured meaning biçim forms caused the image to be criticized in this field as well. For example, formal elements of historical buildings in Turkey (domes, minarets, eaves, bay windows, etc.), Hanging their tectonic and formal situations, they began to exist together with the means of the structure. These architectural elements are molded as forms and new forms produced for these meanings have started to be perceived as meaningless (Alemdar, 2009).

'Social And Spatial Restructuring In Balat"

Auge says that the space studied by anthropology is the space used by people, and that the legibility of that space is enhanced by the inhabitants, equipped with symbols that reflect their social existence and schemata. The three main themes symbolized - intertwined - are identity, relation and history. The way of symbolizing the place of a community is the factor that determines the personalities of individuals and constitutes their experiences (Kural et al., 2013).

Social relations, which are socially reproduced by forming a whole with the life style in the environment, and which are in constant change and development, cause the redefinition of urban identity. Social experiences, opinions, beliefs and behaviors constitute the socio-cultural structure of society. These elements, which direct one's social behaviors, also play an active role in the formation of urban identity. Identity affects the formation of the designer as much as society. Therefore, it can be defined as a cultural phenomenon in which completely new or past elements are reinterpreted. It is necessary to perceive and comprehend the city in a continuity from past to future.

The elements constituting the urban identity can be evaluated in terms of elements originating from natural, human and human-made environment.

Identity elements originating from human environment are individuals and society. The identity of the individual matures in the environment in which he lives. All conscious, unconscious perceptions, knowledge, experiences, thoughts, behaviors, expectations and predictions about the future, needs and desires of the individual, and also the identity of the community in which he lives are shaped. The individual identity forms the group and community identity. Accordingly, identity elements originating from the human environment are composed of sub-elements for demographic structure (population size, structure, density, age groups ...), institutional structure (political, administrative, legal, economic ...) and cultural structure (Importance). and Kılıçarslan, 2005).

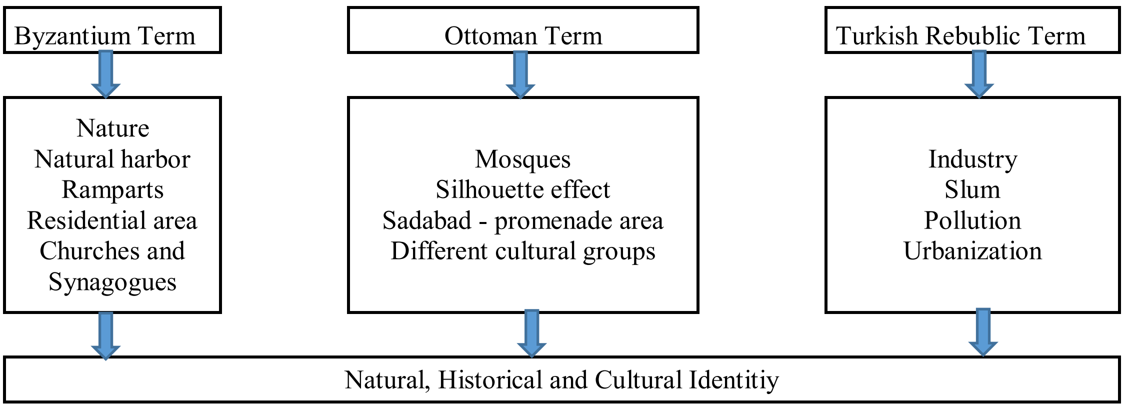


Figure 1. Identity formation of Haliç in historical process (Importance and Kılıçarslan, 2005).

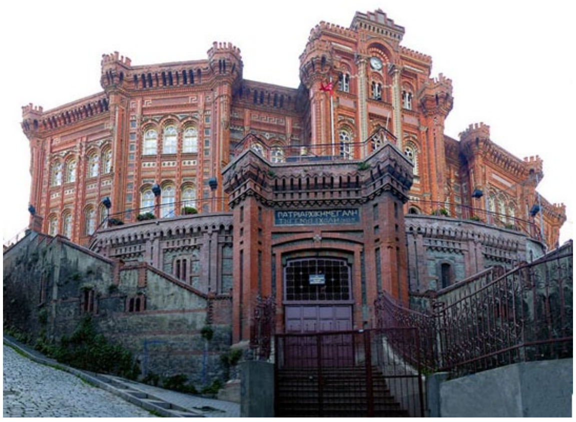
Before defining space, Heidegger believes in the necessity of understanding it and describes it as an integral part of the existence of man and his world with the idea of being in the world (Hisarlıgil, 2008). Various writers emphasize that there are semantic differences between the creator / designer of the space and its use or distance reading. For this reason, it is important to establish a language unity between the designer and the reader of the space. In the space-user communication environment, the language of space is a communication tool. The designer should be able to reach the user and express himself / herself while transforming the space he created and designed in his memory into a concrete product. In order to do this, he / she should evaluate and shape the spatial elements loaded with meaning that correspond to the concepts used in the project by choosing from the culture, expectations and traditions of the society with their own knowledge and experience. Thus, the user can easily detect and read space (Günal and Esin, 2007).

There is a close connection between people's places and identities. Because they look at the world from this “space / and“ home ve and try to give meaning to everything that is going on around them in proportion to their equipment in this “space”. As Gaston Bachelard puts it, evi the house of people opens up to the world. İ The connection of man with the “house” is in fact his connection with the ”world ((Tüzer, 2007).

Fener, Balat And Ayvansaray Neighborhood, What Makes This Place Special?

I think it would be a good place to say that Istanbul is the most surprising district. As you walk through the streets, you become aware that you are special; you cannot believe what you see, you find yourself in a visual and emotional feast. Here you can see what Istanbul, Constantinople, Bizantion mean. Turks, Greeks, Jews, Armenians, Bulgarians and Gypsies lived for years as neighbors. It is the most beautiful representation of the cultural mosaic of the 3000-year-old Istanbul city. On the other hand, now extinction, abandonment, deceit, forgotten, has become a symbol of ignorance, Fener, Balat, Ayvansaray. These streets are covered with the sadness of a faded, almost extinct wealth. Even though it may seem cute that the chirp of an impassive life that doesn't belong here, sometimes, you're buried and connected to this special world birden.When you say Fener, inevitably, the Patriarchate and Fener Greek High School, which welcomes people at the beginning of that breathtaking hill, comes to mind. Balat is the picture that comes to mind with its typical houses, synagogues and colorful bazaar. Ayvansaray is a place with more garden houses and walls.

	
Fener Greek orthodox patriarchate (frontage)	Fener Greek Ortodox patriarchate (rear facade)

	
Fener Greek High Scoll (frontage)	Fener Greek High Scoll (rear facade)
	
Typical Balat Houses	Typical Balat Houses
	

Balat Bazaar	Balat Bazaar
	
Balat Bazaar	Balat Bazaar
	
Ahrida synagogue (Inside)	Ahrida synagogue (frontage)

Fener, Balat And Ayvansaray Today

The districts of "Fener, Balat and Ayvansaray alan, located on the shores of the Golden Horn and constitute a great urban potential for Istanbul, are a great cultural heritage for Istanbul with its historical and socio-cultural richness extending along the historical Byzantine sea walls. The old Jewish quarter is one of the last settlements inhabited by Roma today. The gentrification process has continued in the region for the last 20 years. On the other hand, aside from the rehabilitation works currently underway, it is still an idle region and sanitary conditions have not been improved.

The region was first brought to the agenda in the early 2000s with the rehabilitation project started with Fatih Municipality-European Union cooperation and protection-improvement targets. In the second stage, Fener-Balat Renovation Project works are taking place. Thus, the restoration works carried out under the leadership of the European Union with Fatih Municipality were replaced by renovation works carried out in a public-private partnership. The region was declared a renewal area in 2006, based on the Law No. 5366 on the Conservation, Conservation and Use of Worn Historical and Cultural Immovable Assets.

About Law No. 5366

Law No. 5366 on the Kanun Renewal Protection and Survival of Immovable Historical and Cultural Immovable Assets', approved by the Council of Ministers Decision dated 17.11.2005 and numbered 2005/9668, published in the Official Gazette dated 14.12.2005 and numbered 26023. In Article 4 (f) of the Implementing Regulation titled başlıklı renewal area sit, the areas registered and announced as protected areas and protected areas and the areas within the protected areas belonging to these areas are defined and accepted by the Council of Ministers upon the proposal of the competent authority. (Ahunbay et al.2016).

Urban renewal, which can be defined as the process of reorganization of urban building stock, urban areas and social relations, often transformation, revival, revitalization, etc. with and / or in place of concepts. Different nomenclatures and definitions related to the process in question cause the evaluations to be intertwined (Şentürk, 2011).

Renovation And Generation Studies In Balat, Fener, Ayvansaray

In Fener, Balat, Ayvansaray region, in order to ask how the people in the region view the urban transformation and how they meet the gentrification processes, the inhabitants of this neighborhood were asked what problems they had and what they needed.

Many people who have participated in research with the local people have been living here for a long time. Some of the people living in the neighborhood are living, some of the region consists of leading artisans. Almost all of the researchers stated that the region was ignored. They state that even if they have heard that the problems will be solved before the local elections, the problems will continue exponentially. The participants say that many projects have been produced in the region and that in every project the authorities say Bal Balat will change, everything will be nice "but nothing has changed.

The main problems of the participants who live in the region are the neglect and weakness of the buildings in the neighborhood. The reason for this problem is that the buildings in the neighborhood are registered and because of this reason they can not maintain their buildings.

According to the opinions of the people living in the neighborhood, the reason for the lack of service to Balat is that the state considers the inhabitants of the municipality as suburbs, and that the majority of the nearby constructions are near nightlife. They also think that due to the low level of culture of the inhabitants, the district does not provide adequate services.

Since the buildings in the region could not meet the needs of the day, both the people living in Istanbul and the people who lived there preferred to settle in new places. As the physical conditions of the vacated houses are constantly deteriorating, they are preferred by low-income families. Balat people are poor due to unemployment. The poor neighborhood affects the tradesmen and prevents the development of the environment. The continuation of the tradesmen situation in the surrounding area leads to a homogenous structure with the presence of people from all walks of life.

There is not enough children's playground in the neighborhood. The lack of cultural activities (theater, cinema, exhibition hall, etc.) causes the streets to be vacated in the evening.

Original, Spatial And Social Texture

It has been determined that the buildings in the region need to be renovated. The weaknesses of the façades of some buildings and the internal structures of some buildings were determined. Within the scope of the study, it is necessary to ensure the restoration and rehabilitation of the buildings in accordance with the original, not with demolition and reconstruction. Thus, the neighborhood does not lose its own stance and preserves its historical texture. The shanty houses in the region must be demolished and constructed in accordance with the environmental texture that can reflect the spirit of the region.

The inability of the region to renew itself for many years caused periodical problems. The neighborhood continues to have hemeonomic, social and cultural problems both physical infrastructure today. Due to these problems, the residents of the district agree that the region will be in a much better condition than the old state regardless of the quality of the renovation works. According to the participants, the renewal of the region will prevent the mentioned problems and the values of the properties will increase and consequently the social, economic and cultural structure will change and the income of the owners and the artisans will increase.

In recent years, the movement of trades in the neighborhood real estate trades, traders, those who make the “old residents” (foreigners) who deal with real estate business non-Muslims, rich, high society, artists, intellectuals, expats, lawyers, doctors and engineers who have a professional profession.

A significant number of respondents who believe that building purchases and renovations in the region are good for the region perceive the fact that purchases are made silently by foreigners as a threat. According to the participants, the first of the reasons for my region to be preferred is that the region, which is the most beautiful place of Istanbul, will be a very valuable district in the future.

Outdoor Stage With Historical Decor; Start

The city is a multi-faceted phenomenon that has been in the interest of many disciplines and has been defined in many ways. Today, although it is argued that all the cities of the world are starting to resemble each other, it is a fact that the dynamics, socio-cultural interaction and development process of each city are different from each other. Therefore, each city has a different history, a silhouette, social life and identity formed with a different structure.

According to Al do Rossi, the city is hidden within its historicity that has created a collective consciousness over time. Rossi's approach is not to create new ideal forms, but to use them in the essence of existing and created forms in historicality (Hagur, 2005). There is a close connection between people's places and identities. Because they look at the world from this “space / and“ home ve and try to give meaning to everything that is going on around them in proportion to their equipment in this “space”. As Gaston Bachelard puts it, evi the house of people opens up to the world. I The connection of man with the “house” is in fact his connection with the ”world ((Tüzer, 2007). Rather than neglecting personal changes, Barker thought that they would be self-contained with the concept of behavioral environment and that environmental factors were more important. Individuals move every day in a wide range of behavioral environments and they control their behavior; but they are not personal characteristics. For example, the main street, post office, classroom, hair salon, cinema, where any person lives, are all behavioral environments. Each is described in terms of mutually dependent environmental characteristics that make it homogeneous (Göregenli, 2010).

According to Bailly, the space represented becomes the perceived space. In other words, it becomes what is seen, heard, felt and even in the life space. However, Bertrand thinks that the perceived space is generally larger than the experiential space (Göregenli, 2010).

The first connotation of the concept of mek third space an used by Oldenburg for the first time is an order of priority. The first space corresponding to the conceptualization of the home / private space has priority. This is followed by public spaces called the second space, such as workplaces or schools. The third spaces, which are considered to be outside the first and second spaces, but can also carry the characteristics of these spaces in a sense, are at the top of the list (Demir, 2017).

Third Space Features;

• People who use third places are not in their homes or workplaces. But they are as comfortable as at home. (Homes away home)
• These places; neutral, egalitarian, cheerful places whose main activity is chat.
• They are easily accessible to everyone.
• It has a simple profile.
• These places are regulars (Oldenburg, 1991)

Istanbul and even start having an important place for Turkey, Lantern, Ayvansaray, as we can see from Istanbul, and has become a place frequented by tourists. The unspoiled historical texture, mosque, church, synagogue, patriarchate, narrow and abundant slopes with organic curves and colorful buildings are enough to turn the balat into a center of attraction. Today, we observe that cafes are opened under almost every building of balat. Young people show much interest in the neighborhood. We can connect this to the history of the district, but it can be thought that the universities of Kadir Has and Ayvansaray, which are located next to balat, are influential.

One of the most characteristic features of Balat is the antique shop, auctioneer, and second-hand shop wearers. Some of them hold auction sales, some of them old, some of them new, some of which are recently fashioned, and some of them specialize in major fields such as toys and electronic devices that transport people to their childhood. They all have one thing in common: it gives people intravenous nostalgia.

Balat was always nice. Who knows, he would come again, but most of the young people were outside the radar. Balat stopped, stopped, with the concept spaces opened to become the new address of the old Cihangir and Galata goers. At the weekend, they started to come to Balat for breakfast and to get up from Sarıyer just to have a coffee. Every corner in Balat is full of colorful Balat houses with every bay, with cozy concept cafes, breakfasts, 3rd wave coffee shops, modern antique shops and vintage shops.

The Agora Tavern is a living legend. For almost 140 years, every raki-loving pub has been coming to the bar, like a pub with ossified goers. Even in the dull days of Balat, the neighborhood was a shining place.

Balat has become a place where art houses take place, where handmade, ceramic objects are made, cloth bags, badges of anime characters, handmade notebooks and postcards, and design products are produced.

The natural texture of the neighborhood is the backdrop for photographic photographers and newlywed couples to have their wedding photos taken on the streets that are open-air scenes.

The neighborhood, which used to be the venue for many films and series in the past, now creates a natural outdoor scene for a series that is completely owned by it. The first question asked by the residents of Balat is nerede Where is the Çukur withdrawn? Ken while some guides organize the 'Çukur' tour and respond to the request.

The 'Çukur' series brings thousands of people to the historical streets of Balat. Founded benches, street music played in the street, guiding children in return for the money and more .. Here, step by step Balat and "Çukur" tourism ...

Balat, one of the oldest districts of Istanbul, where the series of 'Çukur' was shot, is experiencing historical days with series tours. The attraction of local and foreign tourists to the attraction places made the shopkeepers smile.

With its colorful houses and historical texture, Fener Balat, which is one of the popular sightseeing places of domestic and foreign tourists, is now experiencing 'Çukur' tourism.

In the places used in the series, in front of the graffiti and 'Çukur' tattoos, queues are formed especially on weekends to have photos taken.

The cafes carrying the name of the series characters and cafes close to the set where the 'Çukur' music plays are also full.

References

Ahunbay, Z., Dinçer, İ., Şahin., Ç., (2016). Neoliberal Kent Politikaları ve Fener-Balat-Ayvansaray Projesi, Türkiye İş Bankası Kültür Yayınları, İstanbul.

Alemdar, Z., Y., (2009). Mimarlıkta Anlatı Olarak İmge, İstanbul Teknik Üniversitesi,Fen Bilimleri Enstitüsü,Doktora Tezi, Danısmanı : Prof. Dr. Semra Aydınlı, İstanbul.

Batmaz, S., K., (2013). Tasarımda Çeşitlenme Sağlayan Yöntemlerin Günümüz Mekan Uygulamaları Üzerinde İncelenmesi, İstanbul Kültür Üniversitesi, Fen Bilimleri Enstitüsü, Yüksek Lisans Tezi, Anabilim Dalı: İç Mimarlık ve Çevre Tasarımı, Programı: İç Mimarlık, Danışman: Doç. Dr. Didem Baş,İstanbul.

Çağlar, N., ve Ultav, Z., T., (2004). Emile Zola Yazınından Mimari/Kentsel Mekana Dair Okumalar ve Düşünceler , Hacettepe Üniversitesi Edebiyat Fakültesi Dergisi, 2004 / Cilt: 21 / Sayı: 2 / Ss. 43-60

Demir, G., (2017). Oldenburg'un Üçüncü Mekân Paradigması Bağlamında Kütüphane Mekânının Sorgulanması, Bilgi Dünyası, 18(2), 195-223. doi: 10.15612/BD.2017.628

Göregenli, M., (2010). Çevre Pisikolojisi İnsan-Mekan İlişkileri, İstanbul Bilgi Üniversitesi Yayınları, İstanbul.

Hagur, Z., (2005). Fener - Balat Semtlerinde Kentsel Açık Alan Kullanımının İrdelenmesi Ve Semtlerin Sahikesimi İçin Bir Düzenleme Önerisi, İstanbul Teknik Üniveristesi, Fen Bilimleri Enstitüsü, Yüksek Lisans Tezi, Disiplinler Arası A.B.D. , Kentsel Tasarım Programı, Tez Danışmanı : Prof. Dr. Handan Türkoğlu, İstanbul.

Günal, B., ve Esin, N., (2007). İnsan – Mekân İletişim Modeli Bağlamında Konutta Psikososyal Kalitenin İrdelenmesi, İtüdergisi/A Mimarlık, Planlama, Tasarım Cilt:6, Sayı:1, 19-30.

Köseoğlu, E., (2011). Kent Mekânına İlişkin Kuramsal Bakışlar: Rob Krier, Christopher Alexander Ve Bill Hillier, İdeal Kent, Sayı 5, Aralık 2011, Ss. 96-111 ISSN: 1307-9905

Kural, N., Dedekargınoğlu, C., Türel, R., O., Altay, G., Tuncel, B.,(2013). Kültürün Yerleşkesi Mimari: Bacıköy Üzerinden Bir Sorgulama" Bellek Ve Kültür Uluslararası Sepozyumu, Kültür Araştırmaları Derneği Ve Bilkent Üniversitesi, Ankara.

Oldenburg, R., (1991). The Great Good Place: Cafes, Coffee Shops, Bookstores, Bars, Haır Salons, And Other Hangouts At The Heart Of A Communıty.

Önem, A., B., Kılınçaslan, İ., (2005). Haliç Bölgesinde Çevre Algılama Ve Kentsel Kimlik, İtüdergisi/A Mimarlık,Planlama Ve Tasarım Cilt:4, Sayı:1, 115-125 Mart 2005.

Solak, S., G., (2017). Mekân-Kimlik Etkileşimi: Kavramsal Ve Kuramsal Bir Bakış, Manas Sosyal Araştırmalar Dergisi, Cilt: 6, Sayı: 1.
Şentürk, M., (2011). Yenilemeye Karşı Sıhhileştirme: Fener-Balat-Ayvansaray'da Kentsel Mudahalelere Yaklaşımlar, Sosyoloji Dergisi, 3. Dizi, 22. Sayı.
Tecim. T., (2017). İstanbul Balat'la Başlar, Alternatif Yayıncılık Limited, İstanbul.
Turgut, H., (1990). Kültür-Davranış-Mekan Etkileşiminin Saptanmasında Kullanılabilecek Bir Yöntem, İstanbul Teknik Üniversitesi, Fen Bilimleri Enstitüsü, Doktora Tezi, Danışmanı; Prof. Dr. Nilüfer Ağat, İstanbul.
Tüzer, İ., (2007). Kimliklerin Çatıştığı Mekân: "Kiralık Konak" Ve Evini/Evrenini Arayan Nesiller, Bilgi - Bahar / Sayı 41: 225-239, Ahmet Yesevi Üniversitesi Mütevelli Heyet Başkanlığı.
Ünlü, T., (2006). Mersin'de Değişen Kentsel Mekân: Çamlıbel'de Morfolojik Değişim, Ytü Mim. Fak. E-Dergisi, Cilt 1, Sayı 4.

SEMIOTIC EXPLANATION OF GENDER PERCEPTION CREATED BASED ON HOLLYWOOD ACTRESSES OF 1950-1970 PERIOD

Nevin ALGÜL

algulnevin@gmail.com

Abstract: There is no doubt that the actresses in the camera frame were sculpted according to the perception of woman and the beauty of an eye looking behind the camera. There are certain visual and linguistic features that are imposed on a sexy actress, and she cannot get much out of it. Different meanings have been attributed to dark-haired actresses. The aim of this article is to examine being an actress in Hollywood between 1950 and 1970 in the light of semiotics.

Keywords: *Hollywood, semiotics, perception of women, sexy woman, modest women.*

SEMIOTIC EXPLANATION OF THE ROLES OF ACTRESSES IN THE POSTERS OF 1950-1980 TURKISH MOVIES IN CREATING GENDER PERCEPTION

Nevin ALGÜL

algulnevin@gmail.com

Abstract : The aim of this article is to investigate the role of visual and linguistic reflection forms of good family daughter, family woman and doomed backslider woman or vamp woman identities in the Turkish Cinema in the creation of gender perception.

STABILITY AUGMENTATION SYSTEM DESIGN AND SWARM OPTIMIZED ESTIMATION OF AN AIRCRAFT

Aziz KABA

azizkaba@eskisehir.edu.tr

Emre KIYAK

ekiyak@eskisehir.edu.tr

Gülay ÜNAL

giyibaka@eskisehir.edu.tr

Tansu FİLİK

tansufilik@eskisehir.edu.tr

Abstract:

Applications of Kalman filter have significant improvements at aviation industry from aircrafts to unmanned aerial vehicles and even in satellites thanks to the computationally efficient recursive formulas of the Kalman filter. One important application of Kalman filter is parameter estimation which leads to noise reduction of sensors thus ensures more precise navigation solutions for aircrafts with configurations on multiple sensors. However, noise reduction process relies on a prior knowledge of the noise characteristics such as mean and covariance. Ideally, these values are assumed to be known but in real applications, these values may not be known exactly.

In order to overcome this limitation of the Kalman filtering applications, an optimization based approach is proposed to obtain superior performance and optimality by means of linear minimum - mean square error. Results of the performed simulations showed that, proposed method can eliminate the sensor noises with different characteristics thus yields quasi - optimal and efficient estimation of an aircraft.

This study was supported by Eskisehir Technical University Scientific Research Projects Commission under the grant no: 1705F120

STABILITY OF OIL IN WATER EMULSION AFFECTED BY THE INTERACTION OF MODIFIED TAPIOCA STARCH AND MILK PROTEIN

Siwatt Thaiudom

thaiudom@sut.ac.th

Numphon Thaiwong

nthaiwong@hotmail.com

Abstract

The interaction effect of acetylated (AC) oroctenyl succinic acid (OSA) starch and milk protein (skim milk powder: SMP; sodium caseinate: NaC; orwhey protein concentrate: WPC) on the stability, change of fat particle size, viscosity, and storage modulus of oil-in-water emulsion with variable fat contentwas determined. The results revealed that types of milk protein andstarchand fat content in emulsions influenced the stability (creaming index) of emulsion. The creaming was found in emulsion containing NaC.The interaction of NaC-OSA provided the highest emulsion stability. Type of modified starchwithwhey protein did not affect creamingbut the fat content did. NaC could maintain the size of fat particles and provide a high viscosity and solid-like characteristic in emulsion better than WPC and SMP. OSA at higher concentration might inducemore phase separation with milk protein, resulting in less solid-like structure.

STUDY ON SHUNT CURRENTS IN A MULTI-STACK VANADIUM FLOW BATTERY SYSTEM

Han-Wen Chou[a], Hwa-Jou Wei[a], Feng-Zhi Chang[b], Amornchai Arpornwichanop[c], Yong-Song Chen[b]*

[a]Institute of Nuclear Energy Research, Atomic Energy Council, Taoyuan 32546, Taiwan
[b]Department of Mechanical Engineering and Advanced Institute of Manufacturing with High-tech Innovations, National Chung Cheng University, Chiayi County 62102, Taiwan
[c]Computational Process Engineering Research Unit, Department of Chemical Engineering, Faculty of Engineering, Chulalongkorn University, Bangkok 10330, Thailand

imeysc@ccu.edu.tw

Abstract: An all-vanadium redox flow battery (VRFB) is an energy storage device that uses the redox reaction of vanadium ions with different oxidation states. It has the advantages of quick conversion between charge and discharge processes, long operation life, separate power and energy capacity designs; as a result, it has been considered as one of potential candidates as energy storage systems for renewable energies. Because the electrolyte is electrically conductive, shunt currents occur within a multi-cell stack and within the piping system that connecting stacks. Shunt currents are affected by cell number in a single stack, stack number, dimensions of flow channels. In this study, a mathematical model is developed to determine shunt currents in a multi-stack system. The effect of stack number on charge transfer efficiency are predicted by this model. Results show that central stacks in a VRFB system provide more current. The maximum cell current decreases with increasing stack number.

Keywords: All-vanadium redox flow battery, multi-stack, shunt current, flow rate, charge transfer efficiency

Introduction

All-vanadium redox flow batteries (VRFBs) are devices that charge and discharge by the redox reaction of vanadium with different oxidation states. VRFBs have the advantages of long cycle life, low self-discharge, low maintenance cost, flexible design on stack power and environmental-friendly; as a result, they are considered as a potential energy storage system for renewable energy sources [1-3]. In a VRFB stack, multiple cells are connected in series for high voltage requirement. To meet the system voltage requirement, multiple VRFB stacks are connected in series in a system.

Because the electrolyte is electrically conductive, shunt currents occur in the manifolds and flow channels within the stacks and also in the piping system. The existence of shunt currents results in the decrease of electric capacity and energy conversation efficiency. As a result, it is important to understand the effect of shunt current on the battery performance and the effect of design parameters on shunt currents.

Xing et al. [4] developed a model to study shunt current in a VRFB stack based on the electrical circuit analog method. Their results suggested that increase of single cell power, reduction of cell number, and increase of the resistances of electrolytes in the manifolds and channels can help reduce shunt current loss. Tang et al. [5] investigated the effect of shunt current on efficiency and temperature variation within a 40-cell stack during standby condition by combining the shunt current model and thermal model. Their results showed that stack temperature was significantly increased due to the existence of shunt current within the VRFB stack.

It is challenging to measure shunt currents within a VRFB stack because it is not easy to install any current sensor in the manifolds and flow channels. Fink et al. [6] installed current sensors on the external hydraulic system of a 5-cell stack for the measurement of shunt currents. A mathematical model was also developed for the investigation of shunt current on coulombic efficiency. Results showed that inner cells within a stack discharge faster than outer cells. Yin et al. [7] developed a three-dimensional model to investigate the effect of shunt current distribution on coulombic efficiency. The model was validated by the experimental data and the results showed that short channel design caused a coulombic efficiency loss of approximately 23%.

Shunt currents could be reduced by increasing the electrical resistance of electrolyte in the flow path between cells; as a result, longer and smaller cross-sectional area of flow path are preferred in designing a VRFB. However, the increase of flow resistance will cause the increase of pump consumption. The trade-off between shunt current loss and pump power consumption is a key issue on stack and system design. In this study, a mathematical model that can investigate the effect of flow path design on shunt current of a multi-stack system is developed. The distribution of shunt currents in the stack and in the piping system is predicted and the charge transfer efficiency is analyzed.

Modeling Methods

In order to simplify the model, the following assumptions were made.
1. Electrical potential is uniform throughout the active area.
2. Shunt currents in the inlet paths and outlet paths are the same in a single cell and in the piping system.
3. Temperature and electrolyte concentrations within the system are uniform.

The shunt currents within a VRFB stack and in the piping system were modeled as an equivalent electrical circuit, as shown in Figure 1. In the system, there are z VRFB stacks connected in series and each stacks consists of K cells, resulting in $M = Kz$ cells totally. The parameters $R_{\mathrm{pc,S}}$, $R_{\mathrm{nc,S}}$, $R_{\mathrm{pm,S}}$, and $R_{\mathrm{nm,S}}$ represent the equivalent resistances of electrolyte within the positive channel, negative channel, positive manifold, and negative manifold, respectively. The resistances of the electrolyte in the piping system are represented by $R_{\mathrm{pc,P}}$, $R_{\mathrm{nc,P}}$, $R_{\mathrm{pm,P}}$, and $R_{\mathrm{nm,P}}$.

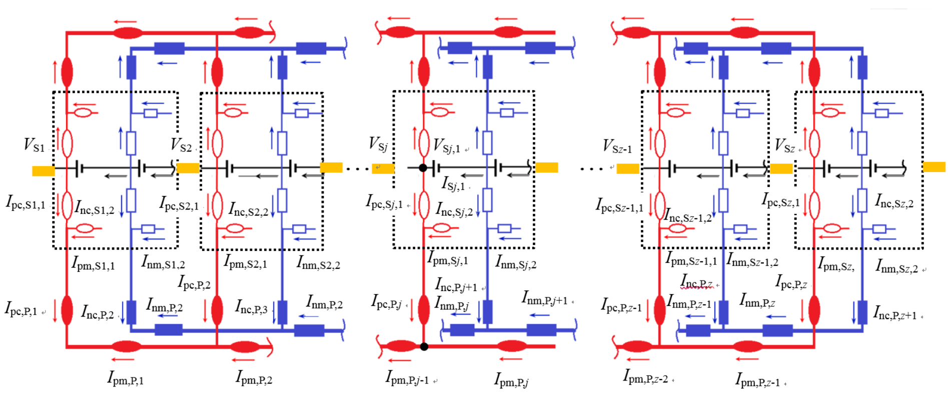


Figure 1. The equivalent electrical circuit of the system with multiple stacks in series.

Appling Kirchoff's law to the i-th cell of the equivalent electrical circuit for the stack results in linear equations.

$$I_{\mathrm{S}j,i} - I_{\mathrm{S}j,i-1} - 2I_{\mathrm{pc,S}j,i} - 2I_{\mathrm{nc,S}j,i} = 0 \tag{1}$$

$$I_{\mathrm{pc,S}j,i} + I_{\mathrm{pm,S}j,i} - I_{pm,\mathrm{S}j,i-1} = 0 \tag{2}$$

$$I_{\mathrm{nc,S}j,i} + I_{\mathrm{nm,S}j,i} - I_{\mathrm{nm,S}j,i-1} = 0 \tag{3}$$

$$V_{\mathrm{S}j,i} - R_{\mathrm{pc}} I_{\mathrm{pc,S}j,i} + R_{\mathrm{pm}} I_{\mathrm{pm,S}j,i} + R_{\mathrm{pc}} I_{\mathrm{pc,S}j,i+1} = 0 \tag{4}$$

$$V_{\mathrm{S}j,i} - R_{\mathrm{nc}} I_{\mathrm{nc,S}j,i} + R_{\mathrm{nm}} I_{\mathrm{nm,S}j,i} + R_{\mathrm{nc}} I_{\mathrm{nc,S}j,i+1} = 0 \tag{5}$$

where $I_{\mathrm{S}j,i}$ and $V_{\mathrm{S}j,i}$ represent the current and voltage of j-th stack in the system and i-cell in the stack.

In each stack, the positive electrolyte is connected with the positive channel of the positive piping system. The current and voltage relations can be modified as:

$$I_{\mathrm{S}j,1} - I_{\mathrm{T}j} - 2I_{\mathrm{pc,S}j,1} = 0 \tag{6}$$

$$I_{\mathrm{pc,S}j,1} + I_{\mathrm{pm,S}j,1} - I_{\mathrm{pc,P},j} = 0 \tag{7}$$

$$V_{\mathrm{S}j,1} - R_{\mathrm{pc}} I_{\mathrm{pc,S}j,1} + R_{\mathrm{pm}} I_{\mathrm{pm,S}j,1} + R_{\mathrm{pc}} I_{\mathrm{pc,S}j,2} = 0 \tag{8}$$

where $I_{\mathrm{T}j}$ is the overall current of a single stack. Similarly, the negative electrolyte is connected with negative piping system:

$$I_{\mathrm{nc,S}j,2} + I_{\mathrm{nm,S}j,2} - I_{\mathrm{nc,P},j} = 0 \tag{9}$$

The last single cell in each stack does not have a complete positive loop, the related equations are modified as:

$$I_{\mathrm{S}j,M} - I_{\mathrm{S}j,M-1} - 2I_{\mathrm{pc,S}j,M} - 2I_{\mathrm{nc,S}j,M} = 0 \tag{10}$$

$$I_{\mathrm{S}j,\mathrm{pc},M} - I_{\mathrm{S}j,\mathrm{pm},M-1} = 0 \tag{11}$$

$$I_{\mathrm{nc},M+1} - I_{nm,M} = 0 \tag{12}$$

In the piping system, similar equations for the current balance and voltage balance can be obtained by the same method:

$$I_{\text{pc,P},j} + I_{\text{pm,P},j} - I_{\text{pm,P},j-1} = 0 \quad (13)$$

$$I_{\text{nc,P},j+1} + I_{\text{nm,P},j+1} - I_{\text{nm,P},j} = 0 \quad (14)$$

$$V_{\text{S}j} - R_{\text{pc,S}} I_{\text{pc,S}j,1} - R_{\text{pc,P}} I_{\text{pc,P},j} + R_{\text{pm,P}} I_{\text{pm,P},j} + R_{\text{pc,P}} I_{\text{pc,P},j+1} + R_{\text{pc,S}} I_{\text{pc,S}j+1,1} = 0 \quad (15)$$

$$\left(V_{\text{S}j} - V_{\text{S}j,1}\right) - R_{\text{nc,S}} I_{\text{nc,S}j,2} - R_{\text{nc,P}} I_{\text{nc,P},j+1} + R_{\text{nm,P}} I_{\text{nm,P},j+1} + R_{\text{nc,P}} I_{\text{nc,P},j+2} + R_{\text{nc,S}} I_{\text{nc,S}j+2,2} + V_{\text{S}j+1,1} = 0 \quad (16)$$

The first and last stacks are special cases in this system:

$$I_{\text{pc,P},1} + I_{\text{pm,P},1} = 0 \quad (17)$$

$$I_{\text{nc,P},j+1} + I_{\text{nm,P},j+1} = 0 \quad (18)$$

$$I_{\text{pc,P},z} + I_{\text{pm,P},z-1} = 0 \quad (19)$$

$$I_{\text{nc,P},z+1} - I_{\text{nm,P},z} = 0 \quad (20)$$

The system voltage is the summation of stack voltage:

$$V_{\text{SYS}} = \sum_{j=1}^{z} V_{\text{S},j} \quad (21)$$

The system current is the same with the stack current:

$$I_{\text{SYS}} = I_{\text{T},j} \quad (22)$$

The cell voltage is assumed to be a function of operating current:

$$V_i = f(\text{I}_i) = V_{\text{cell}}^0 - R_{\text{e}} I_i \quad (23)$$

The resistance of the electrolyte can be determined by the dimension and geometry of the flow path. Shunt current and cell current are determined by this model. The overall unknown of the system is 5M-2. The linear equations can be expressed in a matrix from:

$$\mathbf{V} = \mathbf{AI} \quad (24)$$

where **V** is the vector, consisting of cell voltages, **A** is the matrix with resistances, and **I** is the current vector to be solved. The solution process is similar to the previously published paper [8].

Results and Discussion

Voltage and current of each cell and shunt currents in the system are coupled together in this model. An iteration procedure was applied to solve this model. All cell currents were initially assumed to be the same; therefore, the initial cell voltages were the same. The cell voltages obtained from first and second calculations were very closed, as shown in Figure 2. In order to obtain accurate results, the results obtained by the second time calculation were used for analysis.

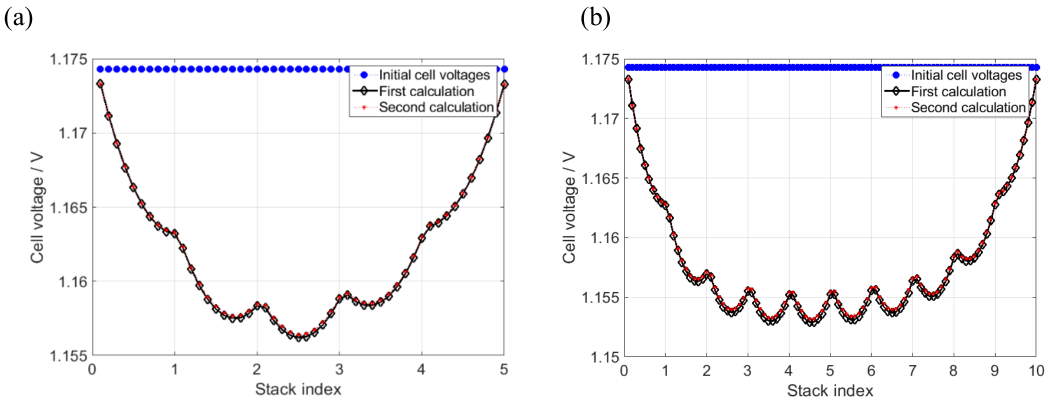


Figure 2. Convergence test of the model for (a) 5 20-cell stacks; and (b) 10 10-cell stacks.

There could be different configurations of cell number and stack number in a system. The following shows an example of designing an approximately 100-volt VRFB system with 100 cells. The stack number was designed as 5, 10, and 20 with cell numbers of 20, 10, and 5, respectively. The electrolyte conductivity and dimension of the flow channel and manifold in the stack can be obtained from our pervious study. The length of connected pipes varied with respect to stack size. Some distance was left between stacks for piping connection and maintenance, as shown in Fig. 3. The channel distance from the manifold of piping system to each stack is estimated as 15 cm. Each cell thickness is estimated as 1 cm. The dimension of the piping system and corresponding electrolyte resistances are listed in Table 1.

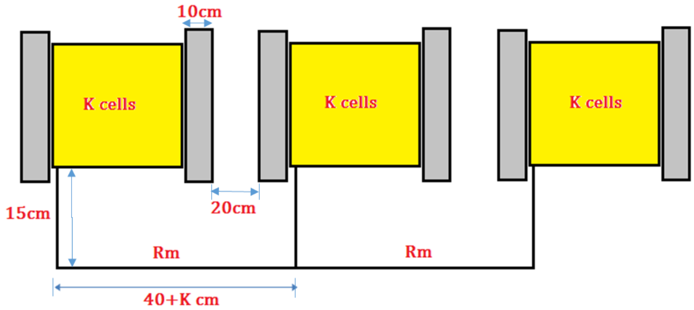


Figure 3. Dimension of piping system for electrolyte.

Table 1: Pipe length and resistance for various stack number.

Stack number, Z	Cell number in a stack, K	Pipe manifold length $L_m = 40+K$ (cm)	Pipe manifold resistance R_{pm}, R_{nm} (Ω)
5	20	60	39.52
10	10	50	32.93
20	5	45	29.64

Figures 4(a), 4(b), and 4(c) present cell current distribution in each stack for 5, 10, and 20 stacks in series when the system is charged at 54 A. It can be seen that the cell currents are lower than 54 A. Part of charge was lost due to shunt current. For the 5-stack system, the lowest cell current in each stack is located at the central cells. However, for the 10-stack and 20-stack systems, the cell current of the first and last stack gradually decreases. It is due to the shut current exiting in the flow channels of piping system. Figures 4(d), 4(e), and 4(f) present cell current distribution in each stack for 5, 10, and 20 stacks in series when the system is discharged at 54 A. The cell current distribution shows similar distribution as that in the charging process. Most central cells need to generate more current to compensate shunt current loss. It can also be observed that the cell current decreased with increasing stack number and the cell current distribution for most stacks became uniform. This is because the voltage difference between cells was reduced with decreasing cell number in a single stack.

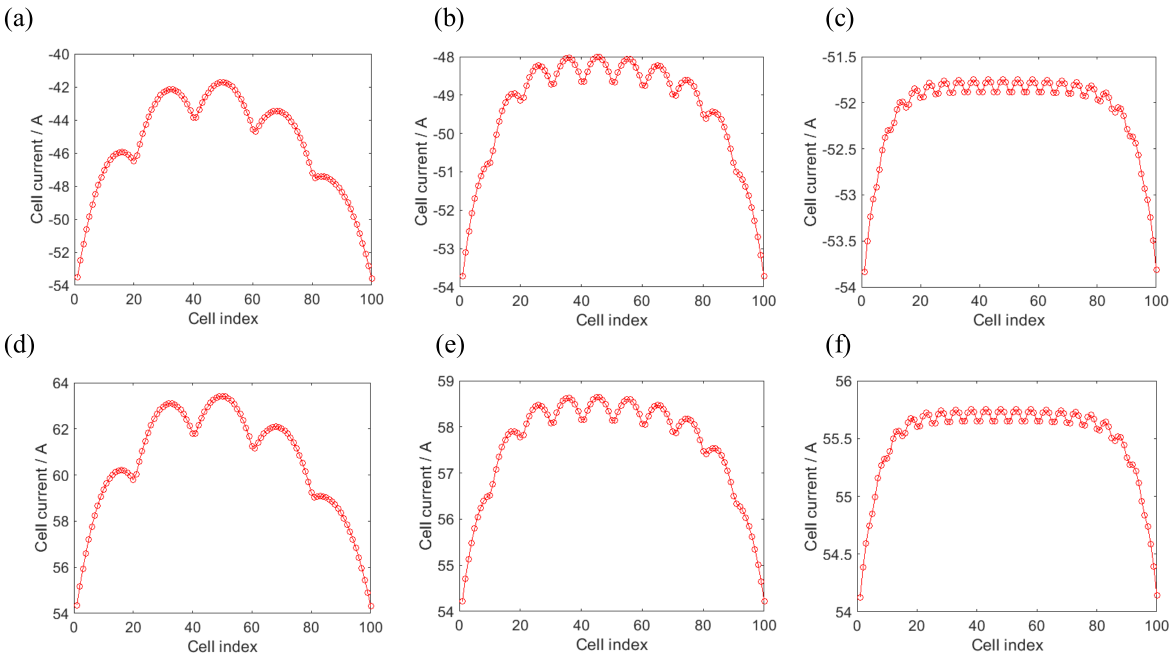


Figure 4. Cell current distribution during charge process for (a) 5 20-cell stacks; (b) 10 10-cell stacks; and (c) 20 5-cell stacks and during discharge process for (d) 5 20-cell stacks; (e) 10 10-cell stacks; and (f) 20 5-cell stacks.

Figures 5(a), 5(b), and 5(c) present shunt current in the flow channel and manifold of each stack for 5, 10, and 20 stacks in series when the system is charged at 54 A. In each stack, the maximum shunt current is located in the manifolds due to the smallest electrolyte resistance. As the stack number increases, the shunt currents in the flow channel or manifold decrease. Due to the potential difference between cells and stacks. During the discharge process, the shunt current distribution shows similar trend.

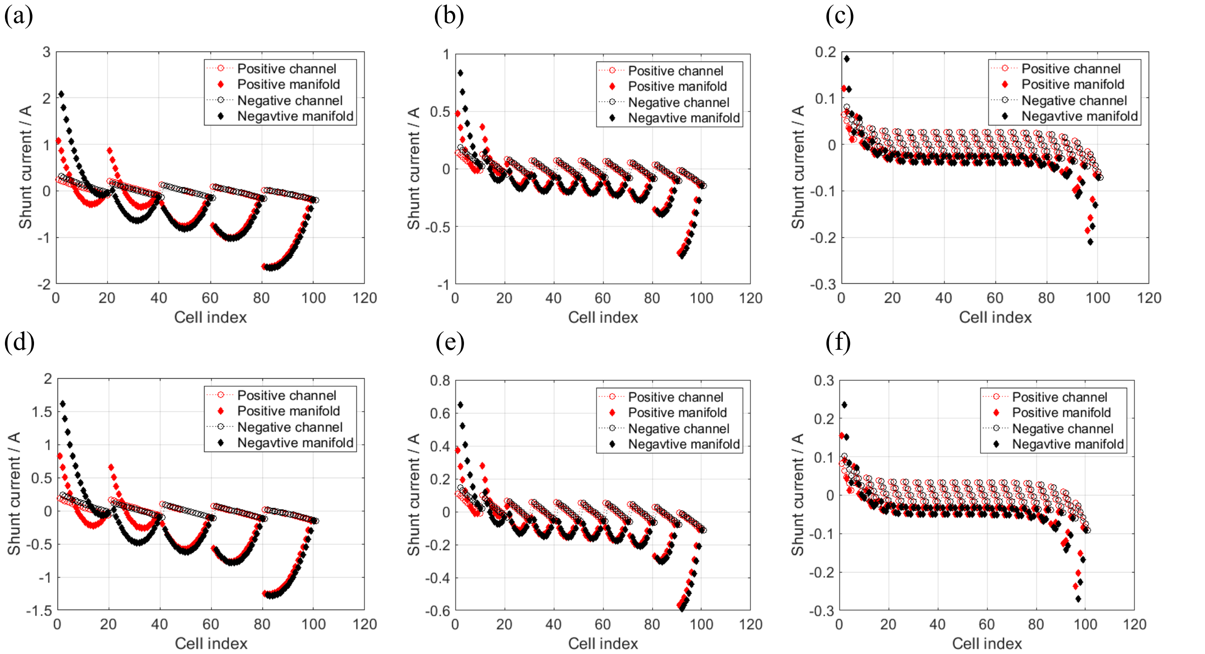


Figure 5. Shunt current distribution within the stacks during charge process for (a) 5 20-cell stacks; (b) 10 10-cell stacks; and (c) 20 5-cell stacks and during discharge process for (d) 5 20-cell stacks; (e) 10 10-cell stacks; and (f) 20 5-cell stacks.

Figures 6(a), 6(b), and 6(c) present shunt current in the flow channel and manifold of the piping system for 5, 10, and 20 stacks in series when the system is charged at 54 A. The maximum shunt current is located in the central manifold. In addition, the shunt currents in the first flow channel and last channel also showed relatively larger than those in the other flow channels. Because of the special location of first flow channels, shunt currents in the first stack converged to the first flow channel and first manifold. Similar Explanation can be applied for the discharge process, as shown in Figures 6(d), 6(e), and 6(f).

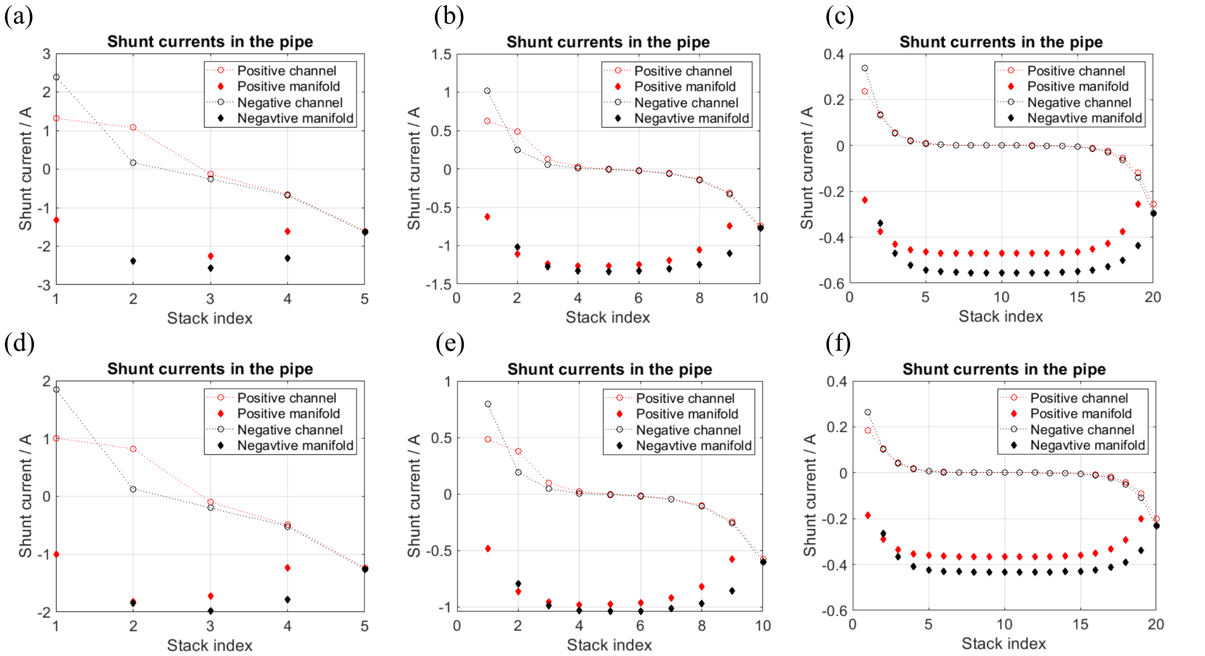


Figure 6. Shunt current distribution within the piping system during charge process for (a) 5 20-cell stacks; (b) 10 10-cell stacks; and (c) 20 5-cell stacks and during discharge process for (d) 5 20-cell stacks; (e) 10 10-cell stacks; and (f) 20 5-cell stacks.

The charge efficiency is defined as the ratio of the power charged to each cell to the power applied to the system:

$$\varepsilon_{\text{charge}} = \frac{\sum \left(V_{\text{cell}} I_{\text{cell}} \right)}{V_{\text{sys}} I_{\text{sys}}} \tag{25}$$

whereas the discharge efficiency is defined as the ratio of net power generated from the system to the power generated from each cell.

$$\varepsilon_{\text{discharge}} = \frac{V_{\text{sys}} I_{\text{sys}}}{\sum \left(V_{\text{cell}} I_{\text{cell}} \right)} \tag{26}$$

The power difference between cells and system results from shunt current loss. The effect of stack number in a system with overall 100 cells on the efficiencies is shown in Table 2. As can be seen, the efficiencies increase with increasing stack number. As cell number in a single stack decreases, the maximum cell potential difference also reduces, resulting in lower shunt current. In addition, the electrolyte resistances in the piping system are usually larger than those within a stack, causing less shunt current. Although shunt current in a system can be reduced by increasing stack number, the pump power also increases due to increased pipes. A trade-off between pump power and shunt current need further investigation.

Table 2: Comparison of efficiencies of the system with various stack number.

Stack number	Charge efficiency	Discharge efficiency	Overall efficiency
5	0.896	0.926	0.830
10	0.943	0.957	0.902
20	0.975	0.968	0.944

Conclusion

Electrolyte of the VRFB is electrically conductive, causing shunt currents in the manifolds and flow channels within the stacks and also in the piping system. The existence of shunt currents results in power loss and performance drop. Shunt current is affected by cell number in a stack and stack number in a system. In this study, the effect of system configuration on shut current is investigated by a mathematical model. The following conclusion can be drawn.

(1) Shunt current shows quasi-symmetrically distribution within the connected stacks and the maximum shunt current is located in the central manifold of the piping systems.
(2) Charge transfer efficiency increases with increasing stack number under a predetermined overall cell number in a system.

Acknowledgements

The authors would like to acknowledge the support from the Bureau of Energy (107-D0112), Ministry of Economic Affairs, Taiwan, ROC for this study.

References

[1] C. Fabjan, J. Garche, B. Harrer, L. Jörissen, C. Kolbeck, F. Philippi, G. Tomazic, F. Wagner, The vanadium redox-battery: an efficient storage unit for photovoltaic systems, *Electrochim. Acta*. 47 (2001) 825–831.
[2] M. Skyllas-Kazacos, G. Kazacos, G. Poon, H. Verseema, Recent advances with UNSW vanadium-based redox flow batteries, *Int. J. Energy Res*. 34 (2010) 182–189.
[3] F. Díaz-González, A. Sumper, O. Gomis-Bellmunt, R. Villafáfila-Robles, A review of energy storage technologies for wind power applications, *Renew. Sustain. Energy Rev.* 16 (2012) 2154–2171.
[4] F. Xing, H. Zhang, X. Ma, Shunt current loss of the vanadium redox flow battery, *J. Power Sources*. 196 (2011) 10753–10757.
[5] A. Tang, J. McCann, J. Bao, M. Skyllas-Kazacos, Investigation of the effect of shunt current on battery efficiency and stack temperature in vanadium redox flow battery, *J. Power Sources*. 242 (2013) 349–356.
[6] H. Fink, M. Remy, Shunt currents in vanadium flow batteries: Measurement, modelling and implications for efficiency, *J. Power Sources*. 284 (2015) 547–553.
[7] C. Yin, S. Guo, H. Fang, J. Liu, Y. Li, H. Tang, Numerical and experimental studies of stack shunt current for vanadium redox flow battery, *Appl. Energy*. 151 (2015) 237–248.
[8] Y.S. Chen, S.Y. Ho, H.W. Chou, H.J. Wei, Modeling the effect of shunt current on the charge transfer efficiency of an all-vanadium redox flow battery, *J. Power Sources* 390 (2018) 168-175.

SÜRDÜRÜLEBİLİR ENERJİ ile YEŞİL BİNA UYGULAMALARINDA HASTANE YAPILARININ PLANLANMASI

Ahmet Sertac KARAKAS[1*], Nail Mahir KORKMAZ[2], Tarık Serhat BOZKURT[3]

[1]İstanbul Üniversitesi, Yapı İşleri ve Teknik Daire Başkanlığı, İstanbul, Türkiye

skarakas@istanbul.edu.tr

[2] İstanbul Üniversitesi, Mimar Sinan Üniversitesi, İstanbul, Türkiye

mkorkmaz@istanbul.edu.tr

[3] İstanbul Üniversitesi, Yapı İşleri ve Teknik Daire Başkanlığı, İstanbul, Türkiye

tarik.bozkurt@istanbul.edu.tr

Özet: Enerji tüketiminin verimli düzeyde kullanılmasının sağlanması son zamanlarda daha fazla önem arz etmektedir. Özellikle ham madde olanaklarının kısıtlı olması kaynakların daha ekonomik bir şekilde kullanılmasını gerektirmekte bu hususta kaynakların geri dönüşüm olarak kullanılmasıyla çevreye olan zararlı etkilerinin azaltılması zorunluluğunu doğurmaktadır. Bu bakımdan yapılar tasarlanırken uygulanacağı yerleşim birimi, arazinin durumu, kullanılacak malzeme tiplerinin belirlenmesi ve verimli enerji tüketiminin sağlanması için yapıların sürdürülebilir şekilde yaşam döngüsünü sağlayacak şekilde bütüncül bir yaklaşımla tasarlanarak yapı tipi geliştirilmelidir. Bu bağlamda sürdürülebilir ekolojik yeşil binalar; planlama, uygulama ve işletme boyunca enerji tüketiminin en az olduğu doğal kaynakların geri dönüşüm döngüsü bakımından daha yoğun kullanıldığı atıkların asgari olduğu yapılardır. Hastane Binaları günün tamamında sürekli enerji ihtiyacına ve tüketimine maruz kalmaktadır. Bu çalışmada İstanbul Üniversitesi Cerrahpaşa'da yer alan Cerrahpaşa yerleşkesi Hastane Binalarının yenilenmesi kapsamında Master plan öncesi yeşil bina tasarım kriterlerinin belirlenmesi açıklanmıştır. Sürdürülebilir bina tasarımı doğrultusunda multidisipliner olarak enerji verimliliğini esas alan proje çalışmalarına değinilmiştir. Sonuç olarak, yeşil bina (LEED - Enerji ve Çevresel Tasarımda Liderlik Program) tasarım aşamasında, enerji verimli kullanılmalı ve binaların enerji verimliliğinin tek bir noktadan otomasyonla sağlanması gerektiği anlaşılmaktadır.

Anahtar kelimeler: Enerji verimliliği, LEED, Ekolojik yeşil bina

Abstract: Ensuring the efficient use of energy consumption has been become more important recently. In particular, limited availability of raw materials requires a more economical use of resources. In this respect, it is required to reduce the harmful effects on the environment by using the resources as recycling it is essential to design energy efficient building by means of main energy consumption strategies which can be listed as state of land topography, settlement and type of materials. In order to ensure decrease of energy consumption, the building type should be improved with a holistic approach to provide the sustainable life cycle of the buildings. In this context, sustainable ecological green buildings are aimed to obtain not only minimum energy consumption but also minimum resources consumption by means of using waste material. Hospital buildings are exposed to continuous energy needs and energy consumption throughout the day. In this study, it was explained design strategies which are aimed to obtain the green building design criteria in the stage of Master Plan within the scope of the renewal of the Cerrahpasa Campus Hospital Buildings in Istanbul University. In line with the sustainable building design, project studies were carried out based on multidisciplinary energy efficiency. As a result, in the green building design stage (LEED - Leadership in Energy and Environmental Design), energy should be used efficiently and It is understood that the energy efficiency of the buildings should be ensured by means of automation from a single point.
Keywords : Energy efficiency, LEED, Ecological green building,

Giriş

Günümüzde insanlığın büyük bir bölümü sanayileşme süreci ile hızlanan aşırı kentleşme sonucu büyüyen kentlerde yaşamaktadırlar. Dünyadaki insan nüfusunun kontrolsüz artması ile tarımsal arazilerin yapı alanı olarak kullanımı, doğal afet, savaşlar, aşırı kentleşme, mevcut yapıların atık haline dönüşümü, yenilenebilir enerji kaynaklarının sınırlı kullanımı, fosil yakıt/nükleer enerjinin daha çok kullanma, doğal kaynakların kirletilmesi yada fazla kullanımını, kentlerdeki değişim ve dönüşüm hareketi sonucu mevcut yapıların ekonomik ömrünü tamamlaması ile yapısal atıkların oluşması gibi nedenlerden Dünyamızın hızlıca tüketildiği ve yaşanabilirliliğin ortadan kalkması tehlikesi ile sürdürebilirlik kavramı ortaya çıkmıştır.

1972 yılında Birleşmiş Milletle Konseyince Sürdürebilirlik ile ilgili Stockholm Çevre Bildirgesi ile başlayan süreç zaman içerisinde Bruntland, Rio ve Kyoto bildirgeler ile Sürdürebilir Kalkınma kavramı açıklanmış ve çevre için yapılması gerekenler sıralanmıştır. Sürdürülebilir kalkınmanın sağlanması için üçlü kâr hanesi olarak gösterilen, ekonomik, ekolojik ve sosyal gelişmenin birlikte gerçekleşmesi gerekmektedir (Şimşek, 2012). Taraflar Konferansı COP21 Birleşmiş Milletler İklim Zirvesi 2015 yılında Paris anlaşması ile 195 ülke iklim değişikliği ile mücadelede etme kararı almıştır. Bu anlaşma ile ısınmayı 2 derece daha düşürmek amaçlanmıştır.

Taşınmaz geliştirme sürecinde sürdürülebilir kalkınma, çevre dostu bina, yeşil bina, akıllı bina gibi yapıyı açıklayan kavramlar ile gelişmiş binalar programı, olurluk incelemesi (business case), LEED vb. sertifikasyon sistemleri gibi yapılarda sürdürülebilirliğin ölçülmesini sağlayan yeni kavramları beraberinde getirmiştir. Bu kavramlar arasında en çok yeşil bina kavramı kullanılmaktadır (Şenol, 2009).

Sürdürülebilir ekolojik, çevreci yeşil binalar tasarım, uygulama ve işletme sürecinde enerji ve doğal kaynakların kullanımı ile atıkların en az olduğu yapılar olarak bilinmektedir. Ancak Sertifikasyon sistemleri ile günümüzde yeşil bina etiketi adı altında kullanıcılara yönelik tüketim aracı olarak sertifika almış binalar olarak da sunulmaktadır. Her ne kadar tüketim vasıtası olarak düşünsek bile sistemin getirdiği asgari standartlar ile en azından enerji verimli yapılar inşa edilmesinin önünü açacaktır. Hastaneler 24 saat enerji tüketen ve çok çeşitli atık (nükleer, tıbbi, evsel, vb.) üreten yapı tiplerinin başında gelmektedir. Yeşil bina sertifika sistemleri ile bu tüketimin önüne geçecek tasarım ve planlamalar yapılabilir.

Amaç

Yeşil Bina Kavramı ve Sertifikasyon Sistemleri

Dünya kaynaklarının önemli bir bölümü yapı inşa ederken kullanılmaktadır. Bu nedenle ekolojik ve çevreye duyarlı yapı inşa etme fikri ile birlikte yeşil bina kavramı ortaya çıkmaktadır. Yeşil Bina, yapıyı tasarlarken başlayan süreç bütüncül olarak inşa edilme (malzeme kullanımı, yapım tekniği, vb.), yapının kullanım ve yapının geri dönüşüm süreçlerinde belli kriterler ile takip edilmesidir. Yeşil bina kavramını kurumsallaştırmak adına birçok ülke kendi sertifika sistemlerini kurmuştur. Bunların en yaygını Leed ve Bream Sertifika sistemleridir.
Sürdürülebilir bina; yaşam döngüsü süresince arazi seçimi, yerleşim, tasarım, konstrüksiyon, işletim, bakım ve yıkım süreçleriyle insan sağlığı ve çevre üzerindeki negatif etkileri azaltılmış, enerji, su ve malzemenin etkin olarak kullanımına odaklanmış bir tasarım sonucu ortaya çıkan üründür (Çelik, 2009; Cassidy and Wright, 2003). Sürdürülebilirlik; ekonominden kalkınmaya, tarımdan çevreye kadar her türlü konuyu kapsayan derin bir kavramdır. Yeşil bina teriminin daha çok bir etiketleme olarak kullanıldığını, sürdürülebilir bina kavramının ise daha geniş kapsamlı ifade edildiğini görüyoruz. Yeşil bina kavramı özellikle sertifikalandırma sistemleri ile özdeşleşmiş bir terim haline gelmiştir ve çoğu zaman enerji etkin bina ya da yüksek performanslı bina kavramları ile aynı anlamda kullanılmaktadır. (Çelik, 2009)

Yeşil Bina Sertifika Sistemleri

Yeşil bina sertifika sistemleri, bina bazındaki projelerin çevre üzerindeki etkilerinin objektif ve somut olarak ortaya konulmasında ve doğal kaynakları korumadaki duyarlılıklarını meydana çıkarmada ölçülebilir bir referans sağlamaya çalışan bir tür derecelendirme sistemi olarak tanımlanmaktadır. Sertifika sistemleri bir binayı yeşil yapan kriterleri tanımlamaktadır. Sertifika alan bir binanın ne derecede ve hangi bakımdan yeşil olduğunun bilinmesi sertifika sistemleri ile birlikte mümkün olmaktadır. Sertifika sistemleri; yeşil binaların bir kavram olmaktan çıkıp gerçeklik kazanmasını sağlamıştır.

Sertifika sistemleri, genel ve geçerli ölçme standartları oluşturarak yeşil binayı tanımlamak, bütünsel bir bina tasarım yöntemi geliştirmek, yapı sektöründe çevresel liderlik tanımak, yeşil rekabeti teşvik etmek, yeşil binanın yararları konusunda tüketici bilincini arttırarak bina pazarını dönüştürmeyi amaçlamaktadır. (Erdede ve Bektaş, 2014).

Sertifika değerlendirme sistemleri Tablo 1’de sunulmuştur.

Tablo 1: Sertifika sistemleri.

Değerlendirme Sistemi	BREEAM	LEED	Green Star	CASBEE	SBTool
Oluşturulduğu Tarih	1990	1998	2003	2001	1998
Ülke	İngiltere	Amerika	Avustralya	Japonya	Kanada
Kriterler	✓ Yönetim ✓ Enerji ✓ Su ✓ Ulaşım ✓ Sağlık ve Konfor ✓ Atık ✓ Malzemeler ✓ Arazi Kullanımı ve Ekoloji ✓ Kirlilik ✓ Yenilik	✓ Yenilik ve Tasarım ✓ İç Mekan Hava Kalitesi ✓ Malzeme ve Kaynaklar ✓ Sürdürülebilir Arsalar ✓ Su Etkinliği ✓ Enerji ve Atmosfer	✓ Enerji ✓ Malzeme ✓ İç Mekan Çevre Kalitesi ✓ Ulaşım ✓ Yönetim ✓ Su ✓ Arazi Kullanımı ve Ekoloji ✓ Kirlilik ✓ Yenilik	✓ İç Mekan Çevresi ✓ Servis Kalitesi ✓ Arsada Dış Mekan Çevresi ✓ Enerji ✓ Kaynaklar ve Malzemeler ✓ Arsa Dışındaki Çevre	✓ İç Mekan Hava Kalitesi ✓ Enerji ve Kaynak Tüketimi ✓ Çevresel Yükler ✓ Sosyal ve Ekonomik Esaslar ✓ Kültürel ve Algısal Esaslar ✓ Arsa Seçimi, Proje Planlama ve Geliştirme
Sertifika Düzeyleri	Geçer (1 Yıldız) İyi (2 Yıldız) Çok İyi (3 Yıldız) Mükemmel (4 Yıldız) Olağanüstü (5 Yıldız)	Sertifika (40-49 puan) Gümüş (50-59 puan) Altın (60-79 puan) Platin (80 puan ve üstü)	4 Yıldız (45-59 puan) 5 Yıldız (60-74 puan) 6 Yıldız (75-100 puan)	S,A,B+,B-,C	-1 (olumsuz) 0 (Kabul Edilebilir) 3 (İyi Uygulama) 5 (En İyi Uygulama)

Breeam ve Leed, Dünyada en yaygın ve bilinen sertifika değerlendirme sistemlerinin başında gelmektedir. Breeam; İngiltere'de Yapı Araştırma Kurumu (BRE) tarafından geliştirilerek, 1990 yılında uygulamaya geçirilen Yapı Araştırma Kurumu Çevresel Değerlendirme Metodu (BREEAM- Building Research Establishment Environmental Assessment Method), yeşil bina değerleme sistemlerinin ilkidir. BREEAM sistemi, yönetim, sağlık ve memnuniyet, enerji, ulaşım, su, atıklar, arazi kullanımı ve ekoloji, malzeme ve kirlilik gibi kriterler için puan toplayarak değerleme yapar (Erdede ve Bektaş, 2014). Performans gösteren yapılar kademeli olarak Geçer (30-45 puan), İyi (45-55 puan), Çok İyi (55-70 puan), Mükemmel (70-85 puan) ve Seçkin (85 puan üstü) olmak üzere derecelendirilir.

LEED, yeşil binaların gelişimi ve üretiminin hızını artırmak ve çevresel sürdürülebilirliği sağlamak amacıyla, Amerikan Yeşil Binalar Konseyi (USGBC) tarafından 1998 yılında geliştirilmiştir. Ana hedefleri; bina yeri seçiminde çevreye olan etkiyi en aza indirmek, yeşil rekabeti desteklemek, yeşil binalarla ilgili farkındalığı arttırmaktır. Bunun için beş alanda değerlendirme yapılır. Bunlar; sürdürülebilir alan planlaması, suyun verimli kullanımı, enerji verimliliği ve yenilenebilir enerji kullanımı, malzeme ve kaynak kullanımı ve iç ortam kalitesidir. 2009 yılından sonra ise Sertifika (40-49 puan), Gümüş (50-59 puan), Altın (60-79 puan) ve Platin (80 puan ve üstü) olarak verilmektedir.

LEED ve BREEAM sistemleri üzerine uzman olan Llewelyn Davies Yeang (LDY) Eco Systems ekibi, her iki sistemi su, enerji, kirlilik, hava kalitesi, ekoloji, arazi kullanımı ve ulaşım gibi temel kategoriler üzerinden karşılaştırmaya çalışmıştır. Genel özellikler açısından her iki sistem benzer gibi gözükmekle birlikte, BREEAM kontrol listelerinin (Checklist) çevresel etkiye daha çok odaklandıkları, LEED'in ise kullanıcının sağlık ve konforunu daha ön planda tuttuğu belirtilmektedir (13). Her iki sistemin kriterlerinin farklı standartlara, yönetmeliklere ve düzenlemelere dayanması nedeniyle, sistemler arası kriterler benzerlik taşısa dahi; kriterlere verilen puanların dolayısıyla da önem derecelerinin çok farklılaşabildiği görülebilmektedir (Utkutuğ, 2011).

Kapsam

Leeds Sertifika Sistemi ve Uygulamaları

Yeşil bina sertifika sistemlerinin başında LEED; Amerikan Yeşil Binalar Konseyi (USGBC) tarafından 1998 yılında geliştirilmiş yeşil bina derecelendirme sistemlerinden biridir. Bu kapsamda ABD'de ilk altın derece ile New York ta inşa edilen World Trade Center Binasına verilmiştir. Türkiye, LEED Yeşil Bina sertifikası alan ilk 10 ülke içinde 8. sırada yer almaktadır.

Yeşil bina değerlendirme ve derecelendirme sistemlerinden biri olan LEED, yöneticilere pratik yeşil bina tasarımı, inşası ve bakım-onarımı ile ilgili çözümler sağlamaktadır. LEED derecelendirme sistemleri çoğunlukla 100'ü "Temel", 6'sı "Tasarımda Yenilik", ve 4'ü "Bölgesel Öncelik" olmak üzere toplam 110 puan üzerinden değerlendirilmektedir. Her bir puan, bina ile ilgili elementlerin çevre ve insanlar üzerindeki faydaları düşünülerek belirlenmiştir. Yeşil bina projeleri, bazı derecelere göre kazandıkları puanlarla sertifikalandırılmaktadırlar. Bu dereceler aşağıdaki gibidir (Katz, 2012):

- Sertifikalı: 40-49 puan
- Gümüş: 50-59 puan
- Altın: 60-79 puan
- Platin: 80 ve üzeri puan

Leed, bina tipleri kategori olarak aşağıda yer verilmiştir.

a)Leed Bd+C (Building Design + Construction)- Leed Bd + C (Yapı Tasarımı + Konstrüksiyon):
Yeni inşa edilen veya büyük oranda yenilenen binalar için geçerlidir. Yeni binalar, çekirdek ve kabuk, okullar, ticari yapılar, konaklama, veri merkezleri, depolar ve dağıtım merkezleri ve sağlık yapılarını içermektedir.

b)Leed O+M (Building Operations And Maintenance)- Leed O + M (Bina İşlemleri ve Bakım):
Mevcut binalar için bu sertifika tipinin amacı, binaların enerji, su, malzeme ve iç mekân kalitesi performanslarını iyileştirerek çevresel etkilerini azaltmaktır. Enerji/Su verimliliği ve iç mekân kalitesinin iyileştirilmesi; ilgili binanın işletme maliyetlerini düşürmekte, sürdürülebilir hedeflerin ve amaçların sağlanmasına yardımcı olmaktadır. Bu sertifika tipinin altındaki yine alt kategoriler mevcut binalar, Sağlık Yapıları, Veri Merkezleri, Depolar ve Dağıtım Merkezleri, Okullar ve Ticari Yapılardır.

c)Leed Id+C (Interior Design And Construction) -Leed Id + C (İç Tasarım ve İnşaat):
İç mekan projeler için geçerlidir. Bu sertifika tipinin altındaki yine alt kategoriler İç Mekan, Sağlık Yapıları ve Ticari İç Mekanlardır.

d)Leed Nd (Neighbourhood Development)- Leed Nd (Komşuluk-Mahalle Gelişimi):
Konut kullanımını, konut dışı kullanımları ya da mix projeleri içeren yeni saha geliştirme projeleri ya da kentsel dönüşüm projeleri için geçerlidir. Projeler, geliştirme yapılan alanda tasarım veya inşaat aşamasında olabilir.

e)Leed Homes (Konutlar):
Müstakil evler, az katlı (bir ila üç katlı) veya orta yükseklikteki binalar (dört ila altı katlı) için geçerlidir.

Leed başvuru süreci projelerin ve sahanın gereklilikleri LEED kredileri temel alınarak, LEED danışmanı, proje ekibi, işveren, yüklenici ve diğer proje paydaşları birlikte incelenmektedir. Daha sonra LEED Sertifika seviyesi tespit edilmektedir. Söz konusu ön değerlendirme çalışmalarının sonuçlanması ile proje USGBC' ye kaydedilmektedir. Tasarım süreci ile birlikte projelerin (mimari, elektrik, mekanik, altyapı, peyzaj) geliştirilmesi konusunda inceleme ve onay için tasarım kredilerinin belgelenmektedir.
LEED sertifikası almış örnek bina modelleri Şekil 1'de verilmiştir.

(a)

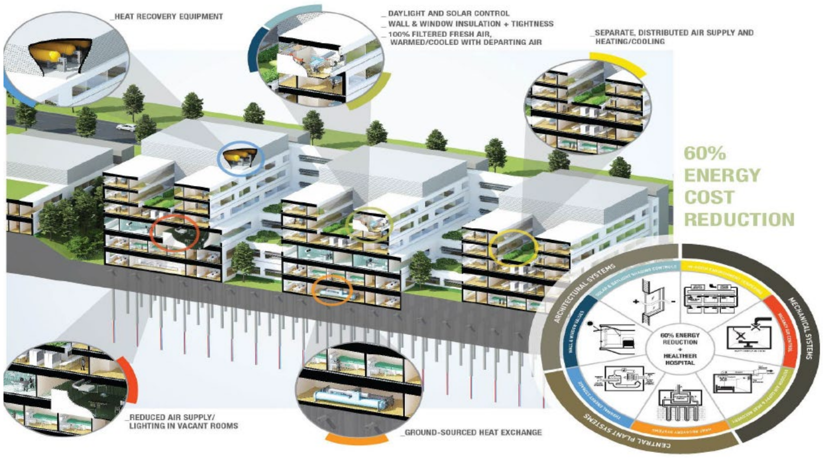
(b)


Şekil 1. Leed sertifikası almış bina örnekleri a) New York yeşil bina örneği (URL-1), b) Seattle merkez kütüphanesi (URL-2).

Türkiye'de yeşil bina sertifikasyon sistemlerine ilgi giderek artmaktadır. Bunların başında sağlık yapıları gelmektedir. Günün tamamında hizmet vermesi nedeniyle ciddi oranda enerji tüketen ve atık üreten binalardır. Bu nedenle yeşil hastanelerin oluşması kaçınılmazdır.

"Yeşil hastane" kavramı, çevre dostu bir yerleşim yeri seçmek, sürdürülebilir ve verimli tasarımlar kullanmak, doğa dostu yapı malzemeleri ve ürünleri satın almak, inşaat esnasında çevreye duyarlı olmak ve çevreye duyarlılığı hizmet sürecinde de devam ettirmek gibi seçeneklerden en az birini karşılayan hastaneleri tanımlamak için kullanılmaktadır. Yeşil hastane, geri dönüşüm yapan, materyalleri, malzemeleri tekrar kullanan, atık maddeleri azaltan ve çevreye daha temiz hava veren bir tesis etrafına kurulmuştur (http://hospital2020.org/Agreenhospital.html).

Bir hastane ortamında, geliştirilmiş çevresel ve sağlık prensiplerini ve uygulamalarını tesisin planlama, tasarım, inşa, bakım ve onarım faaliyetlerine entegre etmenin getireceği birçok maddi ve manevi avantaj bulunmaktadır. Yeşil hastanelerde yatan hastaların duygusal açıdan daha sağlıklı oldukları ve daha az ağrı kesici vb. ilaç kullanarak daha kısa sürede taburcu oldukları yapılan araştırmalarla belgelenmiştir. Dolayısıyla hastaneler açısından "yeşil" stratejiler belirlemek oldukça önemlidir (Royal Jubilee Hospital Patient Care Centre Project, 2008). Enerji verimliliğinin ön plana çıktığı bu tasarımlarda hastane binalarının enerji tüketimlerinde yüzde altmış tasarruf sağlanabilinir. LEED sertifika sistem modeli Şekil 2'de gösterilmiştir.



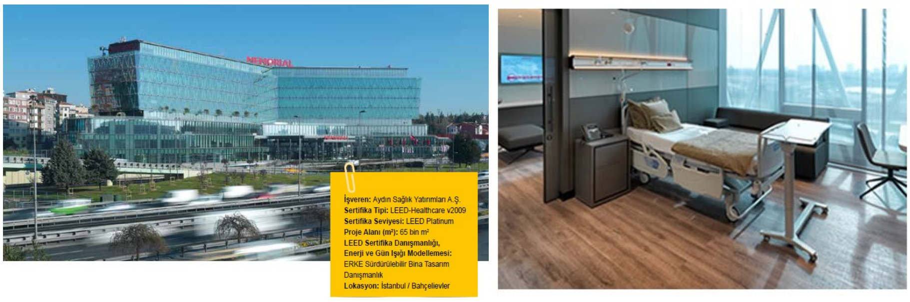
Şekil 2. Leed-Healtcare sertifika sistemi modeli (Leed Ön Değerlendirme Raporu - 3).

Sağlık Bakanlığı'nın 2012 yılı sonunda, 200 yatak ve üzeri kapasiteli hastanelerde LEED sertifikasını zorunlu hale getirmesiyle (4), ülkemizde de LEED Yeşil Bina sertifikasının hastanelerde kullanılması konusu başta kamu hastaneleri olmak üzere talep yaratmıştır. Bu kapsamda örnek olarak Memorial Bahçelievler Hastanesi tanıtılmıştır.

Proje alanı seçimi yapılırken yoğun bir bölge tercih (Bahçelievler) edilmiş, kent merkezinde ana arter (D 100 karayolu) karayoluna yakın bir konumdadır. Bu sebeple su alanlarından uzak ve tarım arazi üzerinde yapılaşmadan kaçınılmıştır. Ayrıca yer seçiminde çevresel saha değerlendirmesi yapılarak, proje alanının daha önceden kirletilmemiş bir arazi olduğunun tespiti yapılmıştır. Proje, toplu taşıma duraklarına yürüme mesafesinde olacak şekilde tasarlandığından proje kullanıcılarının toplu taşıma kullanımına teşvik edilmesi sağlanmıştır. Bisiklet kullanım alanı(soyunma ve duş mekânları) yer verilmiş ve bu şekilde bisiklet kullanımı teşvik edilmiştir. Şarj edilebilir araçlar için 8 araçlık şarj noktası bulunmaktadır. Otopark sayısı yönetmelik sınırlarında ve yer altında tasarlanmıştır. Isı adası etkisi azaltılmıştır. Ayrıca ısı etkisini azaltmanın bir diğer yöntemi olarak çatıda açık renkli materyal kullanımı sağlanmış ve yeşil çatı uygulaması ve yağmur suyunu en iyi şekilde değerlendirmek adına çatılara düşen yağmur suları toplanıp peyzaj alanlarında kullanılmak üzere tasarlanmıştır.

Su tüketimi minimuma indirecek; tesisat sistemleri, medikal cihaz, x-ray, susuz sistem havalandırma sistemleri kullanılmıştır. Projede ozon tabakasını incelten ve küresel ısınmayı tetikleyen CFC'ları içermeyen soğutuculara sahip HVAC sistemler kullanılmıştır.

Projede işletme sırasında oluşacak kâğıt-karton-plastik-metal-cam gibi geri dönüştürülebilen atıklar için atık kutuları yerleştirilmiş; buna ek olarak da cıvalı ve elektronik atıklar için de toplama noktaları tasarlanmıştır. Proje inşaatı sırasında çıkan geri dönüştürülebilen atıkların da yüzde 80 oranında geri dönüşüme gönderilmesi sağlanmış olup, bina içi hava kalitesi için gerekli düzenlemelerin başında sigara içilen alanlar kısıtlanmasına gidilmiştir. Örnek hastane binası ve oda tasarımı Şekil 3'te gösterilmiştir.



Şekil 3. Özel hastane binası ve hasta yatak odası tasarımı (http://www.yesilbinadergisi.com/edergi/21/47/20/)

Materyal ve Metot

Üniversite Hastanesi Leeds Sertifikasyon Süreci ve Tasarımı

Sürdürülebilir binalar tasarlanması için Master plan hazırlanmadan önce "yeşil bina" kavramı adı altında tasarım kriterleri belirlenmiştir. Bu kapsamda Leed Gold Sertifika derecesi hedeflenmiştir. Bu kapsamda proje aşamasında tasarım, gold derecesi kriterlerine göre mimari, elektrik ve makine tesisat disiplinlerince ortak tasarım çalışmaları yapılmıştır.

Yeni Cerrahpaşa Hastanesi Alan Tanıtımı

Yeni Cerrahpaşa Hastanesi alanı İstanbul Fatih İlçesi sınırları içerisinde tarihi yarımada da yer almaktadır. Bünyesinde tarihi yığma ve betonarme yapıları barındırmaktadır. Binaların çevresel faktörler gibi dış etkenlere maruz kalmasından dolayı tarihi nitelikli yapılar restorasyon kapsamına alınmış, diğer binaların ise yenilenmesi için proje çalışmaları yürütülmüştür. Bu kapsamda binaların ekonomik ve fiziksel eskimeleri sebebiyle hem hastane hem de eğitim binalarının yenilenmesi için master planı çalışmaları yapılmıştır. Yerleşkelerin alanları, gerçekten de, UNESCO'nun koruması altına alınmış tarihi bir bölgenin içerisinde bulunmakta ve bu kuruluşun belirlediği yükümlülükler yerine getirilerek master proje hazırlanmıştır.
Master projede; Cerrahpaşa yerleşkesi iki bölüme ayrılarak, iki etapta yeniden inşa edilmesi planlanmıştır. Birinci etabı hastane binalarından oluşmaktadır. Çalışma alanı olarak Yukarı Cerrahpaşa diye adlandırılan bölüm seçilmiştir. Hastane Binaları Toplam kapasite alanı 380.256,40 m2'dir. Gün ışığından daha fazla yararlanılması için yapılacak olan her türlü mimari değişiklik birden fazla krediye pozitif etki edecektir. LEED-HC sisteminde hastaların daha fazla gün ışığı ve manzaradan faydalanması teşvik edilmekte, kolay yollardan bahçeye çıkabilmeleri ve açık havada gezinebilecek yerleri veya balkonları olmasına da ekstra puanlar verilmektedir. Bu bağlamda büyük pencere seçimleri, ilgili noktalarda gün ışığı bacaları, yeşil çatı yaklaşımları, yeşil ve açık alanların artırımları, güneş rafları ve güneş kırıcıları gibi uygun yapısal çözümler tasarım süreci yer verilmiştir. Yukarı Cerrahpaşa (Hastane) LEED Sınırı ve Avan proje görselleri sırasıyla Şekil 4 ve Şekil 5'te gösterilmiştir.

Şekil 4. Yukarı Cerrahpaşa (Hastane) LEED sınırı (Leed durum raporu-2).

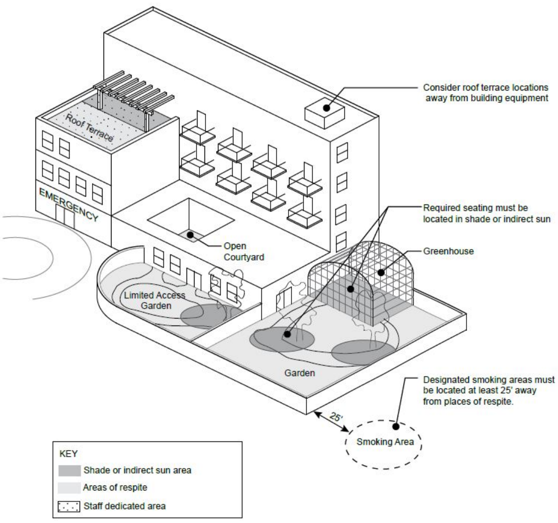
Şekil 5. Yukarı Cerrahpaşa master ve avan proje görselleri.

Genel Mimari Öneriler

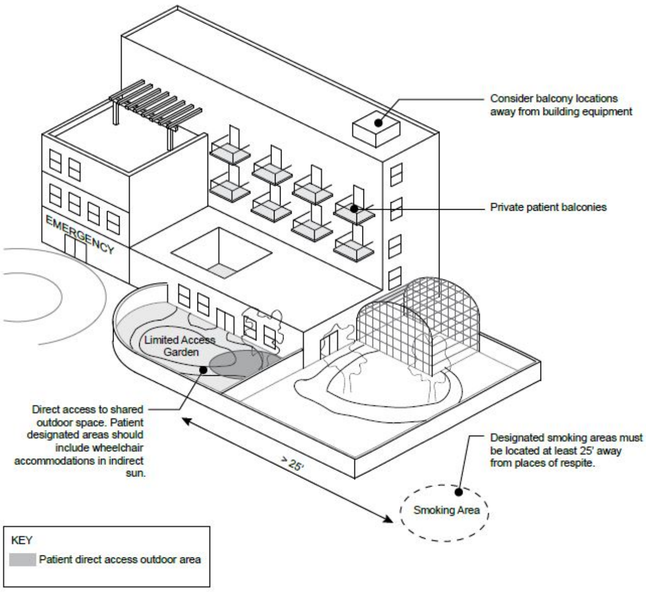
Öncelikle LEED Proje sınırları belirlenmeye çalışılmıştır. Üst Cerrahpaşa'nın tamamı LEED sınırlarına alınmasına karar verilmiştir. Bu sınıra korunacak olan binaların da dahil edilmesi ile aslında korunan alanlar, açık ve yeşil alanlar açısından bir çok avantaj elde edilmiştir. Bu konuda herhangi bir mimari değişiklik yapılmamıştır. Sadece LEED'e bildirilecek olan kapsamın şekli ortaya çıkmıştır. Böylelikle birçok krediye yaklaşım için alan hesapları ile ilgili bilgilerin netleşmesi sağlanmıştır. Bina tasarımında yer verilen mekânlar dışında tasarımda aşağıda yer alan maddelere göre malzeme ve sistemler seçilmiştir.

- Bina genelinde yüksek yalıtım değeri bulunan yalıtkan yapı malzemeleri kullanılmıştır.
- Yapının büyük bölümünün cam olması sebebi ile cam fiziksel değerleri yüksek tutulmuştur. Seçilen camlar düşük ısı iletim katsayısına (U değeri) sahiptir.
- Havalandırma sistemi ısı geri kazanımlı mekanik olarak tasarlanmıştır.
- Aydınlatma armatürleri oldukça iyi seviyelerde yer almaktadır. Aydınlatma otomasyonu desteği enerji verimliliğini en üst seviyeye çekmektedir.
- Su kullanımı kontrol altına almak adına düşük debi değerli bataryalar, çift basmalı klozetler tercih edilmiştir.
- Enerji üretiminde Trijenerasyon (yakıt olarak doğal gaz veya biyogaz kullanılarak eşzamanlı elektrik, ısıtma ve soğutma üretimidir) sistemi kurulacaktır.
- Pompalar enerji verimli ve frekans kontrollü seçilmiştir.

Hastalar için rahatlama yerleri ve hastane giriş çıkış imkânlarının gösterildiği alanlar sırasıyla Şekil 6 ve Şekil 7'de sunulmuştur.



Şekil 6. Rahatlama yerleri kapsamı (Leed Ön Değerlendirme Raporu - 3).



Şekil 7. Hastalar için direkt dışarı çıkış imkanı kapsamı (Leed Ön Değerlendirme Raporu - 3).

Elektrik Disiplinince Yapılan Leed Çalışmaları

Işık Kirliliğinin Azaltımı — Çatı

Bu kredinin alınabilmesi için iç ve dış aydınlatma ile ilgili olarak aynı anda birçok kritere uyulması gerekmektedir. Her ne kadar dış aydınlatma için bu kriterler yerine getirildi ise de, iç aydınlatmada dışarıya penceresi olan her hasta yatak odasının iç aydınlatmasının 23:00 – 05:00 saatlerinde otomatik olarak kendini %50 kısması opsiyonu yerine getirilemediğinden(yatırım girdileri çok yüksek olması) dolayı bu kredinin alınamayacağı belirlenmiştir.

Lambalarda Civa Kullanımı

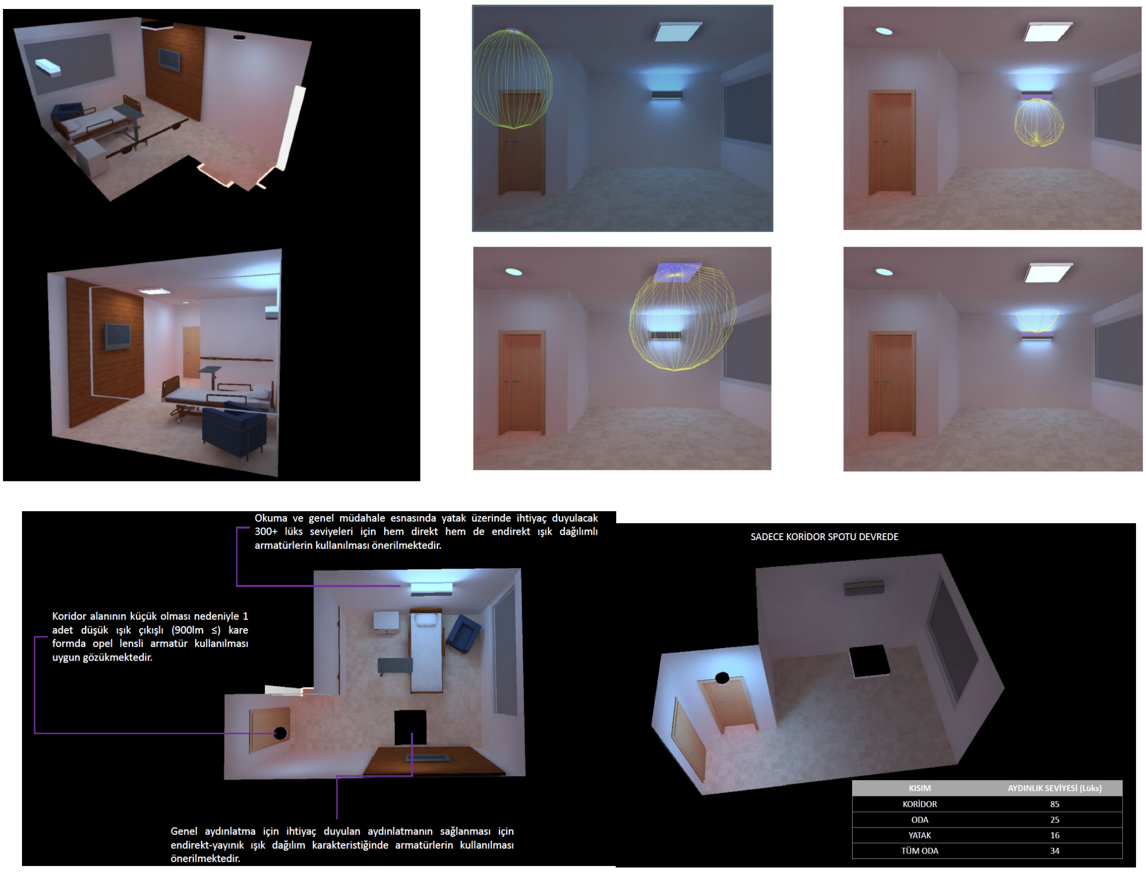
Elektrik gurubu ile yapılan aydınlatma konuları ile ilgili her türlü çalışma ve önerilerde hem enerji verimliliği ön planda tutulmuş olup hem de LEED'in bu kredisi için gerekli olan maksimum Civa miktarlarının aşılmaması için özen gösterilmiştir. Bu krediye uygun lambalar seçilmiş olup kredinin alınmasında herhangi bir problem bulunmamaktadır.

Bina Enerji Performansı

Binada kullanılan her türlü enerji verimli aydınlatma armatürü, otomasyon sistemi ve verimli aydınlatma mühendisliği uygulamaları için, aydınlatma danışmanlığı kapsamında birçok farklı çalışma yürütülmüştür. Enerji modellemesinde baz binaya oranla verimli olan bu uygulamalar ile Bina Enerji performansı üzerinden puanlar gelmektedir. Yalnız Bina Ön-Enerji Modellemesi binanın bütün sistemlerini aynı anda çalıştırmasında dolayı her sistemin ayrı ayrı kaç puana karşılık verim getirdiğini söylemek çok zordur. Bunun için detaylı bina enerji modellemesi yapılması gerekmektedir.

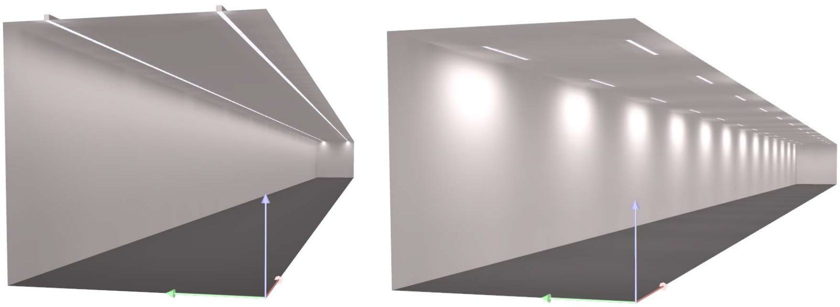
Elektrik grubu ile yapılan ortak çalışmalar sonrası genel mahallerde aydınlatma otomasyonu kullanılmasının çok büyük enerji tasarrufu sağladığı belirlenmiştir. Koridorlardaki armatür yerleşimi konusunda, istenilen aydınlık seviyelerini düşürmeden yatırım ve işletme maliyeti opsiyonları göz önüne alınarak detaylı çalışmalar yapılmış ve grubun bilgilendirilmesine sunulmuştur.

Hasta yatak simülasyonuna ait görsel çalışma Şekil 8'de gösterilmiştir.



Şekil 8. Örnek hasta yatak odası simülasyonu (Leed Ön Değerlendirme Raporu - 3).

C blok üzerinde gün ışığı analizleri ve en verimli aydınlatma seçenekleri için de Oda Analizleri yapılmıştır. Şekil 9'da örnek koridor simülasyonu gösterilmiştir.



Şekil 9. Örnek koridor simülasyonu (Leed Ön Değerlendirme Raporu - 3).

Hastane koridorlarının çift doğrusal armatür tasarımı olması durumunda standartlar yakalanmamakta olup, şaşırtmalı yapıldığında enerji verimliliği ve az sayıda armatür nedeniyle istenen değerlere ulaşılmaktadır.

Mekanik Disiplinince Yapılan Leed Çalışmaları

Genel Su Verimliliği

Bu maddenin ön koşulu olan kısım kullanılması öngörülen şebeke suyunun EPA standartlarından % 20 daha az olması ile gerçekleşecektir. Krediden maksimum puan alabilmek için Tablo 2'ye uygun seçim yapılması kararlaştırılmıştır. Tablo 2'de Leed'e uygun armatür su tüketim değerleri verilmiştir.

Tablo 2: Leed'e uygun armatür su tüketim değerleri (Leed Ön Değerlendirme Raporu - 3).

Armatürler	Referans değerler	Önerilen
Klozet	6 litre / basım	2.5 – 4 litre / basım
Pisuvar	3.7 litre / basım	1 – 2,5 litre / basım
Umumi Musluk (özel hastane odaları için)	8.3 litre / dakika	5.5 – 6.6 litre / dakika
Umumi musluk (diğer tüm uygulamalar)	1.9 litre / dakika	1.5 – 1,9 litre / dakika
Umumi musluk (sensörlü)	1 litre / devir	0.7 – 0.8 litre / devir
Duş Başlığı	9.5 litre /dakika	6 – 9.5 litre /dakika

Bina Enerji Performansı

Binada seçilecek olan yapı malzemeleri ile ilgili hesaplar sonrasında yalıtım kalınlıklarının arttırılması sağlanmış, kullanılacak olan yalıtım malzemesi olan taş yününün de herhangi bir sakınca yaratmadığı konusunda görüş bildirilmiştir. Kullanılacak olan HVAC sistemlerinde aslında zaten enerji verimli sistemlerin kullanıldığı görülmüş, LEED için yüksek enerji performansı sağlayacağı öngörülmüştür. Havalandırma sistemlerinde ısı geri kazanımının, COP değeri yüksek soğutma ekipmanlarının ve verimli kazanların kullanılması çok avantajlı seçimlerdir.
Bütün bunlara ek olarak özellikle Tri-Jenerasyon sistemlerinin entegresinin sağlanması enerji puanlarının yukarı çıkmasına neden olacaktır. Özellikle 24 saat enerji tüketen binaların başında gelen hastaneler için, 24 saatlik senaryo ile çalıştırılacak olan bu sistem verimlilik açısından LEED enerji modellemelerinde en yüksek puanların alınmasını sağlayan sistemlerdir.
İstanbul Üniversitesi Cerrahpaşa Yerleşkesi binasının ASHRAE 90.1 kıstasları dahilinde yapılan termal analizleri neticesinde, LEED – NC v2009 değerlendirme sistemi Enerji ve Atmosfer kredi başlığı EAc1- Optimize Enerji Performansı kredisinden alacağı puan aşağıda belirtilmiştir. Bu puan seçilecek olan Trijenerasyon sisteminin kapasitesine göre değişiklik gösterecektir.

Tablo 3'te LEED enerji performans değerleri sunulmuştur.

Tablo 3: Termal analize göre optimize enerji performans değerleri (Leed Durum Raporu – 3).

	Baseline (Ortalama)	Trijensiz Kompleks	0,8 MW Elk- 0,7 MW ABS	1,6 MW Elk- 1,4 MW ABS	2,4 MW Elk- 2,1 MW ABS
Mali Bazda Enerji Verimliliği	Referans	8,1%	12,5%	16,9%	19,4%
LEED EAc1 Puanı	Referans	-	1	3	5

Binanın Enerji Ön-Enerji modellemesinin tamamlanması ile bu krediden alınacak olan puanlar yaklaşık sonuç olarak belli olmuştur. Ortalama olarak 1,6 MW'lık bir trijenerasyon kullanımı baz alınarak yapılan değerlendirme sonucunda %16,9'luk bir enerji verimliliği ortaya çıkmakta olup bunun LEED puan tablosundaki karşılığı 3 puan olmaktadır.

İnşaat Aşaması

Proje aşamasında yapılan çalışmalardan sonra, süreç inşa aşamasında da devam etmektedir. İnşaat aşamasında çevreye az zarar verecek tarzda kazı uygulamaları, erozyon ve sedimantasyon kontrolü, inşaat atık yönetimi ve iç hava kalitesi planının uygulamaları gerekmektedir. Yapı malzemeleri ve yapı kimyasallarının seçimleri ve sertifikalı ürün kullanımı da bu aşamayı ilgilendiren kredilerdir.

Cerrahpaşa Hastanesi Healthcare Scorecard Tablosu ve Değerlendirmesi

Sürdürülebilir alanlar, su verimliliği, enerji ve atmosfer, malzeme ve kaynaklar, iç mekân kalitesi, yenilikçi tasarım ve öncelikle bölge kategorilerine göre tasarımın değerlendirmesi yapılmış ve aşağıdaki Tablo 4'te görüleceği üzere tasarım Leed standart tablosu skor kartta alınacak, alınabilir ve alınamayacak krediler değerlendirilmiştir.

Tablo 4: Cerrahpaşa hastanesi healthcare scorecard tablosu (Leed Durum Raporu – 3).

LEED 2009 for Healthcare: New Construction and Major Renovations

Project Checklist | **Project Name: Istanbul Universitesi Cerrahpasa Hastanesi** | **Date : 29.06.2016**

	Y	?	N			
	12	4	2	**Sustainable Sites**		Possible Points: 18
C	Y			Prereq 1	Construction Activity Pollution Prevention	
C	Y			Prereq 2	Environmental Site Assessment	
	1			Credit 1	Site Selection	1
	1			Credit 2	Development Density and Community Connectivity	1
			1	Credit 3	Brownfield Redevelopment	1
	3			Credit 4.1	Alternative Transportation—Public Transportation Access	3
	1			Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1
	1			Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	1
		1		Credit 4.4	Alternative Transportation—Parking Capacity	1
		1		Credit 5.1	Site Development—Protect or Restore Habitat	1
	1			Credit 5.2	Site Development—Maximize Open Space	1
	1			Credit 6.1	Stormwater Design—Quantity Control ®	1
	1			Credit 6.2	Stormwater Design—Quality Control	1
	1			Credit 7.1	Heat Island Effect—Non-roof	1
	1			Credit 7.2	Heat Island Effect—Roof ®	1
			1	Credit 8	Light Pollution Reduction	1
		1		Credit 9.1	Connection to the Natural World—Places of Respite	1
		1		Credit 9.2	Connection to the Natural World—Direct Exterior Access for Patients	1
	6	3	0	**Water Efficiency**		Possible Points: 9
	Y			Prereq 1	Water Use Reduction—20% Reduction	
	Y			Prereq 2	Minimize Potable Water Use for Medical Equipment Cooling	
	1			Credit 1	Water Efficient Landscaping—No Potable Water Use or No Irrigation	1
	2			Credit 2	Water Use Reduction: Measurement & Verification	1 to 2
	2	1		Credit 3	Water Use Reduction	1 to 3
H		1		Credit 4.1	Water Use Reduction—Building Equipment	1
	1			Credit 4.2	Water Use Reduction—Cooling Towers	1
H		1		Credit 4.3	Water Use Reduction— Food Waste Systems	1
	8	4	27	**Energy and Atmosphere**		Possible Points: 39
C	Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	
	Y			Prereq 2	Minimum Energy Performance	
	Y			Prereq 3	Fundamental Refrigerant Management	
	4	2	18	Credit 1	Optimize Energy Performance ®	1 to 24
	1		7	Credit 2	On-Site Renewable Energy ®	1 to 8
C		2		Credit 3	Enhanced Commissioning	1 to 2
	1			Credit 4	Enhanced Refrigerant Management	1
	2			Credit 5	Measurement and Verification	2
			1	Credit 6	Green Power	1
			1	Credit 7	Community Contaminant Prevention—Airborne Releases	1
	1	10	5	**Materials and Resources**		Possible Points: 16
H	Y			Prereq 1	Storage and Collection of Recyclables	
H	Y			Prereq 2	PBT Source Reduction—Mercury	
			3	Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3
			1	Credit 1.2	Building Reuse—Maintain Interior Non-Structural Elements ®	1
C		2		Credit 2	Construction Waste Management	1 to 2
C		4		Credit 3	Sustainably Sourced Materials and Products	1 to 4
	1			Credit 4.1	PBT Source Reduction—Mercury in Lamps	1
C		2		Credit 4.2	PBT Source Reduction—Lead, Cadmium, and Copper	2
H		2		Credit 5	Furniture and Medical Furnishings	1 to 2
			1	Credit 6	Resource Use—Design for Flexibility	1
	1	12	4	**Indoor Environmental Quality**		Possible Points: 18
	Y			Prereq 1	Minimum Indoor Air Quality Performance	
H	Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
H	Y			Prereq 3	Hazardous Material Removal or Encapsulation	
				Credit 1	Outdoor Air Delivery Monitoring	1
			2	Credit 2	Acoustic Environment	1 to 2
C		1		Credit 3.1	Construction IAQ Management Plan—During Construction	1
C		1		Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
C		4		Credit 4	Low-Emitting Materials	1 to 4
	1			Credit 5	Indoor Chemical and Pollutant Source Control	1
			1	Credit 6.1	Controllability of Systems—Lighting	1
		1		Credit 6.2	Controllability of Systems—Thermal Comfort	1
			1	Credit 7	Thermal Comfort—Design and Verification ®	1
		2		Credit 8.1	Daylight and Views—Daylight	2
		3		Credit 8.2	Daylight and Views—Views	1 to 3
	4	2	0	**Innovation in Design**		Possible Points: 6
	Y			Prereq 1	Integrated Project Planning and Design	
	1			Credit 1.1	Innovation in Design: Specific Title	1
	1			Credit 1.2	Innovation in Design: Specific Title	1
		1		Credit 1.3	Innovation in Design: Specific Title	1
		1		Credit 1.4	Innovation in Design: Specific Title	1
	1			Credit 2	LEED Accredited Professional	1
	1			Credit 3	Integrated Project Planning and Design	1
	3	1	0	**Regional Priority Credits**		Possible Points: 4
	1			Credit 1.1	Regional Priority: Specific Credit	1
	1			Credit 1.2	Regional Priority: Specific Credit	1
	1			Credit 1.3	Regional Priority: Specific Credit	1
		1		Credit 1.4	Regional Priority: Specific Credit	1
	35	36	38	**Total**		Possible Points: 110

Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110

Cerrahpaşa Tıp Fakültesi yeni hastane binalarının skor tablosuna göre tasarım ve yapım aşaması süreçlerinde gold (60-79) derecesinde sertifika alacağı görülmektedir. Skor kart çoğunlukla tasarım kredileri düşünülerek hazırlandığından ve inşaat kredilerine henüz o zaman karar verilemediğinden 35 puan üzerinden görünmektedir. İnşaat kredileri olan 36 puanlık alınabilir krediler eklendiğinde bu puanın artması beklenmektedir.

Sonuç

Kesintisiz olarak enerji, su ve atık hizmetlerinden faydalanan büyük binaların başında gelen hastaneler, yaşam-tasarruf teknolojilerine çok fazla ihtiyaç duymaktadırlar. Tipik bir hastane binası yaklaşık 3500 konuttaki karşılık gelecek şekilde enerji tükettiği bilinmektedir. Bu sebeple Cerrahpaşa Tıp Fakültesi yeni hastanesi Leed "Gold" derecesinde yeşil bina olması hedeflenmiştir. Bu kapsamda sürdürülebilir bina tasarımı doğrultusunda enerji verimliliği için proje, model ve simülasyon çalışmaları (mülti-disipliner) yapılmıştır. Bu analizler neticesinde tasarımcı, işverenin işletme projesine bağlamında Leed danışmanı ve diğer mühendislik disiplinler ile ortak bir çalışma yürüterek söz konusu hastane binaları tasarlanmıştır.

LEED (Yeşil Bina) sertifikası sadece bir durum değerlendirme çalışması değildir. Bu kapsamda yapılan binaların; hem çevreci bir yapıya sahip olmaları hem de enerji verimli olarak tasarlanmaları tavsiye edilmektedir. Bir binadaki enerji verimli tasarım unsurlarını pasif ve aktif olarak ikiye ayırabiliriz. Kabaca gün ışığı destekli aydınlatma, doğal havalandırma, gece soğutması ve havalandırması, gün ışığı bacası ve bunun gibi birçok yöntem kullanılarak binaların (yalıtımlı) yıllık işletme ve enerji maliyetlerinin ve CO2 salınımlarının azaltılması pasif olarak sağlanabilmektedir. Ayrıca seçilecek sistem elemanlarının yüksek verimli olması da, bu işletme maliyetlerini azaltması beklenmektedir. Leed, genel olarak, ısıtma, soğutma, havalandırma, aydınlatma, priz kullanımlardaki enerji verimliliğini en üst düzeyde tutarak, tüketimi en aza indirmeyi amaçlamaktadır. Arsa seçimi, alternatif ulaşım, bisiklet ve yayalaşma, nitelikli açık alan, iç hava kalitesi, otopark kapasiteleri vb. konularda mimarın tasarım yaparken dikkate alması gerekmektedir.

Ülkemizde büyük kapasiteli hastaneleri yönetme modeli henüz bulunmamaktadır. Yöneticiler özellikle tıp fakültesi hastanelerinde tıp doktorlarından oluşmaktadır. Hastane binası işletme konusunda farklı disiplinlerin (işletmeci- endüstri müh., diğer mühendislikler) ortak yürütmesi gereken bir süreçtir. Öncelikle hastane işletme projesinin oluşturulmalı ve Leed süreci bu yönetim planında yer almalıdır.

Leed ve benzeri sistemlerden tam anlamıyla yararlanmak için hastane yönetim modelinin de oluşturulması zorunludur. Bina Bilgi Modelleme (BIM) ortamının oluşturulması bu kapsamda değerlendirilebilinir. İlk tasarım aşamasında BIM kullanılması ile modellenen tasarım, hem yapım sürecinde hem de binanın işletme sürecinde önemli katkılar sunacaktır. Yapım esnasında şantiye ortamında gerçekleştirilen imalatların as-built olarak BİM modeline eklenmesi daha sonrasında bina işletmeye alındığında bakım, arıza, enerji verimliliği bağlamında daha nitelikli sürdürülebilir bina işletmesine katkılar sunmaktadır. Önemli enerji ihtiyacı olan hastane binalarının BIM ortamında tasarlanması ve daha sonra bina yazılım programları ile işletme projesine dönüştürülmesi gerekmektedir. Hastane fonksiyonlarının kusursuz işletilmesi, en iyi şekilde koordinasyonun, kolaylığın sağlanması ile iyi kontrol edilen sistemlerin Leed sürecine katkı sunarak, enerji verimliliği sağlayacağı düşünülmektedir. Ayrıca mimari tasarımın mühendislik disiplinleri ile birlikte modellenmesi ile tasarım sorunlarının ortadan kalkacaktır.
Ülkemizde Leed sertifikası almış çok sayıda hastane binasında otomasyon sistemlerinin kurulmaması ve trijenerasyon ve korjenarasyon gibi enerji sistemleri kurulmuş olmasına rağmen işletmeye alınmaması gibi nedenlerden dolayı sertifika sistemi etiket amaçlı kullanıldığı anlaşılmaktadır. Binaların tek bir noktadan bütüncül otomasyon sistemleri ile denetlenmesi ile ancak enerji verimliliği sağlanacaktır. Sertifika sistemleri amacı, kullanıcı etkilemek olmamalı, gerçekten enerji verimli bina tasarlamak için olmalıdır. Tasarım, yapım ve işletme süreçleri birlikte ve biri birini tamamlayıcı ve devam ettirici bilinçle yaklaşılması gerekmektedir. Her bir süreçte profesyonel destek kaçınılmazdır. Leed ve benzeri sertifika sistemlerinin yaygınlaşması ve daha fazla projenin yeşil bina kapsamına alınması için yerel kriterlere uygun bir sertifika sisteminin oluşturulması ve hayata geçirilmesi gerekmektedir.

Teşekkürler

Bu çalışmada yapmış olduğu katkılardan ve yardımlardan dolayı İ.Ü. Yapı İşleri ve Teknik Daire Başkanlığı'na ve RPA S.r.l. & SWS Engineering S.p.A. İş Ortaklığı firmasına teşekkürlerimizi sunarız.

Kaynaklar

Şimşek, E.P. (2012). Sürdürülebilirlik bağlamında yeşil bina olma kriterleri, *Kağıthane ofispark projesi örneği, Yüksek lisans tezi, İstanbul Teknik Üniversitesi Fen Bilimleri Enstitüsü, İstanbul.*

Şenol, S. (2009). Gayrimenkul geliştirme sürecinde yeşil binaların sürdürülebilirlik kriterleri açısından incelenmesi, *Yüksek Lisans Tezi, İstanbul Teknik Üniversitesi Fen Bilimleri Enstitüsü, İstanbul.*

Çelik, E. (2009). Yeşil bina sertifika sistemlerinin incelenmesi Türkiye'de Uygulanabilirliklerinin Değerlendirilmesi, *Y.Lisans Tezi, İstanbul Teknik Üniversitesi Fen Bilimleri Enstitüsü, İstanbul.*

Cassidy, R. ve Wright. G. (2003). A Report on the green building movement, *Building Design & Construction,* Mart 2009, *http://www.bdcnetwork.com/university/community/934/White+Papers /47492.html)*

Erdede, S. B., Bektaş, S. (2014). Ekolojik Açıdan Sürdürülebilir Taşınmaz Geliştirme ve Yeşil Bina Sertifika Sistemleri, *Harita Teknolojileri Elektronik Dergisi Cilt: 6, No: 1, 2014 (1-12).*

Utkutuğ, G., (2011). Sürdürülebilir Bir Geleceğe Doğru Mimarlık Ve Yüksek Performanslı Yeşil Bina Örnekleri, *X. Ulusal Tesisat Mühendisliği Kongresi, 2011, İzmir,* http://www1.mmo.org.tr/resimler/dosya_ekler/6221b4b01ea0a47_ek.pdf, Erişim Tarihi: 11.06.2019

Olcay, K., (2018). *Yeşil Binada Leed Sertifikasyonu,* Sunum, http://www.yildiz.edu.tr/~okincay/dersnotu/Yesil_VBol_LEED.pdf

Cerrahpaşa Hastanesi, Mimari ve Leed Raporu, 2016

Sürdürülebilir Yapı Teknolojileri Dergisi (2018*).* Leed Platinum Sertifikalı Memorial Bahçelievler Hastanesi, *Yeşil Bina Dergisi, ISSN: 1309-6540, sayı:47, syf:18, http://www.yesilbinadergisi.com.*

Khan, M.A. (2016). Green Hospital, *https://www.slideshare.net/mahboob804/green-hospital-by-drmahboob-ali-khan-phd.*

Leed Durum Raporu – 1, (2016). T.C İstanbul Üniversitesi Çapa ve Cerrahpaşa yerleşkeleri 2. aşama uygulama projeleri danışmanlık hizmet alım işi, *Yüklenici: RPA S.r.l. & SWS Engineering S.p.A.,*

Leed Durum Raporu – 2, (2016). T.C İstanbul Üniversitesi Çapa Ve Cerrahpaşa yerleşkeleri 2. aşama uygulama projeleri danışmanlık hizmet alım işi, *Yüklenici: RPA S.r.l. & SWS Engineering S.p.A.,*

Leed Durum Raporu – 3, (2016). T.C İstanbul Üniversitesi Çapa Ve Cerrahpaşa yerleşkeleri 2. aşama uygulama projeleri danışmanlık hizmet alım işi, *Yüklenici: RPA S.r.l. & SWS Engineering S.p.A.,*

Leed Ön Değerlendirme Raporu - 3, (2016). T.C İstanbul Üniversitesi Çapa Ve Cerrahpaşa Yerleşkeleri 2. aşama uygulama projeleri danışmanlık hizmet alım işi, *Yüklenici: RPA S.r.l. & SWS Engineering S.p.A.,*

URL 1, Newyork yeşil bina örneği, *http://www.mimdap.org/?p=735, Erisim tarihi: 11.06.2019.*

URL 2, Seattle merkez kütüphanesi*, http://v3.arkitera.com/h13752-internet-cagi-icin-kutuphaneler.html, Erisim tarihi: 11.06.2019.*

SÜREÇ İÇERESİNDEKİ DEĞİŞİMLERİN MİMARİ VE YAPISAL TASARIMLARA ETKİSİ VE İLİŞKİSİ (TEK YAPI ÖRNEĞİ)

Ahmet Sertac Karakas[1], Nail Mahir Kokmaz[2], Tarık Serhat Bozkurt[3]

[1]İstanbul Üniversitesi, Yapı İşleri ve Teknik Daire Başkanlığı, İstanbul, Türkiye

skarakas@istanbul.edu.tr

[2] İstanbul Üniversitesi, Mimar Sinan Üniversitesi, İstanbul, Türkiye

mkorkmaz@istanbul.edu.tr

[3]İstanbul Üniversitesi, Yapı İşleri ve Teknik Daire Başkanlığı, İstanbul, Türkiye

tarik.bozkurt@istanbul.edu.tr

Özet: Günümüzde, birçok tarihi değere sahip anıtsal ve sivil mimarlık eserleri restorasyon, güçlendirme ve onarımdan geçmektedir. Kamu ve özel müteşebbislerce gerçekleştirilen restorasyon-onarım uygulamaları zorlu süreçleri içerisinde barındırmaktadır. Bu uygulamalar, genellikle multi-disiplinlerce gerçekleştirilmektedir. Hem projelendirme hem de uygulama aşamalarında profesyonel mesleklerin katkıları görülmektedir. Onarım bütçeleri, kullanıcının talepleri ile birlikte tarihi yapılarında mevcut durumları bu ortak çalışma gerekliliğini zorunlu kılmaktadır. Proje ve resmi onay aşamasında öngörülemeyen çoğu durum onarım aşamasında ortaya çıkmakta ve sürecin yönetilmesinde zorluklar yaşanmasına neden olmaktadır. Bu nedenle yapısal (statik) projelerin tasarımınında yapının özgünlüğünün korunmasında önem kazanmaktadır. Kullanıcının güncel konfor şartlarının sağlanması, yapı güvenliği ile tarihi yapıların kullanım kapasitelerinin üzerinde yoğunlukların planlanması da restorasyon sürecini etkilemektedir. Tarihi yapıların özgünlüğünün korunup, işlevlerinin sağlanması için multidisiplinlerce tasarım sürecinin birlikte değerlendirilmesi gerekmektedir.
Bu çalışmada; Türkiye'de kamu eliyle yapılan bu tür onarım çalışmalarının mimarlık mesleği ile yapısal (statik) projelerin ve akademik alanların ortak çalışma ve tasarımlarına değinilecek olup, bu süreçlerin mimari tasarım ortamına sürüklediği zorluklara dikkat çekilmiştir.

Anahtar kelimeler: Mimari tasarım (restorasyon) Projesi, Statik (yapısal) Projesi, Güçlendirme

THE EFFECT AND RELATIONSHIP OF THE CHANGES IN THE PROCESS ON THE ARCHITECTURAL AND STRUCTURAL DESIGNS (SINGLE EXAMPLE)

Abstract: Nowaday, monumental and civil architecture works with many historical values are undergoing restoration, reinforcement and repair. Restoration-restoration practices carried out by public and private entrepreneurs include challenging processes. These applications are usually carried out by multi-disciplines. In both the project planning and application stage are seen contributions of professional occupations. The current state of the historical buildings, the demands of the users and the repair budgets require the necessity of joint work. Most of the unforeseeable situations in the project and official approval stage occur during the repair phase and lead to difficulties in managing the process. Therefore, it is important to preserve the authenticity of the structure in the design of structural (static) projects. Providing the user's current comfort conditions, building security and planning of densities above the utilization capacity of historical buildings also affect the restoration process. In order to preserve the original of historical buildings and to ensure their functions, multidisciplinary design process must be evaluated together. In this study; In Turkey, this type of repair work in the architectural profession, structural (static) projects, the common work and design of the academic fields and the challenges that these processes have brought to the architectural design environment have been addressed.

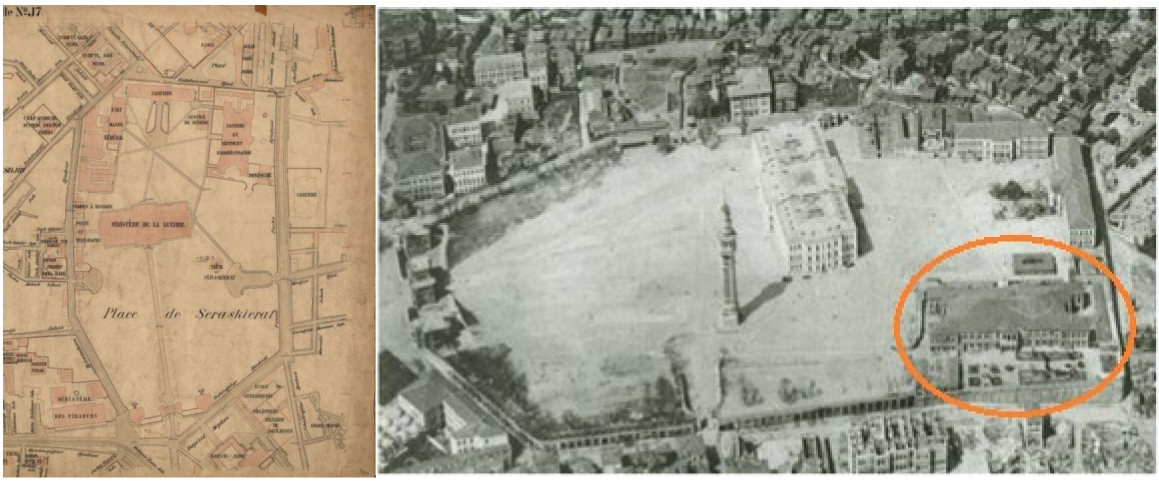
Keywords : Architectural design (restoration) Project, Static (structural) Project, Reinforcement

Giriş

Binaların yapısal durumlarından kaynaklanan statik kaygılar nedeniyle güçlendirme tekniklerinin kullanımda binanın mimari özgünlüğünün korunmasında güçlükler yaşanmaktadır. Deprem ve diğer yönetmelikler (yangın, erişebilirlilik, vb.,) tarihi yapının hangi amaçla kullanılacağı konusundaki düzenlemeler, yapının özgün mimarisinden uzaklaşan kararların alınmasına neden olmaktadır. Bu nedenle özgün mimari tasarım, günümüz ihtiyaçları etkisinde değişime uğramaktadır. Kamuda yapılan restorasyon çalışmalarında güçlendirme projeleri önemli sayılacak etkenlerden biridir. Çünkü mevzuat gereği tam olarak proje aşamasında fiziki çalışmalar (raspa) yapılamadığından güçlendirme projeleri çoğunlukla ihale sonrası yapılmaktadır. Bu da öngörülemeyen birçok proje değişikliğini ortaya çıkarmaktadır. Tarihi yapılarda restorasyon ve güçlendirme uygulamalarında çoklu disiplinlerce proje yapma ve uygulama alanındaki süreçler ile ilgili tarihi bir yapı olan Bekir Ağa Bölüğü Binası (İ.Ü. Siyasal Bilgiler Fakültesi Binası) ele alınmıştır.

Tanzimat Dönemi ile birlikte devam eden batılılaşma hareketleri doğrultusunda Reşit Paşa himayesinde bulunan Gaspare Trajano Fossati, örnek yapı olarak 1841-1843 yılları arasında Bab-ı Seraskerat'ta Hastane Binası (250 kişi yataklı) bina inşa etmiştir. Bina daha sonları askeri amaçlar için kullanılmış ve Osmanlı Döneminin son zamanlarında ise Tevkifhane olarak işlevlendirilmiştir. Tevkifhanenin yöneticisi Bekir Ağa'nın bu binada görev yapması ve aşırı şiddet kullanılması nedeniyle ünlenmiş ve Bekir Ağa Bölüğü olarak adlandırılmıştır. Cumhuriyet dönemi Sereaskerat, Dar-ül Fünun kapatılması sonrası İstanbul Üniversitesine tahsis edilmiş, öncelikle uzun yıllar tıp fakültesi olarak kullanılmış olup, 1979 yılından itibaren Siyasal Bilgiler Fakültesi olarak kullanılmaya başlamıştır (Seçkin, 2011; Yıldızlar, 2019; Poçan, 2010).

Şekil 1'de ilgili yapıya ait eski haritalandırma ve fotoğraflarına yer verilmiştir.



(a) (b)

Şekil 1. Alman mavisi (1913), (a), (Alman mavisi, 1913); Seraskerat binaları-Bekir ağa bölüğü binası (1918),(b) (URL-1).

Yapı, İstanbul ili, Fatih İlçesi, Süleymaniye Mahallesi, 618 ada, 19 parselde Tarihi Yarımada da (Suriçi) Fatih döneminde eski sarayın bulunduğu alanda yer almaktadır. İstanbul Yenileme Alanları Kültür Varlıkları Koruma Kurulunun 04.12.2009 tarih ve 515 sayılı kararı ile İstanbul Üniversitesi Beyazıt Yerleşkesinin Koruma grubu I olarak belirlenmiştir. Tarihi süreç içerisinde çok sayıda fonksiyon değişikliğine uğraması nedeniyle çok fazla değişime uğramıştır. Plan ve cephe özelliklerinde değişim tarihi fotoğraf ve çizimlerden gözlenmektedir.
Şekil 2'de söz konusu yapıya ait proje uydu alanı görüntüleri gösterilmiştir.

(a) (b)

Şekil 2. Proje alanı uydu görüntüleri (a,b); (URL-2).

Tarihi yapı oldukça eğimli bir arazi üzerinde, tarihi istinat duvarı marifetiyle düz bir alanda simetrik, 2 katlı orta sofa planlı, monoblok olarak girinti çıkıntı ve çıkmalar ile hareket kazandırılarak yapılmıştır. İsviçre'nin Belinzona Cantinale arşivindeki orijinal çizimlerinde yer alan orta sofadaki basık kubbe tonoz yapıda yer verilmemiş ve sofa üzerindeki eski resimlerde yer alan fenerde bulunmamaktadır (Yergün, 2002). Yapı 2014 yılında başlayan restorasyona kadar ciddi tahribatlar ve eklemeler geçirmiştir.

Amaç ve Kapsam

İstanbul, Fatih ilçesi, Tarihi yarımada sınırları içerisinde yer alan 1.Koruma Grubu bölgesinde bulunan (618 ada 19 parsel) İstanbul Üniversitesi, Beyazıt yerleşkesindeki Bekir Ağa Bölüğü Binası örneğinde yapının güçlendirme öncesi ve sonrası değerlendirilmesi yapılmıştır. Kullanıcı talepleri, fonksiyon değişiklikleri, yapısal (statik) projelerden gelen geri bildirimler ve uygulamacılardan kaynaklanan değişimlerin tarihi yapıdaki özgün mimari tasarımlar ve mühendislik alanlarındaki tasarımların koordinasyonu ve etkisi incelenmiştir.

Söz konusu tarihi yapı 19. Yüzyılda Batılılaşma hareketlerinin mimarlık alanındaki örneklerindendir. Gaspare Fossati tarafından tasarlanan yapı, ahşap yapılardan, batı tarzı masif tuğla duvar yapılara geçiş döneminde örnek yapı niteliğinde olup 1841-1843 yılları arasında inşa edilmiştir. Tarihi yapı öncelikle hastane binası olarak tasarlanmış ancak, askeri amaçla kullanılmak üzere Bekir Ağa Bölüğü olarak askeri yapı daha sonraları cezaevi işleviyle kullanılmaya başlanılmıştır. Cumhuriyet ile birlikte İstanbul Üniversitesine devredilen yapı öncelikle tıp fakültesinin bazı bölümleri için kullanılmış ve nihayetinde İstanbul Üniversitesi Siyasal Bilgiler Fakültesi'nce kullanılmaya başlanmıştır. Tarihi yapının ilk tasarım işlevinden günümüze kadar çok fazla değişime uğraması nedeniyle özgün yapının tasarımında çok sayıda değişikliğin yaşandığı görülmüştür. Son olarak ta Fakülte Binası işlevi ile kullanılması nedeniyle yoğun kullanımın getirdiği değişimler araştırılarak mimari ve yapısal tasarım alanlarındaki durumu değerlendirilmiştir.

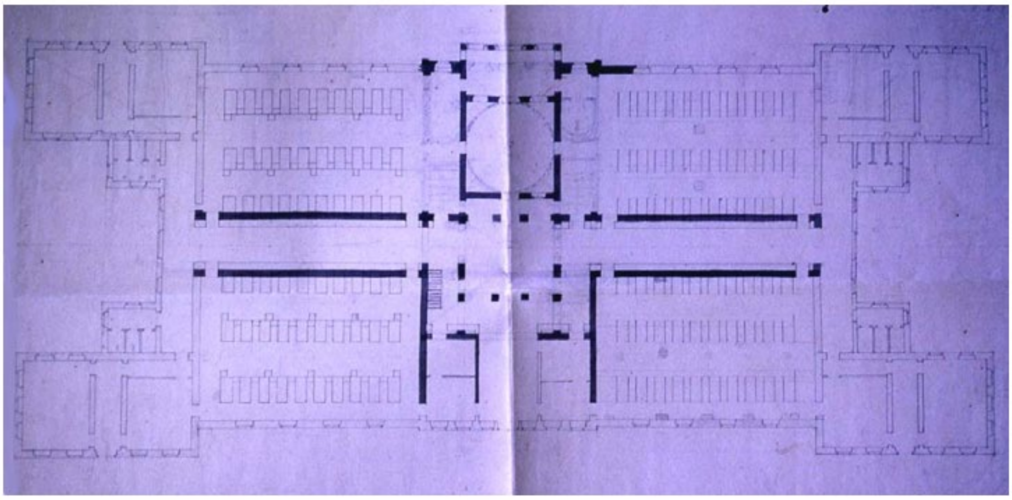
Mimari proje süreci ve yapıda değişimler

Gaspare Trajano Fossati ilk tasarımı

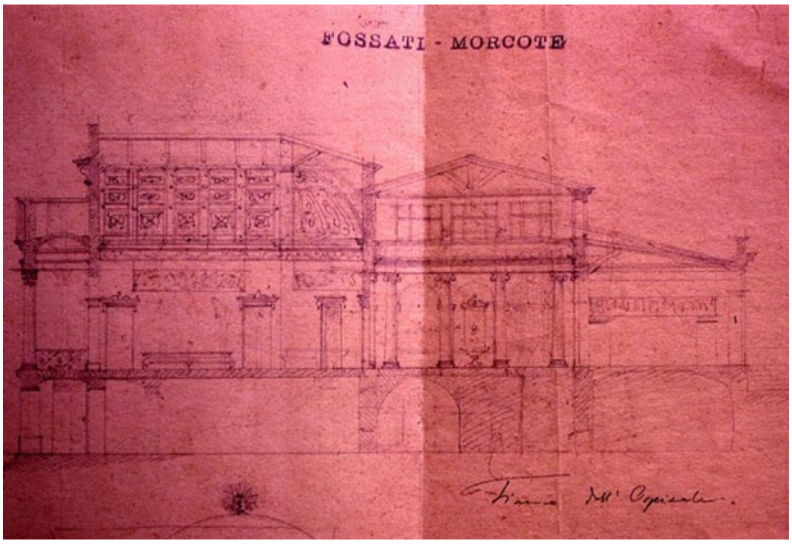
Anılan yapı 250 yataklı Seraskerlik Hastane Binası olarak tasarlanmış ancak 1875 tarihli haritalarda bu tasarımın uygulanmadığı görülmüş ve haritada Kışlay-ı Hümayun Binası olarak adlandırılmıştır. Yapının orta sofalı, büyük bir ev planına sahip olduğu belirtmiştir (Can, 1993). Ayrıca Hastane olarak kullanıldığı kayıtlardan tespit edilememiştir (Can, 1993).

Tarihi yapı, yığma, tuğla duvar yapım tekniğine göre ahşap kirişlemeli ve volta döşeme olarak yapım sistemi kurgulanmıştır.

Şekil 3'te özgün proje plan ve cephe görünüşleri sunulmuştur.



(a)



(b)

Şekil 3. Arşivden elde edilen Fossati özgün projesi– plan (a), görünüş (b); (Poçan, 2010).

İsviçre Bellnizona Cantonale arşivinden edinilen Şekil 3'te görüldüğü üzere orta sofalı üstü kubbeli ve etrafı sütunlu simetrik plana sahip, arazinin eğimli olması nedeniyle doğu cephesinde iki katlı, batı cephesin 1 katılı olarak tasarlandığı görülmektedir. Ana girişin yanı sıra yan girişlerde mevcuttur. Alt kata geçiş, girişin sol yanındaki merdiven ile sağlandığı görülmektedir. Monoblok yapıda geniş koğuşların bulunduğu anlaşılmaktadır.

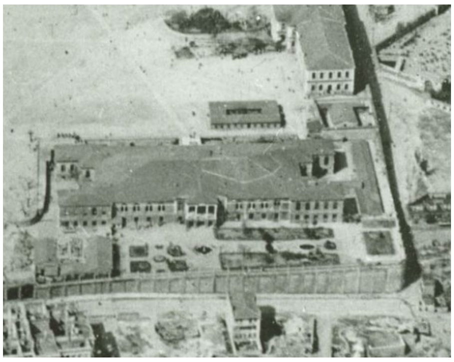
Bekir ağa bölüğü dönemi

Yapı ismiyle anılan dönemde kışla ve cezaevi olarak kullanılmıştır. İlk tasarımdaki plana sadık kalınmış, ancak kubbe ve tonoz tarihi fotoğraflarda görülmediğinden uygulanmadığı anlaşılmaktadır. Fossatini yağlı boya resminde batı cephesinden binaya geçişin köprüler vasıtasıyla bağlandığı tespit edilmiştir. Çatı örtüsünü kırma çatı tekniğinde tek parçadır. Çatı geniş saçaklı olup, oluklu kiremitle kaplandığı görülmektedir (Şekil 4,5).

(a) (b)

Şekil 4. Fossatinin Beyazıt kulesinden yaptığı çalışma (a) (Poçan, 2010); Bekir ağa bölüğü batı cephesi (b) (Fréres, 1893).

Anılan yapıyla ilgili Osmanlı dönemine ait görüntüler Şekil 5 ve Şekil 6'da sunulmuştur.



(a) (b)

Şekil 5. Bekir ağa bölüğü (1918), (a) (URL-1); Bekir ağa bölüğü (1890), (b) (URL-2).

Osmanlının son dönemindeki değişimler yukarıdaki fotoğraflarda görülmektedir. Binada çok fazla değişiklik gözlenmemiştir. Cumhuriyet dönemi ile birlikte binanın özgünlüğünden uzaklaşmaya başlamaktadır.

Cumhuriyet dönemi tıp fakültesi ve siyasal bilgiler fakültesi dönemi mimari tasarım kurgusu

Cumhuriyetle yeni bir dönemin başlamasıyla birlikte Ankara'nın Başkent olmasından sonra, harbiye nezareti Binası ile Bekirağa Bölüğü Binası İstanbul Üniversitesine devrolmuştur. Bina tıp fakültesi olarak uzun yıllar kullanılmış ve 1979 yılında yapılan onarımlar neticesinde Siyasal Bilgiler Fakültesine tahsis edilmiştir (URL-4).

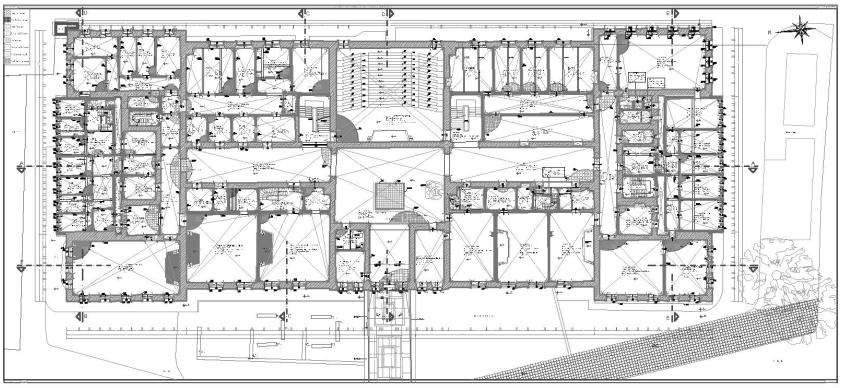
Üniversiteye geçiş döneminden sonra ihtiyaçlara göre binada çok fazla değişim yaşanmıştır. Can yaptığı çalışmada binanın 1950 yılında yıktırıldığından bahseder (Can, 1993). Yapıda en önemli bu dönemde yaşanan değişiklikler yapı kabuğunda meydana gelmiştir. Pencere düzen ve tipleri değişmiş, binaya girişler tek ana akstaki kapıya indirilmiştir. Çatı tipi değiştirilerek, orta alanlar aydınlık olarak bırakılmıştır.

2012 yıllında İl Özel İdare tarafından başlatılan projeler kapsamında rölöve, restitüsyon ve restorasyon projeleri hazırlanmış ve İstanbul Yenileme Alanları koruma Kurulunca projeler onaylanmıştır. Daha sonraları İstanbul Üniversitesi bu projeler doğrultusunda 2014 yılından itibaren restorasyon ve iyileştirme çalışmalarına başlamıştır. Şekil 6'da anılan yapıya ait cephe rölöve çalışmalarına yer verilmiştir.

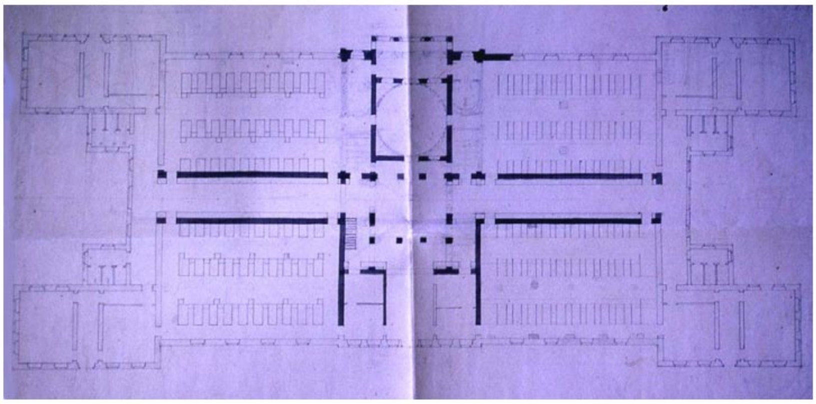
(a) (b)

Şekil 6. Rölöve projesi batı-doğu cepheleri (a), Rölöve projesi güney kuzey cepheleri (b);(Akrapol Mim.,2012).

Şekil 6'da görüldüğü üzere yapının restorasyon öncesi özgün mimarisine göre tüm cephe özelliklerinin değiştiği görülmektedir. Yeni eklentilerle özgünlükten uzaklaşıldığı belirlenmiştir. Şekil 7 ve Şekil 8'de sırasıyla ilgili yapıya ait zemin kat rölöve kat planı ve Fossati'ye ait zemin kat özgün proje planı gösterilmiştir.



Şekil 7. Rölöve projesi zemin kat planı (Akrapol Mim, 2012).

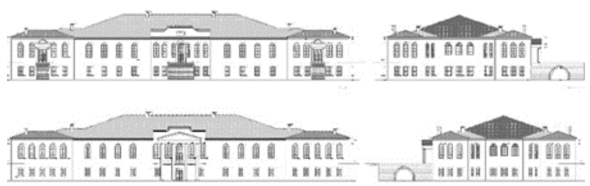


Şekil 8. Fossati özgün proje zemin kat planı (Poçan, 2010).

Zemin kat rölöve projesinde görüldüğü üzere alttaki orijinal planda yer alan mekân organizasyonun tamamen değiştiği görülmektedir. Bina 2. normal kat (orijinal projesine göre) ve sonradan eklenen 1 adette sonradan eklenen asma kat inşa edilmiştir. Fossatinin orijinal plandaki 4 adet koğuşun bölümlenerek birçok sayıda yeni mekâna dönüştüğü görülmüştür.

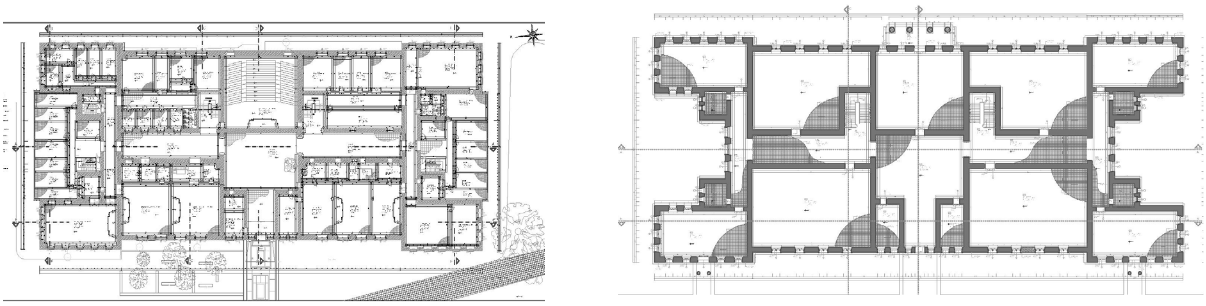
Özellikle tıp fakültesinin kullanımı için kuzey ve güney akstaki çıkıntılara yeni ekler yapılarak bina büyütülmeye çalışılmıştır. Binanın kuzey güney aksındaki alınlıklı girişleri yok olmuştur. Ayrıca yapının ahşap kirişlemeli döşeme sistemi olduğu düşünülmektedir. Ancak günümüzde bunlar tamamen yok olmuştur yerine betonarme döşemeler yapılmıştır. Binaya asma kat eklenmiştir. Bu katlara ulaşım için merdivenler planlanmış ve yapının özgün planından iyice uzaklaşılmıştır. Yapım yılı tam olarak bilinmemekte olup, 20. Yüzyılın ikinci yarısına ait betonarme bina tekniği kullanıldığı anlaşılmaktadır. Can'ın çalışmasında bahsettiği 1950 yıllardaki yıkım olduğu düşünülmektedir [6].

Şekil 9. Birinci öneri restitüsyon projesi cepheler Akrapol Mim, 2012).



Şekil 10. İkinci öneri restitüsyon projesi cepheler (Akrapol Mim, 2012).

Fossatinin orijinal yağlı boya resmindeki yapı özelliklerine öneri restitüsyon projelerinde yer verildiği görülmüştür. Aydınlık fenerli ve fenersiz olarak projeler hazırlanmış olup İstanbul Yenileme Alanları Kültür Varlıklarını Koruma Kurulunca 2. öneri kabul edilmiştir.



(a) (b)

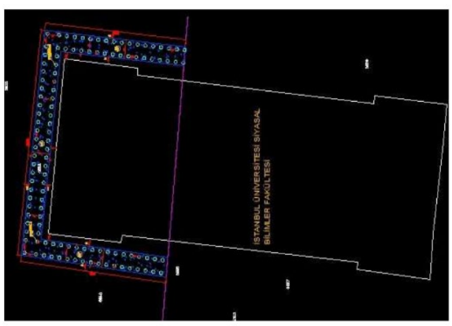
Şekil 11. Restorasyon projesi zemin kat planı (a); Restitüsyon projesi Zemin Kat Planı (b), (Akrapol Mim, 2012).

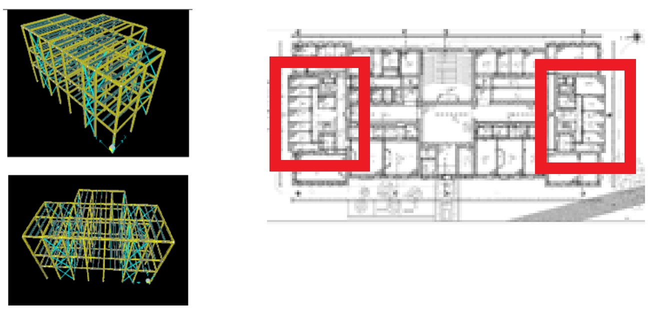
Restitüsyon projesinde tarihi yapıya 4 adet girişe yer verilmiş iken restorasyon projesinde bu girişlerden sadece ana batı cephesindeki giriş projede yer almıştır. Restorasyon projesinin kat planları hazırlanırken, 2. Restitüsyon projesinden uzaklaşılarak, mevcutta kulanım gereksinimlerine göre bir mekân dizimi ve organizasyonu yapılmıştır.

Mimari ve statik tasarımlar

Birinci dönem mimari ve yapısal (statik) tasarımlar

Restorasyon öncesi proje müellifleri tarafından hazırlanan mimari ve mühendislik tasarım projeleri tarihi yapının mevcut durumunun korunması üzerinden geliştirilmiştir. Şekil 13b'de görüldüğü üzere; rölöve projesi, restorasyon projesine dönüştürülmüştür. Binanın yapısal tasarımı, mevcut duvar ve döşemelerin iyileştirilmesi, yapının rijitliğinin korunması için mini fore kazık uygulamaları yapılması (şekil 12) ve iki adet muhdes betonarme yapının yıkılarak, yerine çelik konstrüksiyon yapıların tasarımını içermektedir (Şekil 13a).



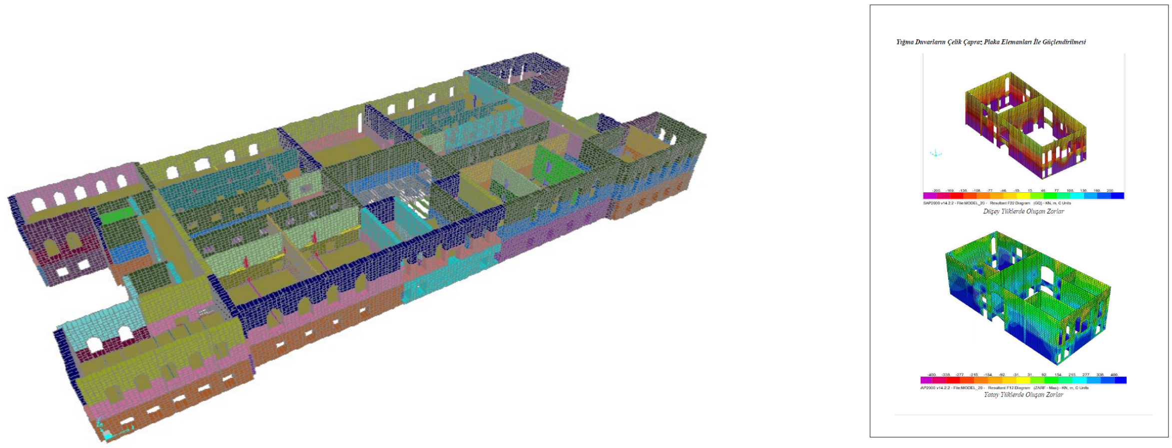


(a) (b)

Şekil 12. Fore kazık tasarımı (Akrapol Müh, 2012).

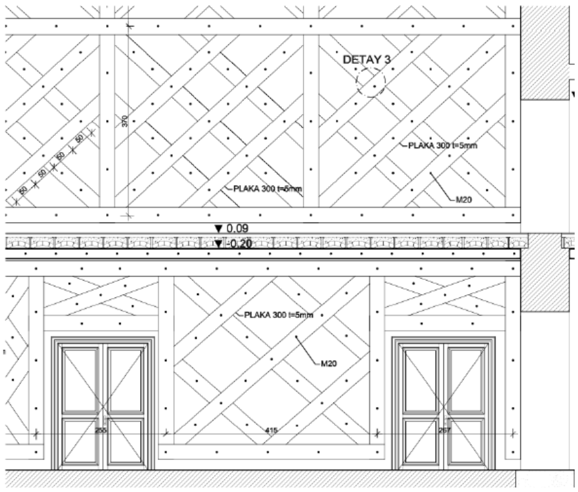
Şekil 13. Çelik muhdes yapı tasarım (a), (Akrapol Müh, 2012) ve konumu (b), (Akrapol Müh, 2012).

Şekil 12'de görüleceği üzere 80 cm çapında kiriş başlıklı U şeklinde tarihi yapının kuzey cephesini çevreleyecek şekilde yerleştirilmiştir. Şekil 13'te yapının kuzey ve güney cephelerindeki girintilerde yer alan mevcut betonarme yapılar yerine çelik yapılar tasarlanmıştır.
Şekil 14'te tarihi yapının statik tasarım modülü sunulmuştur.



Şekil 14. Tarihi yapının statik tasarım modülü (Akrapol Müh., 2012).

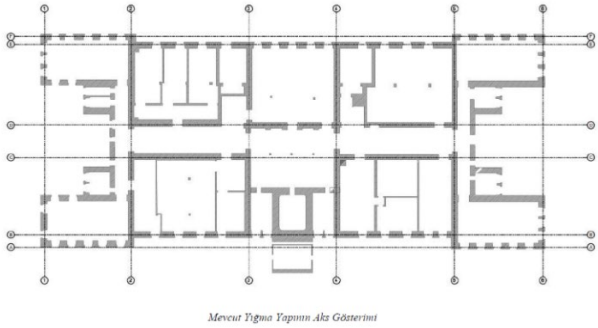
Şekil 15'de tarihi yapıya ait statik tasarım müdahale detayı ve aks planı gösterilmiştir.



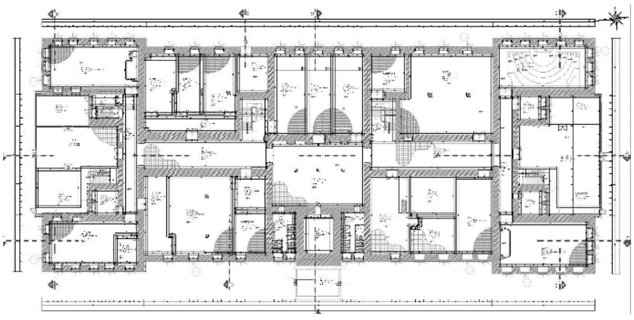
Şekil 15. Tarihi yapının statik tasarım müdahale detayı ve statik tasarım aks planı (Akrapol Müh.,2012).

Mevcut tarihi binanın yığma duvarlarının iyileştirilmesi, yapının restorasyonu kapsamında yapının deprem performans seviyesini arttırmak amacıyla yapıda çeşitli müdahalelerde bulunulmuştur. Bunlardan ilki mevcut volta döşemelerinin olduğu mahallerde volta döşemesine çelik lamalar ile bağlantı yapılarak, yığma duvara birleşimi sağlanmıştır. Çatı kotu seviyesinde yeni bir hatıl tasarımı yapılarak, hatıl arası boşluklara çapraz çelik makaslar düşünülmüştür. Duvarlardaki kapı ve pencere boşluklarına metal levhalar karşılıklı geçirilip bağlantısı sağlanmıştır. Dış cephelerde 1.5 metreden küçük duvar açıklıklarına duvar içerisinden geçirilen mil yardımı ile kayma kapasitesi artışı sağlatılmaya çalışılmıştır. 1.5 m ile 3.5 m arası duvar parçalarında ise karbon lifli lamine plak ile duvarların iç cephe taraflarında derz aralarına belli aralıklar ile yerleştirilmesiyle benzer kapasite artışı sağlanmaya çalışılmıştır. Yapılan duvar deneyleri neticesinde tüm yapıdaki duvarlar içerisinde tuğlalar arasında boşluklar görülmüştür bu sebeple tüm taşıyıcı duvarlarda enjeksiyon yapılacaktır. Mevcut betonarme döşemeler için herhangi bir iyileştirme detayı bulunmamaktadır (Akrapol Müh, 2012).

Şekil 16 ve Şekil 17'de sırasıyla tarihi yapının statik aks planı ve restorasyon kat planları sunulmuştur.



Şekil 16. Tarihi yapının statik aks planı (Akrapol Müh., 2012).



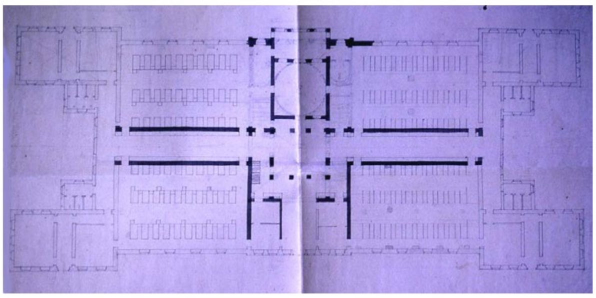
Şekil 17. Tarihi yapını restorasyon kat planı (Akrapol Mim., 2012).

Mimari ve yapısal (statik) projeler karşılaştırılarak değerlendirildiğinde; mevcut mahallerin korunması için öncelikle yapı dışında ciddi bir fore kazık uygulamasından bahsedilmiştir. Alanın sit alanı olması nedeniyle toprak altı arkeolojik eser çıkma olasılığı nedeniyle alan denetimli kazılmadan imalat yapılması fikri olası eser çıkma durumu dikkate alınmıştır. Daha sonra duvar iyileştirmeleri için karbon plakların kullanımı ve betonarme hatıl yapılması özgünlüğüne zarar verebileceği göz önünde bulundurulmuştur. Ayrıca duvar içlerine ve boşluklarına metal elemanların yerleştirilmesi tarihi duvarın özgünlüğünü etkileyebileceği öngörülmüştür. Buna karşın mevcut betonarme muhdes yapıların çelik kontrüksiyon olarak tasarlanması hem dönem farkının yaratılması ve tarihi yapı ile ilişkisinin kurulması hem de hafif olması nedeniyle yapısal tasarım anlamda doğru bir karar olacağı düşünülmüştür.

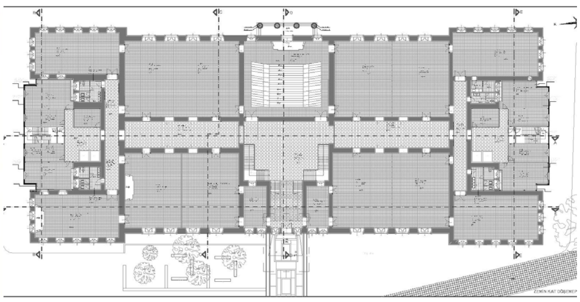
İkinci dönem mimari ve yapısal (statik) tasarımları

2014 yılının Ağustos ayından itibaren restorasyon projeler doğrultusunda ve mimari statik danışmanların direktifleri ile restorasyon ve güçlendirme çalışmalarına başlanılmıştır. Binanın çevresinde ki muhdesler kaldırılmış ve araştırma raspaları ile işe devam edilmiştir. Kaplamaların sökülmesi ve araştırma raspaların tamamlanmasına müteakip ortay çıkan durum tarihi binanın yapısal güvenliğinin çok zayıf olduğu proje müellifleri ve danışmanlarca karar verilmiştir. Bir yandan da binada ortaya çıkan gizlenmiş mimari elemanların ortaya çıkarılması ve binanın kullanıcıları yapılan görüşmeler ile restorasyon projesinde bulunan asma katın iptal edilerek buradaki mekanların çatı arasına (öğretim elemanları odaları) alınması kararlaştırılmıştır. Bu karar ile bina özgün plan şemasına yaklaşmıştır. Restoraston projesinde revizyona gitme ihtiyacı doğmuş ve bu doğrultuda yeni bir müellif ile tadil restorasyon projesi hazırlanmış ve İstanbul Yenileme Alanları Kültür Varlıklarını Koruma Kurulunca onaylanmıştır.

Yukarıdaki nedenlerden dolayı birinci dönem proje çalışmaları kapsamlı revizyona uğramıştır. Öncelikle mimari kararlar verilerek yapılan revizyonlara göre statik tasarımcılar yapısal tasarımı modellenmeye çalışmıştır.



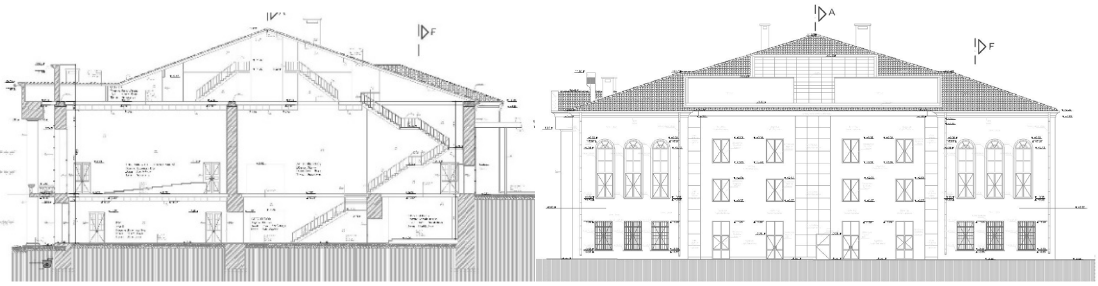
Şekil 18. Orijinal Fossati zemin planı (Poçan, 2010).



Şekil 19. Tadil restorasyon projesi zemin planı (Artlite Mim, 2015).

Şekil 18 ve Şekil 19'da görüldüğü üzere tadil restorasyon projesi ile Fossatinin özgün kat planında büyük benzerlikler içermektedir. Asma katın iptali ile merdivenlerin yeri değişmiş ve orijinal projesindeki yere taşınmıştır. Üstü kubbeli orta sofa, fakültenin Kurucusunun adını taşıyan amfiye ve dört adet ana koğuş mekânı fakültenin amfileri dönüştürülmüştür. Orijinal döşeme kotlarına ulaşılması nedeniyle İç mekânlardaki hacimler özgün durama getirilmiştir. Tıp fakültesinin ihtiyacı için çok önceleri yapılan eklerin yerine kuzey-güney cephelerindeki girintilere yeniden çelik konstrüksiyon ve cephe kaplamaları ile dönem eki olduğunu vurgulayan iki adet yapı eklenmiştir.

Tadilat restorasyon projesine ait kesit ve kuzey cephesi sırasıyla Şekil 21'de gösterilmiştir.



(a) (b)

Şekil 20. Tadil restorasyon projesi kesit (a) ve kuzey cephesi (b), (Artlite Mim, 2015).

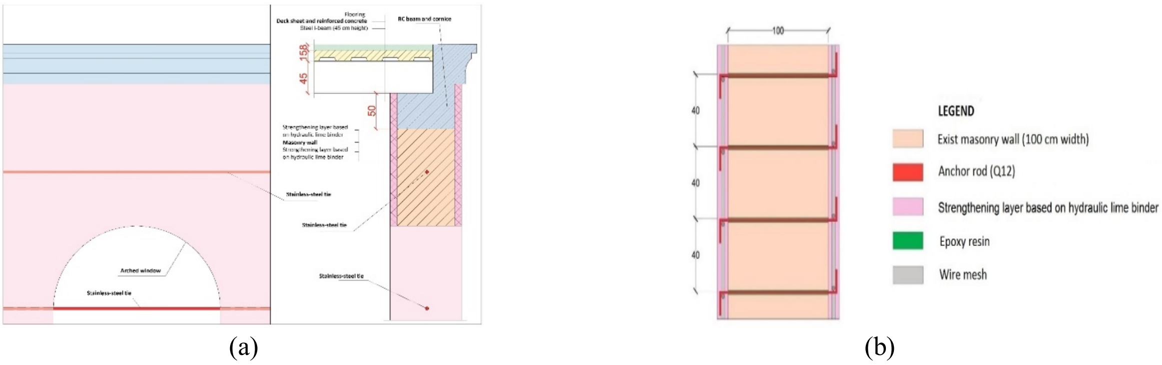
Çatı arası kullanımı Şekil 20'de görüldüğü üzere iki katlı olarak tasarlanmıştır. Tadil restorasyon projesinde özgün beden duvarları en önemli kriter olarak belirlenmiş ve mekan planlanması bu doğrultuda yapılmıştır. Restitüsyon da batı cephesinde yer alan iki adet yan girişe yer verilmemiş olup, ana giriş cumhuriyet döneminde eklenen üstü bakır kaplamalı ahşap direkli saçak bulunmaktadır.

Son dönemde Türkiye'de birçok konuda (deprem yönetmeliği, iş güvenliği-iş sağlığı, yangın, erişebilirlilik standartları, güvenlik vb.) yönetmelikler yayınlanmış ve eğitim ve kamu alanında zorunlu hale gelmiştir. Bu yönetmelikler, mühendislik ve mimari disiplinleri bir arada daha da fazla çalışmaya ve çözüm üretmeye götürmüştür. Bu doğrultuda tarihi yapıda birçok düzenlemeye gidilmiştir. Öncelikle restorasyon işlerinin başlaması ile binanın yapısal durumu analiz edilmiş ve statik-sağlamlaştırma projesi yeniden ele alınarak mimari kararların (döşeme ve duvarların durumu gibi) gözden geçirilmesine sebep olmuştur.

Mimari tasarımda alınan kararlardan doğrultusunda yapısal tasarımda ilk tasarımda yer alan kazık-iksa tasarımından vazgeçilmiştir. Duvarların tamamına enjeksiyon uygulaması, duvar yüzeylerine (kapı pencere iç boşlukları-merkezleri) ve içerisine metal kaplama ve metal paslanmaz millerin yerleştirilmesi, çatı saçak kotunda hatıl yapılması, yan binaların çelik konstrüksiyon olması gibi birinci dönem kararlar doğrultusunda tasarım kararları devam ettirilmiştir. Buna karşın karbon plak uygulamasından vazgeçilerek Şekil 22'de görüldüğü üzere tüm duvar yüzeylerine epoksi harçlı filiz ekimi öngörülmüş, daha sonra hasır çelik ile bir ara donatı yüzeyi elde edilerek kireç harçlı özel bir sıva ile taşıyıcı katman (mantolama) tasarlanmıştır. Çatı aksındaki hatıl kararı yinelenmiş, ancak çapraz çelikler (mevcut döşeme altına) yerine yeni kirişli çelik döşeme kararı alınmıştır. Çatı arası kullanımı ortaya çıkmasından ötürü statik yük hesapları değişmiş tüm yapının statik dengesi daha güçlü olacak şekilde revizyon edilerek, ahşap çatı makası yerine çelik çatı makaslarına geçilmiştir. Çatı pencerelerini yerleştirilmesi içine çelik mertek aralıkları belirlenmiştir.

İlk tasarımda mevcut tüm döşemeler korunacakken, yukarıda bahsi geçen nedenlerden (geniş açıklıkların geçilmesi, niteliksiz-özgün olmama, deprem güvenliği olmaması vb.) dolayı kirişli çelik döşeme tasarımına geçilmiştir. Proje geliştirilirken tüm döşemelerin birbirine ve özgün duvarlara bağlantıları detaylandırılmıştır. Özgün ahşap kirişlerin oturduğu duvar kotları tespit edilmiş buralara kirişlerin oturması için metal plakalar tasarlanmıştır. Bu şekilde özgün mimari plana ulaşılmıştır.

İlk tasarımdaki fore kazık, karbon lifli plaka, mevcut betonarme döşemelerin korunması kararlarından vazgeçilmesi mimari tasarım ve özgünlük için doğru bir yaklaşım olabilmektedir. Duvar iyileştirmelerinde ise mantolama ve çelik çubuk-ankraj kararları yapı tasarımı şekillendirmiştir. Çimento esaslı sıva katmanı uygulaması yerine bina yapısına uygun olarak kireç esaslı güçlendirme sıva katmanı uygulaması gerçekleştirilmiştir. Bu şekilde gerçekleştirilen yapısal tasarımın taşıyıcı yığma duvarların malzeme yapısına daha uygun olduğu ve yığma duvarların daha sağlıklı bir şekilde çevre koşullarına karşı zarar görmeden geleceğe aktarılmasının sağlanabileceği düşünülmektedir.



(a) (b)

Şekil 21. Duvar ve döşeme güçlendirme detayları (Sayin, 2016).

Mimari ve statik tasarımlar ve ilgili resmi kurum onayları alındıktan sonra 2016 yılı içerisinde uygulanmaya başlanılmıştır.

Şekil 22 ve Şekil 23'te sırasıyla ilgili yapıya ait söküm, güçlendirme ve dış cephe restorasyon uygulamaları gösterilmiştir.

(a) (b)

Şekil 22. Restorasyon Döşeme Söküm (a) ve Yapım Aşamaları (b); (Akka, Mim., 2015)

Şekil 23. Dış Cephe Restorasyon İşleri (Akka Mim., 2015).

Farklı Disiplinlerin Mimari Tasarıma Etkileri

Restorasyon sürecinde tarihi yapı Mühendislik (mekanik-elektrik ve statik) ve Mimarlık disiplinlerince özgün işlevin (ya da daha düşük kapasiteli fonksiyon) yerine günümüzde eğitim amaçlı kullanımın kabul edilmesi çok yönlü olarak değerlendirilmiştir. Yapının özgün mimarisinin (cephe ve plan bazında) yeniden oluşturulması ve aynı zamanda statik gereksinimlerden kaynaklı yapı elemanlarındaki teknik ve malzeme seçiminde birlikte hareket edilerek, kararlar alınmış/alındığı görülmektedir. Yangın ihbar-söndürme, iklimlendirme, kuvvetli(besleme)-zayıf akım (kamera-güvenlik, simültane-tercüme, seslendirme, led aydınlatma, otomasyonlar vb.) ile nitelikli sistemleri ile bina en verimli şekilde kullanımı planlanmıştır. Elektro-mekanik sistemlerin(ısıtma-soğutma, asansör, kablolama, vb., açıkta görülmesi yapının görsel zenginliğini bozmaktadır. Bu nedenle bu sistemlerin mimari tasarım sürecinde mühendislik taleplerinin tasarıma yansıtılması gerekmektedir. Örneğin mimari restorasyon projesinde tesisat şaftları ile asansör dönem eki olan (kuzey-güney cephelerindeki çelik yapılar) kısımda konumlandırılmıştır.

Sonuç

Tarihi yapı, hastane (bu işlevde kullanıldığına dair belge bulunamamış) olarak tasarlanmış, daha sonra Kışla Binası (Bekir ağa Bölüğü), Tutukevi, Tıp Fakültesi ve nihayetinde Siyasal Bilgiler Fakültesi olarak işlevlendirilen tarihi Binada restorasyon işleri tamamlanmış olup,

1-Süreçler içerisinde çok büyük değişimlere ve tahribatlara uğrayan tarihi binanın ilk dönem cephe düzeni ve plan şemasına ulaşmak için gerekli kararların mimari ve yapısal(statik) tasarım kararlarının birlikte alınması gerektiği anlaşılmış ve uygulama bu doğrultuda yürütülmüştür.
2-Binanın yapısal çözümleri güncel yönetmeliklere göre yapılması gerekmektedir ve bu sebepten dolayı yönetmenliklerin uygulanmasında zorluklar ile karşılaşılmıştır. Restorasyon projelerinin hazırlanması sürecinde statik, mimari ve tesisat tasarım grubunun birbiriyle entegre çalışması elzem olmaktadır.
3- Tarihi yapılarda Elektro-Mekanik projeler tasarım aşamalarında proje sürecine dâhil edilmesi gerekmektedir. Ancak günümüzde hem yönetmelikler hem de kullanıcı talepleri doğrultusunda tarihi yapılarda önemli sistemlerin kurulması zorunlu kılınmış, bu gibi zorunlulukların uyumsuzlukları mimari grup ile koordineli ve ortak karar alınması ile çözümlere kavuşturulabilmektedir.

4-Kullanıcı, bilim heyeti, şantiye teknik ve idare kontrol grubu ile mimari ve yapısal (statik) tasarım ekibinin birlikte çalışması sonucunda tasarımsal hataların minimum seviyeye indirilmesi beklenmektedir.

Tarihi yapıların özgünlüğünden uzaklaşılmadan gelecek kuşaklara aktarılması ve tarihi yapılarda dönem karmaşasının önlenmesi elzemdir. Mekân fonksiyonlarının fiziksel çevre koşullarına uygun olarak tasarlanabilmesi için multi-disiplinlerce ortaklaşa tasarım sürecinin yürütülmesi gerekmektedir.

Teşekkür
Bu çalışmanın hazırlanmasında gerekli izinlerin ve yardımların alındığı, İstanbul Üniversitesi Yapı İşleri ve Teknik Daire Başkanlığı'na teşekkür ederiz. Ayrıca Danışman öğretim üyelerinden Prof. Dr. Kemal Kutgün Eyyüpgiller'e ve Prof. Dr. Kaya Özgen'e uygulama sırasındaki yardımlarından dolayı teşekkür ederiz. Bunun yanında yüklenici AKKA Mimarlık firmasina teşekkür ederiz.

Kaynaklar

Seçgin, N.,(2011), Sanat tarihi araştırma raporu, MSGSÜ, İstanbull: Sanat Tarihi Bölümü
Yıldızlar, B.; Akçay, C.;Sayın B.; (2019), A Case Study on the Restoration of A Historical Masonry Building Based on Field Studies and Laboratory Analyses, International Journal of Architectural Heritage, DOI: 10.1080/15583058.2019.1607625
Poçan, E., (2010), İstanbul Üniversitesi Siyasal Bilimler Fakültesi / Bekirağa Bölüğü Mimari Değerlendirmesi ve Koruma Sorunları, Yüksek Lisans Tezi, YTÜ Fen Bilimleri Enstitüsü, İstanbul
Alman mavileri, 1913- 1914, I. Dünya Savaşı Öncesi İstanbul Haritaları, Hazırlayan firma: "Deutsch Syindikat für Staebaliche Arbeiten"
Yergün, U., (2002) Batılılaşma Dönemi Mimarisinde Yapım Teknolojisinde Değişim ve Gelişim, Doktora Tezi, YTÜ Fen Bilimleri Enstitüsü, İstanbul.
Can, C., (1993), İstanbul'da 19. Yüzyıl Batılı Levanten Mimarların Yapıları Ve Koruma Sorunları, Doktora Tezi, YTÜ Fen Bilimleri Enstitüsü, İstanbul.
Abdullah Fréres, photographer. *View of the Taşkışla Barracks of the Ministry of War / Abdullah Frères, Phot., Constantinople*. Istanbul Turkey, None. [Between 1880 and 1893] Photograph. Retrieved from the Library of Congress,
Akropol Mimarlık, (2012), İstanbul Üniversitesi Siyasal Bilgiler Fakültesi Rölöve, Projesi, İstanbul.
Akropol Mimarlık, (2012), İstanbul Üniversitesi Siyasal Bilgiler Fakültesi Restitüsyon, Projesi, İstanbul.
Akropol Mimarlık, (2012), İstanbul Üniversitesi Siyasal Bilgiler Fakültesi Restorasyon, Projesi, İstanbul.
Akropol Mühendislik, (2012) İstanbul Üniversitesi Siyasal Bilgiler Fakültesi Hesap Raporu, İstanbul
ARTLITE Mimarlık, (2015) İstanbul Üniversitesi Siyasal Bilgiler Fakültesi Tadil Restorasyon, Projesi, İstanbul.
Sayin, B.; Bozkurt, T., S.; Yildizlar, B.; Akçay, C.; (2016), The consolidation of historical masonry structures: a case study, in: ACE 2016: 12th International Congress on Advances in Civil Engineering, 21-23 September 2016, İstanbul
AKKA Mimarlık, (2015) Restorasyon Firması Albümü, İstanbul
URL 1 <http://www.eskiistanbul.net/749/eski-istanbul-istanbul-universitesi-beyazit-kampusu>, erişim tarihi 31.05.2019.
URL 2 <https://sehirharitasi.ibb.gov.tr>, İ.B.B. Şehir Rehberi , erişim tarihi 2017.
URL 3 <http://www.eskiistanbul.net/3300/beyazit-kulesi-gulmez-freres-fotografi#lg=0&slide=0>, erişim tarihi 31.05.2019.
URL 4 <http://siyasal.istanbul.edu.tr/tr/content/fakultemiz/tarihce>, erişim tarihi 31.05.2019.

THE ADOPTION OF INTERNET-ONLY BANK IN TERMS OF BENEFITS AND DIFFERENTIATED SERVICES

Byoungho Jun

Seoul Women's University, Institute of General Education, Seoul, South Korea

bojun00@swu.ac.kr

Abstract: The purpose of this study is to analyze the adoption of internet-only bank in Korea in terms of benefits (functional, social, experiential, economic benefits) and differentiated services (customization and service diversity). Data was collected using an online and offline survey of 117 internet-only bank users and analyzed the data using structural equation model (SEM). The results of empirical analysis using SmartPLS show that functional benefits, experiential benefits, and customization are significantly related to the user's satisfaction, but economic benefits, social benefit, and service variety are not. This study has the significance in that it examines the user's attitude toward internet-only bank in terms of benefits and differentiated services while other studies analyzed banking services focusing on the attributes of banking channel itself.

Keywords: Internet-only Bank, Benefits, Differentiated services

Introduction

With the advent of internet banking, a large part of the services that are offered by banks can be provided online as well and many banks are closing offline branches and concentrating on improving online channels (Jun, 2017). Even more banks that use internet as the only channel of banking services has come to exist, which called 'internet-only bank'. Internet-only bank do not have any physical infrastructure resulting in costs savings. Instead, they invest in high end computer infrastructure that allows them to serve their customers in better and faster ways (Kim and Kim, 2018). Internet-only bank is a kind of self-service bank targeting small-scaled retail finance. Internet-only bank is providing services only through the internet and limited call center services are provided without face-to-face channel. As a mean to encourage development of fintech internet-only bank has emerged in Korea (Park, 2017). Two internet-only banks in Korea, KaKao Bank and K-Bank have started their operation in 2007. As of August 2017, 3.07 million accounts were opened in Kakao Bank and 490,000 accounts in K-Bank. When it comes to the amount of deposits and loans, Kakao Bank has 1,409 billion Won as deposits and 1,958 billion Won as loans while K-Bank has only 800 billion Won as deposits and 650 billion Won as loans (Park, 2017). The introduction of internet-only banks in Korea has decreased the market price of financial products and banking services resulting in causing healthy competition in banking industry.

Internet-only bank creates customer value by providing time optimization, immediate and customized information, fun and instant connectivity, great convenience and interactivity (Park, 2017). That is, customer use internet-only bank due to the various benefits compared with internet banking and mobile banking which are provided by traditional banks. Benefits are the personal values consumers attach to the product or service attributes and they are often linked to fairly basic motivations of purchasing (Keller, 2007). While prior banking-related studies have focused on the attributes of banking channel itself, this study intends to examine the adoption of internet-only bank in terms of benefits (functional, social, experiential, economic benefits) and differentiated services (customization and service diversity) as well.

Theoretical background

Several studies analyzed banking services and associated factors that influence consumers' adoption of it using a specific adoption theory or an extension of it, such as TAM (Technology Acceptance Model), IDT (Innovation Diffusion Theory), and UTAUT (Unified Theory of Acceptance and Use of Technology) (Aijaz and Heikki, 2015). They usually focused only on the attributes of banking channel and neglected the customer's subjective perception of benefits which banking services provide (Jun, 2017). However, it is necessary to investigate the relationship between the attitude and the usage in terms of user's subjective value, which are user's benefits, because customer has a tendency to use any service to get desirable benefits rather than to get attributes.

Benefits are the desirable consequences consumers seek when they buying and using products or services. Consumers don't buy and use products or services to get attributes; rather they think about products or services in terms of desirable and undesirable consequences - benefits (Peter and Olson, 1987). Benefits have been adopted by some studies on smart phone and mobile applications (Jun, 2017; Keller, 2007; Kwon, 2015; Noh and Hwangbo, 2016; Woo et al., 2013; Yim et al., 2016). Benefits can be distinguished into several categories according to the underlying motivations to which they relate (Keller, 2007; Peter and Olson, 1987). In this study benefits are categorized into 4; functional benefit, experiential benefit, social benefit, and economic benefit by adapting Jun's study (Jun, 2017; Jun, 2019).

Service variety and customization are also important factors of consumer's attitude. Broad range of products and services is one of significant predictor of consumer's motivations (Jun, 2018) and customized services are significantly related to the consumer's attitude and satisfaction (Jun, 2016).

Table 1: Affecting factors of internet-only bank

Factor	Construct	References
Functional benefit	Intrinsic advantages of product or service consumption and usually correspond to the product related attributes	Jun (2017), Yim et al. (2016), Kwon (2015), Noh and Hwangbo (2016)
Experiential benefit	Extrinsic advantages of product or service consumption such as social approval and personal expression	
Social benefit	Benefits relate to what it feels like to use the product or service such as sensory pleasure	
Economic benefit	Cheaper price and cost compared with other channels	
Service variety	Broad range of services	
Customization	Customized services	

Research model and empirical analysis

Research model and hypotheses

The primary purpose of this paper is to investigate the affecting factors of attitude, and usage of internet-only bank as Figure 1.

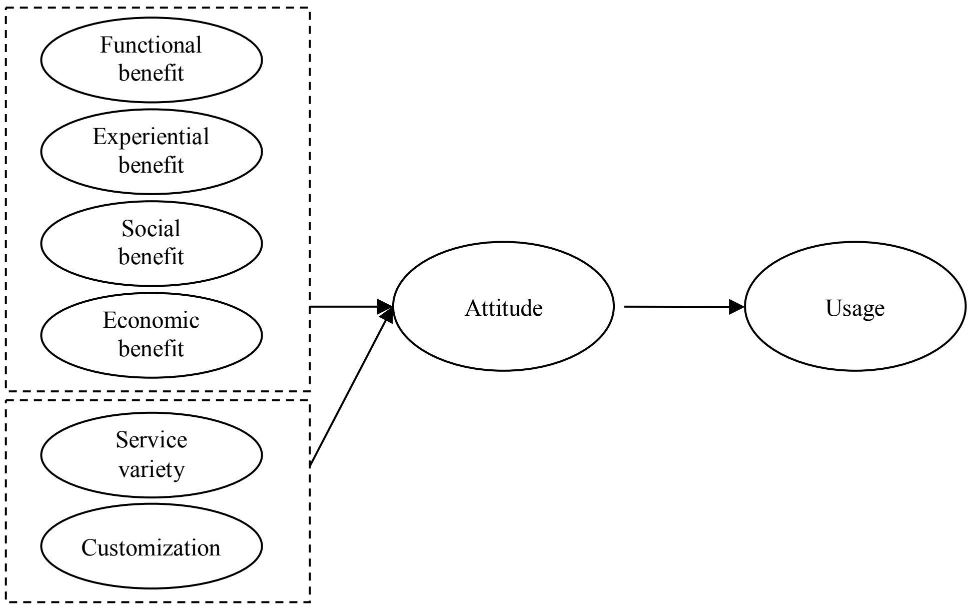


Figure 1. Research model

Based on prior studies which are mentioned in theoretical background benefits (functional, social, experiential, economic benefits) and differentiated services (customization and service diversity) are identified as affecting factors and following hypotheses are established as Table 2.

Table 2: Hypotheses

Hypotheses	Content
H1	Functional benefits will have a positive effect on attitude toward internet-only bank.
H2	Experiential benefits will have a positive effect on attitude toward internet-only bank.
H3	Social benefits will have a positive effect on attitude toward internet-only bank.
H4	Economic benefits will have a positive effect on attitude toward internet-only bank.
H5	Service variety will have a positive effect on attitude toward internet-only bank.
H6	Customization will have a positive effect on attitude toward internet-only bank.
H7	Attitude toward internet-only bank will have appositive effect on intention to re-use.

Empirical analysis

A questionnaire was used to collect data for this study targeting the internet-only bank users in Korea. The instruments measuring the constructs were adapted from the extant literature. The items were measured on a 5-point Likert scale using from 1 ('strongly disagree') to 5 ('strongly agree').

117 responses were used as a basis for the findings of this study. 76% of respondents use internet-only bank more than 1 time in a week. 0ver 70% of respondents use balance check service and transfer service regularly and frequently.

SEM (Structural Equation Model) was used for empirical test using SmartPLS. PLS is an extremely powerful multivariate analysis technique that is ideal for testing structural models with latent variables. This is a convenient and powerful statistical technique considered appropriate for many research situations (Henseler et al., 2009), suitable for studying complex models with numerous constructs (Chin, 1998).

The measurement model was assessed for construct reliability, indicator reliability, convergence validity, and discriminant validity. Table 3, 4 lists the average variance extracted (AVE), composite reliability (CR), factor loadings, and variable correlations. As shown in the table, the measurement model results indicate that the model has acceptable construct reliability (Straub, 1989), indicator reliability (Churchhill, 1979), convergence validity (Chin, 1998; Fornell & Lacker, 1981), and discriminant validity (Fornell & Lacker, 1981), ensuring that the constructs are statistically distinct and can be used to test the structural model.

Table 3: Confirmatory factor analysis

Construct	Factor loadings	Composite Reliability	AVE
Functional benefit	0.831	0.894	0.629
	0.815		
	0.798		
	0.857		
	0.648		
Experiential benefit	0.913	0.954	0.874
	0.951		
	0.939		
Social benefit	0.642	0.816	0.602
	0.734		
	0.924		
Economic benefit	0.776	0.812	0.685
	0.876		
Service variety	0.728	0.878	0.707
	0.911		
	0.872		
Customization	0.875	0.929	0.813
	0.909		
	0.919		
Attitude	0.842	0.909	0.771
	0.937		
	0.852		
Usage	0.978	0.978	0.956
	0.977		

Table 4: Discriminate validity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Functional benefit(1)	**(0.629)**							
Experiential benefit(2)	0.492	**(0.874)**						
Social Benefit(3)	0.274	0.353	**(0.602)**					
Economic benefit(4)	0.523	0.295	0.240	**(0.685)**				
Service variety(5)	0.210	0.384	0.227	0.213	**(0.707)**			
Customization(6)	0.435	0.421	0.293	0.420	0.319	**(0.813)**		
Attitude(7)	0.641	0.561	0.373	0.463	0.245	0.580	**(0.771)**	
Usage(8)	0.508	0.392	0.076	0.320	0.232	0.445	0.513	**(0.956)**

The analysis of hypotheses and constructs' relationships were based on the examination of standardized paths using the bootstrap resampling method (Chin, 1998; Henseler et al., 2009). The results are summarized in Table 5. Functional benefit (β = 0.343, t-value = 3.841), experiential benefit (β = 0.229, t-value = 2.475), and customization (β = 0.284, t-value = 3.0788) were found to be significantly related to consumer's attitude, but social benefit (β = 0.107, t-value = 1.405), economic benefit (β = 0.082, t-value = 0.899), and service variety (β = -0.047, t-value = 0.565) were not. Consumer's attitude also has positive effect on usage (β = 0.513, t-value = 6.649). According to the values given in Table 4, hypotheses 1, 2, 6, 7 are supported but hypotheses 3, 4, 5 are not supported

Table 5: Results of hypotheses testing

Path		Estimate	t-value	Result
H1	Functional benefit → Attitude	0.343	3.841	Accept
H2	Experiential benefit → Attitude	0.229	2.475	Accept
H3	Social benefit → Attitude	0.107	1.405	Reject
H4	Economic benefit → Attitude	0.082	0.899	Reject
H5	Service variety → Attitude	-0.047	0.565	Reject
H6	Customization → Attitude	0.284	3.078	Accept
H7	Attitude → Usage	0.513	6.649	Accept

Conclusion

Internet-only bank means a bank that utilizes internet as the primary sales channel instead of establishing offline branches for face-to-face respond as the traditional bank does. In 2017, two internet-only banks in Korea, Kakao Bank and K-Bank have started their operation.

The launch of internet-only banks has brought many changes. As the existing commercial banks and internet-only banks have started the infinite competition, the maintenance of relationships with customers or the creation of new customers is important (Kim and Kim, 2018). For this, it is meaningful to understand the consumer's attitude toward of internet-only bank. Therefore, this study examined the effecting factors of internet-only bank in terms of benefits and differentiated services.

The results of empirical analysis show that functional benefit, experiential benefit, and customization are significantly related to the consumer's attitude, but social benefit, economic benefit, and service diversity are not. First of all, functional benefit such as quickness, easiness, trust, and effectiveness of internet-only bank was found to be the most important factor for consumers to use internet-only bank. It implicates that consumers appreciate internet-only bank as easier and convenient banking channel with trust. As internet-only bank which use smart phone becomes routine service in daily life, social benefit and economic benefit are not important factors for consumers any more. Instead, personalized and customized services play a great role in consumer's attitude toward internet-only bank. Customized services which make fun and useful to consumers affect the consumer's banking behavior positively. That's why experiential benefit and customization were found to be related to the consumer's attitude. Therefore, banking service provider should consider that banking service be much easier and quickly with trust and fun to consumers and provide more useful customized services with consumers.

This paper has the originality in that it examines the affecting factors of internet-only bank in terms of benefits and differentiated services while prior studies have focused on the attributes of banking channels. Further study should consider the difference among service types and device which use internet-only bank.

Acknowledgements

This paper is a revised and expanded version of a paper which presented (poster) at ISTEC 2019.
This work was supported by a research grant from Seoul Women's University (2019).

References

Aijaz A. Shaikh & Heikki Karjaluoto (2015), Mobile banking adoption: A literature review, Telematics and Informatics, 32, 129-142.

Chin W.W. (1998), Issues and opinion on structural equation modeling. MIS Quarterly, 22, 7-16.

Churchill G. A. (1979), A paradigm for developing better measures of marketing constructs. Journal of Marketing Research, 16, 64–73.

Fornell C. & Lacker D. F. (19810, Structural Equation Models with Unobservable Variables and Measurement Errors. Journal of Marketing Research, 18, 39-50.

Henseler J., Ringle C. M., & Sinkovics R. R. (2009), The use of partial least squares path modeling in international marketing. Advances in International Marketing, 20, 277–319.

Jun B.H. (2016), A Study on the Affecting Factors of Smart banking in terms of user's benefits and personalization, Journal of the Korea Society of Digital Industry and Information Management, 12(4), 135-143.

Jun B.H. (2017), An Empirical Study on the Adoption of Smart Banking in Korea, INFORMATION, 20(5B), 3471-3478.

Jun B.H. (2018), A Study of Consumer Behavior on Online Shopping Discount Event in Korea, Journal of the Korea Society of Digital Industry and Information Management, 14(2), 107-115.

Jun B.H. (2019), An Analysis of the on-line Shopping Motivation of one-person Households using R, Journal of the Korea Society of Digital Industry and Information Management, 15(1), 123-132.

Keller (2017), Strategic Brand Management: Building, Measuring and Managing Brand Equity, Prentice Hall, New Jersy.

Kim S.J. & Kim C.B. (2018), The Effects of the Mobile-banking Characteristics and Internet-only bank Benefits on the Switching Value and the Use Intention, Journal of the Korea Contents Association, 18(8), 109-117.

Kwon Y.M. (2015), A Study on the Affecting the Intention to Use of Smart-Phone Mobile Banking. Review of business & economics, 28, 529-549.

Noh M.J & Hwabgbo C. (2016), A Study on Users' Intention to Use Considering Service Quality of Smartphone Banking. Information System Review, 25, 105-134.

Park M.H. (2017), Influences of Character Marketing on Usage Intention of Internet-only Banks: Case of Kakao bank, Doctoral Dissertation, Yonsei University.

Peter J.P & Olson J. (1987), Consumer behavior: Marketing strategy perspectives, Irwin.

Straub D. (1989), Validating instruments in MIS research. MIS Quarterly, 13, 147-169.

Woo D.S., Moon J.B. & Yoo W.J. (2013), A Study of the Satisfaction on the Social Networking Service Cognition to Personality Traits. The e-Business Studies, 14, 263-285.

Yim K.H., Kwon J.H. & Quan Z.X. (2016), The Effect of Benefits of Mobile Application Use-Diffusion and Purchase Intention in Service Management. Journal of Digital Convergence, 14, 63-69.

THE EFFECT OF HOP α-ACIDS ON THE ALCOHOLIC FERMENTATION PROCESS AND THE ETHANOL YIELD

Ewelina STRĄK-GRACZYK*, Maria BALCEREK*

*Institute of Fermentation Technology and Microbiology, Faculty of Biotechnology and Food Sciences, Lodz University of Technology, Poland
ewelina.strak@edu.p.lodz.pl

Abstract: The alcoholic fermentation is exposed to a high risk of microbial infections, which have a significant impact on the efficiency of the process and the quality of the distillates. This article presents the effect of lactic acid bacteria on an alcohol fermentation by yeast and a method of reducing this undesirable microflora with the use of a preparation of hop α-acids. The results indicate that the application of hop α-acids preparation allows reducing the development of microbial infection, which are mainly lactic acid bacteria. Besides, it allows an ethanol yield to be improved. The solution is as a pro-ecological and agreeing with EU politics.

Keywords: hop α-acids, fermentation, native starch, lactic acid, rye

Introduction

Bacterial contaminants in alcoholic fermentation lead to the formation of undesirable by-products and cause losses in the efficiency of alcohol. Lactic acid bacteria are the most troublesome microorganisms occurring during the production process of agricultural distillate, because they develop quickly in the fermentation environment, with the presence of carbon dioxide, especially in the phase of yeast propagation, at 30-40 °C, at low pH values. The causes of pollution may depend on the purity and quality of raw materials, yeast, fermentation tanks, transmission lines, heat exchangers, etc. (Reed & Nagodawithana, 1991). In factories producing malt whiskey, in which mash is not boiled to preserve the activity of natural malt enzymes, bacterial contamination may deteriorate the quality of distilled spirit and reduce the final yield of this high-quality fermentation product (Walker & Hill, 2016). The strains of lactic acid bacteria isolated from samples from the distillery environment were characterized by high activity during alcoholic fermentation, probably as a result of their adaptation (Bischoff, Skinner-Nemec, & Leathers, 2007; Schell et al., 2007; Skinner & Leathers, 2004). In industrial practice, determining the number of bacteria in many distilleries is often limited to the detection of lactic acid, because aerobic and facultative anaerobic bacteria with low pH tolerance are not considered a serious threat to product quality and production efficiency. The number of bacteria can be significantly reduced by cleaning and disinfecting the equipment, keeping mash at temperatures above 70 °C, using pressure-thermal methods or chemically sterilizing the substrates and adding antibiotics such as penicillin (Ralph, 1981; Rückle & Senn, 2006) or virginiamycin (Arshad, Zia, Asghar, & Bhatti, 2011; Islam, Toledo, & Hamdy, 1999). However, this is doubtful from an economic point of view, but it is even more important to raise awareness and thus also fears of the growing spread of bacterial resistance due to the huge abuse of these compounds. Despite the above precautions, bacterial contamination still occurs in many ethanol plants. Large counts of bacterial cells cause a decrease in the growth and metabolism of yeasts, caused by competition for available nutrients, but also the excretion of toxic metabolites, such as lactic acid in the case of bacteria (Oliva-Neto & Yokoya, 1994). Therefore, it is necessary to take actions to limit undesirable microflora in ethanol fermentation.

All conventional antibacterial agents in the production of ethanol show some deficiencies in the antimicrobial activity (depending on the type of bacteria, selectivity, and yeast status, chemical stability in fermentation conditions (Essia Ngang, Letourneau, & Villa, 1989) or environmental safety concerning animal and human health. that the European Union has banned the use of antibiotics as bactericidal compounds, including in the distillery industry, because the remaining decoction is used as animal feed.

Despite many research efforts aimed at reducing undesirable bacterial flora, this is still a serious problem that poses a threat to the dynamic development of commercial alcohol production. Traditional methods for keeping bacterial contaminants at an acceptable level include introducing a very low pH, for example between 2 and 3 (Gibson, Lawrence, Leclaire, Powell, & Smart, 2007) with sulfuric acid (H2SO4). Proecological techniques are based on the age-old knowledge about the hop, which can provide not only a beneficial taste of various beverages, but also protection against the development of bacterial microflora (Simpson & Smith, 1992; Suzuki, Iijima, Sakamoto, Sami, & Yamashita, 2006).

The antibacterial properties of hop (*Humulus lupulus*) have been known and used in the brewing industry for ages (Verzele & De Keukeleire, 1991).

The topic of this work is to present the effect of hop α-acids in inhibiting the development of unfavorable bacteria during the alcoholic fermentation and yield of the process.

Materials and Methods

For preparing the mashes, rye of the variety Dańkowskie Amber (Danko Hodowla Roślin sp. O.o., Choryń) was used. The physical and chemical analysis of the raw material, including determination of dry mass, protein, reducing sugars and starch content was carried out following the methods recommended in the agri-food industry (AOAC, 1995).

Starch hydrolysis was carried out using amylolytic preparations such as: GC 626 liquefying enzyme preparation, containing the acid α-amylase (EC 3.2.1.1), derived from *Trichoderma reesei*, at a dose of 0.3 mL per 1 kg of raw material and the second saccharification preparation Stargen 002, which contains a blend of *Aspergillus kawachi* α-amylase (EC 3.2.1.1) expressed in *Trichoderma reesei* and glucoamylase (EC 3.2.1.3 from *Trichoderma reesei*) in an amount of 1.2 mL per kilogram of raw material. All the enzyme preparations were purchased from DuPont TM Genencor® Science (USA).

A commercial preparation of dry distillery *Saccharomyces cerevisiae* yeast, Ethanol Red (Fermentis, Division of S.I. Lesaffre, France), was used at 0.3 g L^{-1} mash. The yeast was hydrated and disinfected (15 min, at room temperature) using water and sulfuric acid (25% w w-1) solution (pH of yeast slurry was set at 2.0). Along with the yeast medium, a mineral nutrient for yeast - an aqueous solution of $(NH_4)_2HPO_4$ at a dose of 0.2 g L^{-1} mash was added. A preparation IsoStab® (BetaTech, Germany) of hop α-acids in an amount of 140 ppm was added.

The mashes were prepared with pressureless liberation of starch method (PLS), using a previously ground raw material, in a mill equipped with corundum and ceramic grinders (crumbling below 1.5 mm). The process was carried out in a mixer equipped with a stirrer disposed of in the water heating mantle.

The hydrolysis of native starch consisted of mixing the ground grain with water (in a ratio of 1: 2.8), the pH was adjusted to 4.0 with use of a solution of sulfuric acid 25% w w^{-1}, then the mixture was heated to a temperature of 35 ± 2 °C, and next the GC 626 enzyme preparation was added, these conditions were maintained for 30 minutes in order to pre-hydrolyze a starch(so-called 'activation'). Then, stirring constantly, the mash was cooled to the fermentation temperature (35 °C) and the pH was controlled and possibly re-adjusted to 4.0, after which STARGEN 002 was added. For the samples of mashes of the second variant, the hop α-acid preparation was additionally added. Then all the samples were treated with yeast and nitrogen medium. The process was conducted at 35 °C for 3 days.

During fermentation, samples of the mash were collected (every 24 h) to determine the content of sugars and ethanol. Once fermentation was complete, the ethanol was distilled from the mash using a laboratory kit consisting of a Liebig cooler, a flask, and a thermometer. The distillates obtained, containing 20–30% (v v^{-1}) ethanol, were strengthened to ethanol contents of approximately 43% (v v^{-1}) in a glass distillation apparatus with a special dephlegmator/condenser, according to the method described by Golodetz (Hulda, Njintang, & Cmf, 2017).

The raw materials were analyzed to determine its content of moisture, total nitrogen (AOAC, 1995), reducing sugars (Pomeranz & Meloan, 1995) and starch (BS EN ISO 10520:1998, 1998) using recommended methods in the agricultural and food industries.

Before and after fermentation, the contents of total sugars and reducing sugars in the distillery mashes were determined according to the recommended methods for the distilling industry (AOAC, 1995) expressed in g of glucose per L of mash. Dextrin content (expressed in g L^{-1} of mash) was calculated as the difference between the amounts of total sugars and reducing sugars, taking into account the conversion coefficient (0.9) into dextrins.

Analysis of the sugar profile was performed on high-performance liquid chromatography (HPLC). An Agilent 1260 Infinity apparatus (Agilent Technologies, USA) was used, equipped with a refractive index detector (RID) (temperature set at 55 °C). A Hi-Plex H column (7.7 × 300 mm, 8 µm) (Agilent Technologies, USA) was used to separate the compounds. The column temperature was maintained at 60 °C. As a mobile phase, 5 mM of H2SO4 was used at a flow rate of 0.7 mL min-1. Before analysis, mash samples were deproteinized and filtered through a 0.45 µm PES (polyethersulphone) membrane, then injected at a volume of 20 µL (Hulda et al., 2017) (Strąk-Graczyk & Balcerek, 2019)

Based on the obtained results, the fermentation factors were calculated, i.e. the intake of sugars and fermentation yield (in relation to total sugars determined in the sweet mash).

Results and Discussion

The raw material used in the research was characterized by a dry matter (d.m.) content at the level of 87.1±1.7%. With reference to literature data (Pietruszka & Szopa, 2014), it indicates that the tested raw material was characterized by low water content (Tab.1). In the case of distilleries working in the all-season system, the moisture of the raw material is a significant parameter, which affects possible storage of cereal grain. The processed raw material contained a protein at the level of 11.9±0.2%, which was higher than in rye grains described in the literature. On average, the total protein content in cereals is between 10% and 12% (w w^{-1}) (HGCA, 2018) but the kinds of protein in each variety of cereals have not accurately been described (Villegas-Torres, Ward, & Lye, 2015). Only about 10% – 15% of the total protein is dissolved during mashing.

The unhydrolyzed residue remains along with leftovers from the raw material in the medium (Bringhurst & Brosnan, 2014). The content and types of proteins in grains affect the ethanol yield, which is related to the degree to which the starch granules are embedded in the protein matrix. The strength of protein adhesion and the biomechanical properties of the layers cereal grains play an important role in the processing of the raw material, and subsequent hydrolysis of the granules (Agu et al., 2012).The rye used for research was characterized by starch content at the level of 68.5±1.4%, which is similar to the literature data (Pietruszka & Szopa, 2014) and indicates the usefulness of grain for distillation purposes.

Table 1: The physicochemical composition of rye grains.

Raw material	Dry matter [%]	Protein [% d.m.]	Reducing sugars [g glucose/100 g raw material]	Starch [g/100 g raw material]
Rye Amber cultivar	87.1±1.7^{b}	11.9±0.2^{b}	1.8±0.4^{a}	68.5±1.4^{a}
Literature data (Pietruszka & Szopa, 2014)	80.5±0.02^{a}	9.4±0.05^{a}	4.4±0.01^{b}	67.8 ± 0.3^{a}

Different superscript letters in columns indicate significant differences (P <0.05) between mean values.

Based on the results of the analysis of reducing and total sugars concentrations in the medium after pre-hydrolysis, the efficiency of starch saccharification ('activation') was calculated and expressed in % of its total content. This allowed the evaluation of enzymes performance depending on the variant of prepared samples. Figure 1 shows the results of pre-hydrolysis of rye starch.

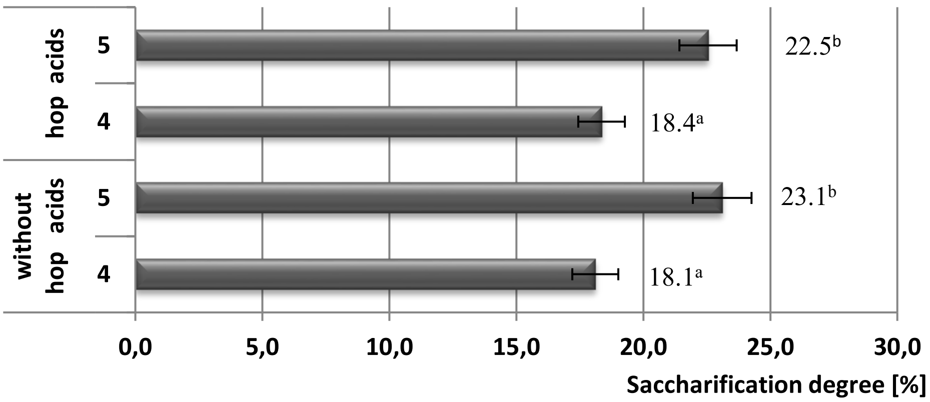


Figure 1 Efficiency of initial rye starch saccharification for two initial pH of medium (pH 4.0 or pH 5.0), and without or with the addition of hop α-acids preparation. Different superscript lowercase letters indicate significant differences (P <0.05) between mean values.

Because hop α-acids preparation was added just before the task of yeast testing, we cannot determine their effect on the starch 'activation' step. However, by this indicator, it can be concluded that the acid α- amylase present in the enzyme preparation GC 626 used for the initial hydrolysis showed higher activity in mashes with initial pH 5.0. Chemical analysis of sweet (Tab. 2) and fermented (Tab. 3) mashes included pH measurement and evaluation of sugars (glucose, maltose, maltose), and dextrins concentrations. Moreover, samples were taken every 24 h to determine the lactic and acetic acid concentrations (as indicators of microbial infection) and ethanol content.

Table 2: Chemical composition of sweet mashes.

Mashes before fermentation	pH	Concentration of sugars [g L^{-1}]			Dextrins [g L^{-1}]
		glucose	maltose	maltotriose	
With hop acids	4±0.1 ^{a}	21.2±0.6 ^{b}	0.3±0.1 ^{a}	0.1±0.1 ^{a}	150.6±2.8 ^{a}
	5±0.1 ^{a}	39.5±1.1 ^{d}	0.4±0.1 ^{a}	0.5±0.1 ^{a}	143.8±2.7 ^{a}
Without hop acids	4±0.1 ^{a}	18.9±0.5 ^{a}	0.3±0.1 ^{a}	n.d.	149.1±2.8 ^{a}
	5±0.1 ^{a}	29.8±0.8 ^{c}	0.5±0.1 ^{a}	0.2±0.1 ^{a}	147.6±2.9 ^{a}

n.d. – not detected; different superscript letters in columns indicate significant differences (P <0.05) between mean values.

Table 3: Chemical composition of fermented mashes.

Mashes after fermentation	initial pH	pH after 72 h	Concentration of sugars [g L^{-1}]			Dextrins [g L $^{-1}$]	Ethanol [% v v^{-1}]
			glucose	maltose	maltotriose		
With hop acids	4±0.1 ^{a}	3.8±0.2 ^{a}	0.1±0.1 ^{a}	n.d.	0.3±0.1 ^{b}	0.9±0.1 ^{a}	11.7±0.6 ^{b}
	5±0.1 ^{a}	4.4.±0.1 ^{b}	0.2±0.1 ^{a}	0.1±0.1 ^{a}	0.1±0.1 ^{a}	1.9±0.1 ^{c}	9.6±0.5 ^{a}
Without hop acids	4±0.1 ^{a}	3.5±0.1 ^{a}	0.2±0.1 ^{a}	1.0±0.1 ^{b}	0.1±0.1 ^{a}	0.9±0.1 ^{a}	10.3±0.5 ^{a}
	5±0.1 ^{a}	4.2±0.1 ^{b}	0.1±0.1 ^{a}	0.2±0.1 ^{a}	0.1±0.1 ^{a}	1.6±0.1 ^{b}	9.5±0.5 ^{a}

n.d. – not detected; different superscript letters in columns indicate significant differences (P <0.05) between mean values.

In mashes before fermentation, the concentration of glucose was higher in samples with initial pH 5. As mentioned above, the acid α-amylase reveal a higher activity at pH 5 than at pH 4. During 'activation' of starch, glucose was the most liberated sugar, followed by maltose, and the lowest in maltotriose, for both pH variants. It is mainly caused by the enzyme mechanism. Despite significant differences in concentrations of sugars determined upon completion of fermentation, it can be observed that all mashes, regardless of the starting pH, have been fermented properly. The lowest concentrations of unutilized glucose, maltose, maltotriose were determined in mashes supplemented with hop α-acid preparation, with initial pH 4 (Table 3). Taken into consideration the dextrin content in mashes, it can be suppose that the saccharification enzymes did not manage to break them down to the simple sugars available for yeast. The lowest dextrin content in the fermented mash with initial pH 4, and supplemented with hop α-acids preparation is reflected in the highest ethanol content (11.7±0.6% v v^{-1}) with comparison to the remaining variant.

Sweet mashes and mashes during fermentation were examined microbiologically. The results obtained for samples collected once every 24 h are shown in Figures 2 and 3.

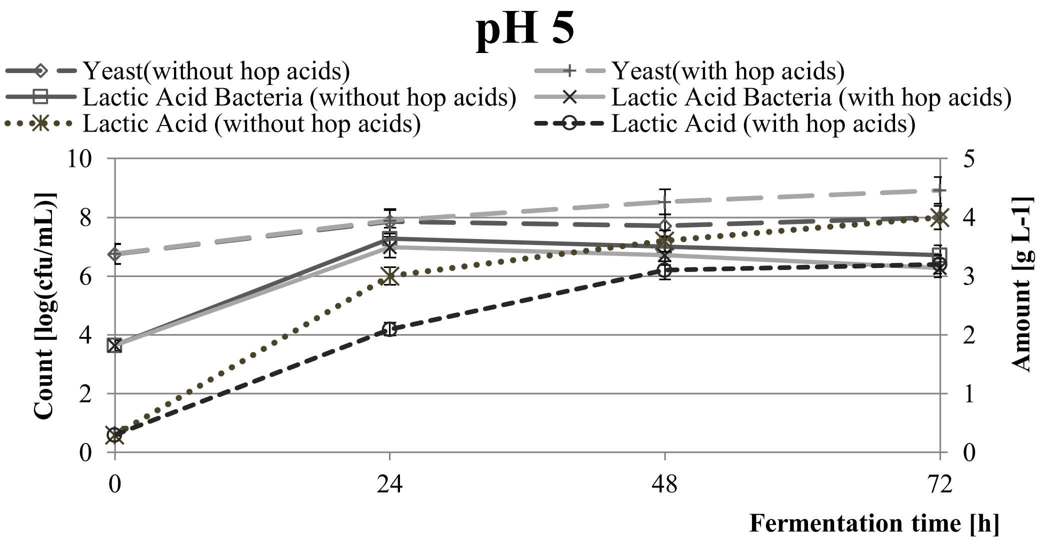


Figure 2 Microbiological analysis of mashes with initial pH 5, during fermentation.

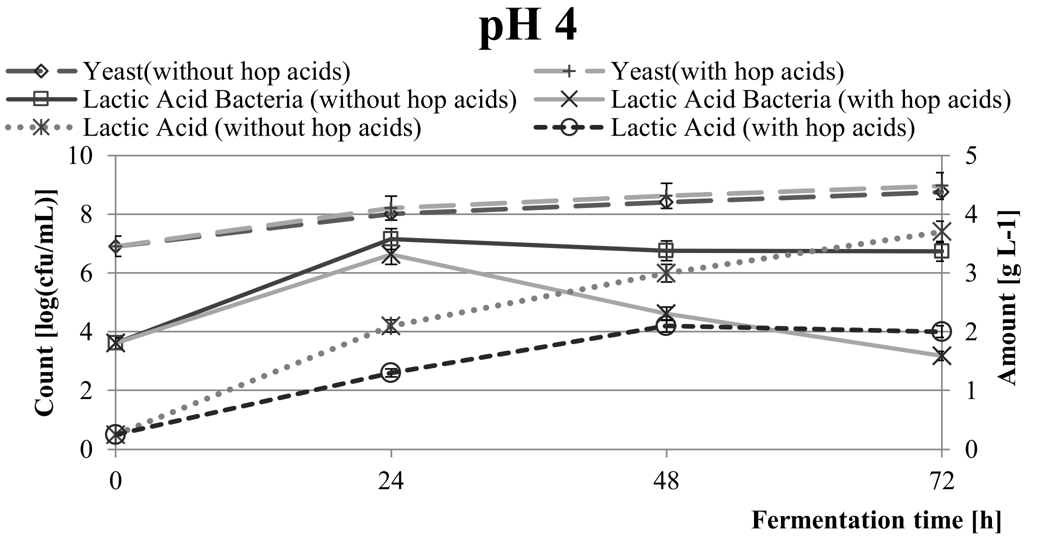


Figure 3 Microbiological analysis of mashes with initial pH 4, during fermentation.

Furthermore, during fermentation, lactic acid content was determined in the mashes (Figs. 2 and 3). The main sources of the microbial contaminations of distillery mashes are raw materials, yeast, equipment, water, and air. This is a serious problem for producers of raw spirit. Yeast and lactic acid bacteria are often found together in natural ecosystems and can compete for the same nutrients. When both microorganisms develop and live together in a specific medium, in which yeast growth is limited by providing suboptimal vitamin concentrations, missing substances (including nicotinic acid, adenine, guanine, aspartic acid, tryptophan, glycine, alanine or lysine) necessary for growth *Lactobacillus* spp. are synthesized in the medium by yeast cells (Narendranath, Hynes, Thomas, & Ingledew, 1997). The obtained results indicated a decrease in pH from 5 to 4, which limits the growth of undesirable lactic bacteria. It was observed that regardless of the initial pH of the mashes, the number of lactic bacteria cells in the medium before the fermentation was at a similar level of 3.63±0.79 log CFU mL^{-1}, while the concentration of lactic acid in mashes reached 0.03±0.01 g L^{-1}. After 24 hours of fermentation in reference mashes(without the addition of hop α-acids preparation), more than 2-fold increase in the number of bacteria cells was noted, and in samples with initial pH 4 reached 7.15±0.29 log CFU mL^{-1}, while for those with pH 5 amounted

7.82±0.32 log CFU mL^{-1}. The addition of hop α-acids preparation to the mashes with the initial pH 4.0 allowed to reduce the number of lactic acid bacteria after 72 h of the process to 3.18±0.1 log CFU mL^{-1}, whereas in the mashes with the initial pH 5.0, lactic acid bacteria count was 6.28±0.2 log CFU mL^{-1}. Also, the content of lactic acid, in comparison to the control samples (without hop α-acids), decreased by 1.7 g L^{-1} for pH 4, and by 0.44 g L^{-1} for pH 5. The count of bacteria decreased with the increase in the final lactic acid concentration, when lactic acid together with ethanol were present in the mashes. This suggests that ethanol acts synergistically with lactic acid to kill these bacteria and that the toxicity of ethanol is increased by the drop in pH caused by lactic acid in the medium.
Suzuki (2011) stated that hop acids affect not only the exhaustion of proton strength and by the capture of divalent cations, such as $Mn2^{+.}$ They disrupt the enzymatic processes of proteins involved in energy production and redox mesostase in a bacterial cell.
The disturbance of the membrane mechanism, cellular processes, and intracellular acidification results in inhibition of the active transport of sugars, nutrients and amino acids through the membrane, and thus interruption of the respiration and synthesis of protein, DNA and RNA, ultimately cell death leading to its death (Doyle & Roman, 2016).

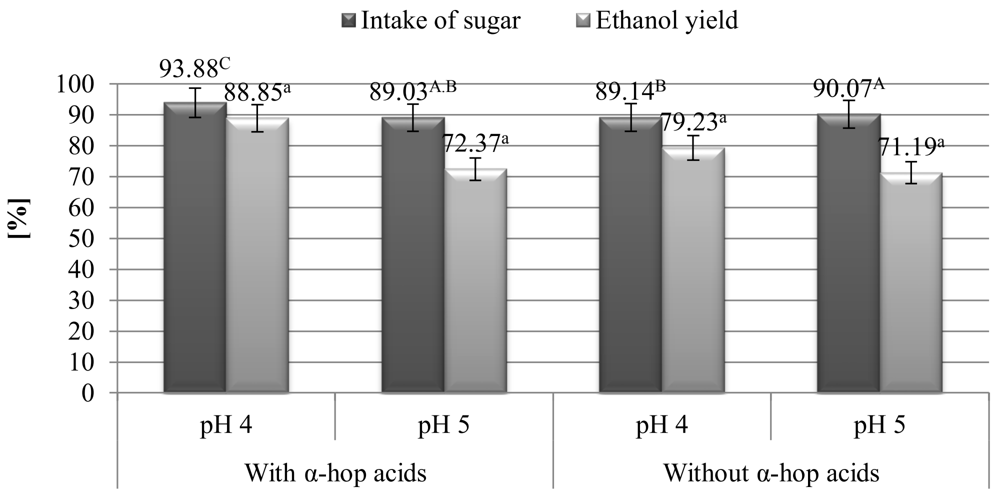


Figure 4 Ethanol fermentation factors.

Different superscript capital letters indicate significant differences (P <0.05) between mean values of sugars intake.
Different superscript lowercase letters indicate significant differences (P <0.05) between mean values of ethanol yield.

The activity of lactic acids has been shown to decrease the yeast growth rate, sugar consumption, and ethanol yield (Strąk & Balcerek, 2015; Thomas, Hynes, & Ingledew, 2001). Lower ethanol contents and fermentation efficiency were observed in trials exhibiting more severe bacterial contamination (Tabs. 2,3 and Figs. 2-4).
Only a 1% drop in ethanol yield is of great importance for food alcohol distillers because their profit margin is very narrow (Makanjuola, Tymon, & Springham, 1992). In large plants with capacities from 400 million to 1100 million liters of ethanol per year, such a decrease would reduce income by 1 million to 3 million per year (Narendranath et al., 1997). Research on the direct effects of process contamination is not easy to carry out (Makanjuola et al., 1992).
Estimation of the ethanol fermentation factors showed that the lower pH of the mashes (at the level of 4), and the use of α-hop acids preparation allowed to improve the efficiency of the process by 5% comparing to the control sample. On the other hand, raising the pH to 5, resulted in a 5% decrease in the yield, despite the use of hop acids preparation. In all tested mashes, the intake of sugars by yeast was at a similar level (Fig. 4).

Conclusion

Bacterial contamination of the fermentation medium is the main cause of the reduction of ethanol yield during the fermentation of starchy raw materials. Among the bacterial contaminants encountered, lactic acid bacteria are the most troublesome, because of their tolerance to high temperature and low pH and the ability to grow quickly. The obtained results indicate that the use of hop α-acids preparation allows reducing the development of microbial infection, which are mainly lactic bacteria. Also, it allows an ethanol yield to be improved. Taking into consideration, that the starchy raw materials, among others cereal grains, may include contaminating bacteria, which compete with the yeast on growth-promoting nutrients, there is a need to apply addition to distillery mashes of antimicrobial preparations, to improve production technologies and obtain products of the highest quality.

References

Agu, R. C., Swanston, J. S., Walker, J. W., Pearson, S. Y., Bringhurst, T. A., Brosnan, J. M., & Jack, F. R. (2012). Predicting Alcohol Yield from UK Soft Winter Wheat for Grain Distilling: Combined Influence of Hardness and Nitrogen Measurements. *Journal of the Institute of Brewing*, *115*(3), 183–190. https://doi.org/10.1002/j.2050-0416.2009.tb00367.x

AOAC. (1995). Official Methods of Analysis of AOAC International (16th ed.). Meryland: AOAC International.

Arshad, M., Zia, M. A., Asghar, M., & Bhatti, H. (2011). Improving bio-ethanol yield : Using virginiamycin and sodium flouride at a Pakistani distillery, *10*(53), 11071–11074. https://doi.org/10.5897/AJB09.1273

Bischoff, K. M., Skinner-Nemec, K. A., & Leathers, T. D. (2007). Antimicrobial susceptibility of Lactobacillus species isolated from commercial ethanol plants. *Journal of Industrial Microbiology & Biotechnology*, *34*(11), 739–744. https://doi.org/10.1007/s10295-007-0250-4

Bringhurst, T. A., & Brosnan, J. (2014). *Scotch whisky: raw material selection and processing*. *Whisky* (Second Edi). Elsevier Ltd. https://doi.org/10.1016/b978-0-12-401735-1.00006-4

BS EN ISO 10520:1998. Native starch. Determination of starch content. Ewers polarimetric method (1998).

Doyle, M. P., & Roman, D. J. (2016). Growth and Survival of Campylobacter fetus subsp. jejuni as a Function of Temperature and pH. *Journal of Food Protection*, *44*(8), 596–601. https://doi.org/10.4315/0362-028x-44.8.596

Essia Ngang, J. J., Letourneau, F., & Villa, P. (1989). Alcoholic fermentation of beet molasses: effects of lactic acid on yeast fermentation parameters. *Applied Microbiology Biotechnology*, *31*, 125–128.

Gibson, B. R., Lawrence, S. J., Leclaire, J. P. R., Powell, C. D., & Smart, K. A. (2007). *Yeast responses to stresses associated with industrial brewery handling*. https://doi.org/10.1111/j.1574-6976.2007.00076.x

HGCA, A. (2018). Cereals and Oilseeds Division of the Agriculture and Horticulture Development Board (AHDB). Retrieved October 17, 2018, from https://cereals.ahdb.org.uk

Hulda, Y., Njintang, Y. N., & Cmf, M. (2017). Optimization of the use of Betterave (Beta Vulgaris) for the Production of Green Energy. *Global Journal of Science Frontier Researche*, *17*(2).

Islam, M., Toledo, R., & Hamdy, M. K. (1999). Stability of virginiamycin and penicillin during alcohol fermentation, *17*, 369–376.

Makanjuola, D. B., Tymon, A., & Springham, D. G. (1992). Some effects of lactic acid bacteria on laboratory-scale yeast fermentations. *Enzyme and Microbial Technology*, *14*, 350–357. https://doi.org/10.1016/0141-0229(92)90002-6

Narendranath, N. V., Hynes, S. H., Thomas, K. C., & Ingledew, W. M. (1997). Effects of lactobacilli on yeast-catalyzed ethanol fermentations. *Applied and Environmental Microbiology*, *63*(11), 4158–4163.

Oliva-Neto, P., & Yokoya, F. (1994). Evaluation of bacterial contamination in a fed-batch alcoholic fermentation process. *World Journal of Microbiology & Biotechnology*, *10*, 697–699.

Pietruszka, M., & Szopa, J. S. (2014). Agricultural Distillates from Polish Varieties of Rye, *32*(4), 406–411.

Pomeranz, Y., & Meloan, C. E. (1995). *Carbohydrates. Food Analysis* (3rd ed.). Boston, MA: Springer US. https://doi.org/10.1007/978-1-4615-6998-5

Ralph, R. J. (1981). Practical aspects of operating an alcohol plant. In T. P. L. (ed.) (Ed.), *A step to energy independence—a textbook for fuel alcohol production.* (pp. 255–265). Lexington, Ky: Alltech Technical Publications.

Reed, G., & Nagodawithana, T. W. (1991). *Yeast Technology* (Seckond Ed). New York. https://doi.org/10.1007/978-94-011-9771-7

Rückle, L., & Senn, T. (2006). Hop acids as natural antibacterials can efficiently replace antibiotics in ethanol production. *International Sugar Journal*, *108*(1287), 139–147.

Schell, D. J., Dowe, N., Ibsen, K. N., Riley, C. J., Ruth, M. F., & Lumpkin, R. E. (2007). Contaminant occurrence, identification and control in a pilot-scale corn fiber to ethanol conversion process. *Bioresource Technology*, *98*(15), 2942–2948. https://doi.org/10.1016/j.biortech.2006.10.002

Simpson, W. J., & Smith, A. R. W. (1992). Factors affecting antibacterial activity of hop compounds and their derivatives, 327–334.

Skinner, K. A., & Leathers, T. D. (2004). Bacterial contaminants of fuel ethanol production. *Journal of Industrial Microbiology & Biotechnology*, *31*(9), 401–408. https://doi.org/10.1007/s10295-004-0159-0

Strąk-Graczyk, E., & Balcerek, M. (2019). Simultaneous saccharification and fermentation of native rye , wheat and triticale starch a * Maria Balcerek , a Katarzyna Przybylsk a. *Journal of Sci Ence and Food Agriculture*, *99*(May), 4904–4912. https://doi.org/10.1002/jsfa.9718

Strąk, E., & Balcerek, M. (2015). Wybrane technologie wykorzystywane w przemyśle gorzelniczym. *Acta Scientiarum Polonorum, Biotechnologia*, *14*(1), 33–44. Retrieved from http://www.acta.media.pl/pl/main.php?s=3&no=506&p=21&id=4451&lang=pl

Suzuki, K., Iijima, K., Sakamoto, K., Sami, M., & Yamashita, H. (2006). A Review of Hop Resistance in Beer Spoilage Lactic Acid Bacteria.

Thomas, K. C., Hynes, S. H., & Ingledew, W. M. (2001). Effect of lactobacilli on yeast growth, viability and batch and semi-continuous alcoholic fermentation of corn mash. *Journal of Applied Microbiology*, *90*(5), 819–828. https://doi.org/10.1046/j.1365-2672.2001.01311.x

Verzele, M., & De Keukeleire, D. (1991). Chemistry and analysis of hop and beer bitter acids. *Developments in food science*, *27*(169), 417.

Villegas-Torres, M. F., Ward, J. M., & Lye, G. J. (2015). The protein fraction from wheat-based dried distiller's grain with solubles (DDGS): Extraction and valorization. *New Biotechnology*, *32*(6), 606–611. https://doi.org/10.1016/j.nbt.2015.01.007

Walker, G. M., & Hill, A. E. (2016). Saccharomyces cerevisiae in the Production of Whisk (e) y, (i), 1–15. https://doi.org/10.3390/beverages2040038

THE EFFICACY OF THE HERBAL IODINE SOLUTION CONCENTRATE FROM THE BRAND OF "JADRANKINA OTOPINA" (JADRANKA'S SOLUTION) IN THE TREATMENT OF THYROID DISEASES

Gordana Bujisic***, Slavica Jankovic**, Erna Davidovic Cvetko**, Ilja Uzelac Bujisic***

*Medical Faculty University J.J.Strossmayer, Osijek, Croatia
**University of Applied Sciences Lavoslav Ruzicka, Vukovar, Croatia
*** Churchill College, University of Cambridge, UK

gordana.bujisic@vevu.hr

Abstract: This paper presents the results of the research on effectiveness of the Herbal Iodine Solution Concentrate "Jadranka's Solution" on diseases of thyroid gland. The research included 64 participants who fulfilled detailed online questionnaire about their socio-demographic data and experiences they had with the Herbal Iodine Solution Concentrate „Jadranka's Solution". Along with that, each participant sent us two laboratory findings of the blood' level of TSH and T4. The most important result of the research was confirmation of the hypothesis that regular use of the Herbal Iodine Solution Concentrate "Jadranka's Solution" improves clinical status of patients with disorders of thyroid gland. Pairwise' comparison has confirmed significant difference at the ,05 level for levels of TSH and T4 before and after the use of "Jadranka Solution". Statistically, the results of the study showed a significant decrease of the values of TSH, and an increase in FT3 and FT4 hormones to their mid-values and above the reference value, when comparing values at the point of diagnosed health issues.
These results confirms subjective evaluation of the participants who, in 98.5% of participants evaluated effectiveness of Herbal Iodine Solution Concentrate "Jadranka's Solution" as excellent and none of them evaluated Solution as ineffective. Speaking about socio-demographic data, most of the participants were 30 to 40 years old (56%), 49,2% of them have university' degree and 68.6% of them is employed. These data point that participants are better educated and informed than overage population in Croatia. Most of them use Herbal Iodine Solution Concentrate "Jadranka's Solution" because of diseases of thyroid gland, 73.4% because of hypothyroidism and 7.8% because of hyperthyroidism.

Introduction

Iodine is a trace element that is essential to the organism in small quantities. Adequate intake of iodine is irreplaceable in the synthesis of thyroid hormone, thyroxine (T4) and tri-iodothyronine (T3) necessary for growth, organ development and the use of nutrients in the body (1). Serious iodine deficiency increases the risk of various disorders in children and adolescents, but the most pronounced development of hypothyroidism and dyspnoea. Namely, thyroid hormones regulate various physiological processes such as protein synthesis, growth and development (2). The chronic iodine deficiency results in increased TSH synthesis in the pituitary gland that stimulates the thyroid to increase the use of available iodine, which over time leads to thyroid hypertrophy and the formation of one or more nodules on the thyroid, ultimately resulting in drowsiness. Health risks arise not only in severe iodine deficiency, but also in small or moderate iodine deficiency, resulting in decreased work capacity, metabolic disorders, disturbed thyroid function, and dyspnoea. In children, slower growth and decreased cognitive functioning resulted in reduced IQ.
In 1993, the World Health Organization therefore issued a decision on the obligatory iodination of kitchen salt, as it is a safe and inexpensive way to combat the lack of iodine. It seemed that this procedure would ensure optimal iodine intake for the entire world population. However, despite these efforts, iodine deficiency has become a public health problem again in developed countries such as Australia and the United Kingdom, which were previously considered to be iodine-sensitive countries. The World Health Organization estimates that 2 billion people, including 285 million school children, have a deficit of iodine (3).
Therefore, the measure of addition of iodine to the kitchen salt proved insufficient for the ingestion of sufficient amounts of iodine, and in many studies it proved extremely useful to add additional iodine Solutions. The fact is that in cases of mild to moderate iodine deficiency, increased thyroid activity may be retained by euthyroidism, that is, thyroid hormone levels are within normal limits, but chronic thyroid stimulation leads to the formation of nodules on thyroid glands and consequent clinical illnesses. Increased intake of iodine leads to a decrease in the incidence of subclinical hypothyroidism and to a reduction in risk for M. Graves (Graves' disease) and thyroid

carcinoma. Accordingly, iodine optimization is an important component of preventive health programs aimed at reducing the incidence of thyroid disease (1,4).
Opinions on the addition of iodine are split, some experts (mostly medical doctors working in practice with patients) insist that each patient with thyroid disease must take iodine supplements, some recommend only iodine from herbal remedies such as algae or seaweeds (4).
„Jadranka's Solution" is precisely such a solution, i.e. the Herbal Iodine Solution Concentrate that contains exclusively iodine from seaweed, and is therefore completely natural. Jadranka's Solution has been on the market for two years, but the production has increased significantly in the last year and the product has a significant rise in the number of beneficiaries. This is exactly what triggered this research, the subjective sense of improvement and the feedback received from beneficiaries were extremely positive. Many stated that their subjective sense of improvement was accompanied by an objective improvement in laboratory findings (before and after the use of the Herbal Iodine Solution Concentrate), in particular TSH and FT4.
It was on this track that we designed a study with a starting hypothesis that the use of Herbal Iodine Solution Concentrate Jadranka's Solution leads to the normalization of the levels of TSH and FT4 in the blood.

Participants and methods

The study included 64 participants who used the Herbal Iodine Solution Concentrate **„**Jadranka's Solution"for a relatively long period of time. Participants were asked for consent to participate in the research and after that they had to fill out an on-line questionnaire containing general data (such as gender, age, educational level, employment) and allegations of Jadranka's Solution (reason of taking, physical illness and diagnosis, length and the daily dose of Jadranka's Solution and satisfaction with the efficiency of the Solution). Additionally, subjects were required to send scanned laboratory findings of TSH and T4 before and after use of the Herbal Iodine Solution Concentrate **„**Jadranka's Solution" and the finding of a physician with a daily dose of Eutirox.

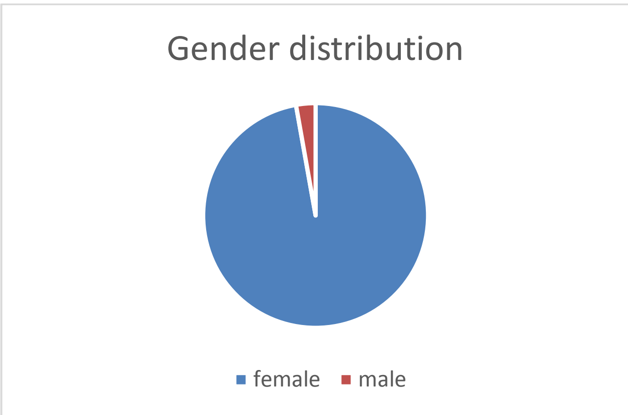
The results were processed first by a simple method of dividing the individual responses to the questions asked, and then the differences of the groups of subjects by different variants were tested with a one-way ANOVA test in order to simplify testing of the difference in TSH and T4 levels before and after the application of the tested agent. For the difference test before and after Repeated Measures ANOVA test was used. Nonparametric Spearman's rank between all variables and changes in the findings was also made. Changes to the findings are counted as a percentage change in relation to the starting value. Everything was analysed in the IBM SPSS Statistics 22.

Results and Discussion

The first group of results refers to general data on respondents and data on the illnesses they suffer from, the dose and duration of taking the Herbal Iodine Solution Concentrate „Jadranka's Solution" and, as a matter of priority, subjective data on the effect of the Solution and its efficacy.

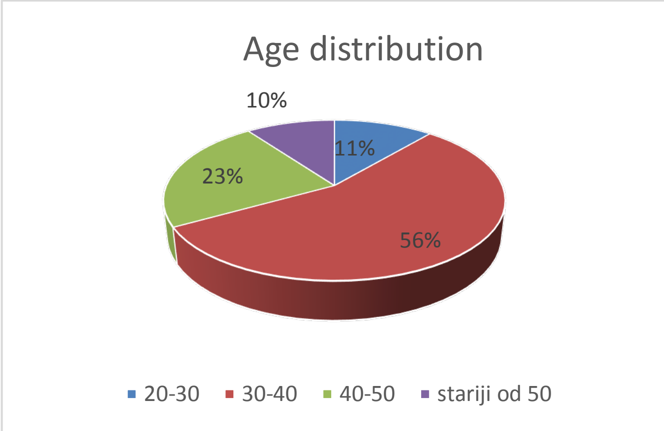
Socio-demographic data

1. Gender Distribution



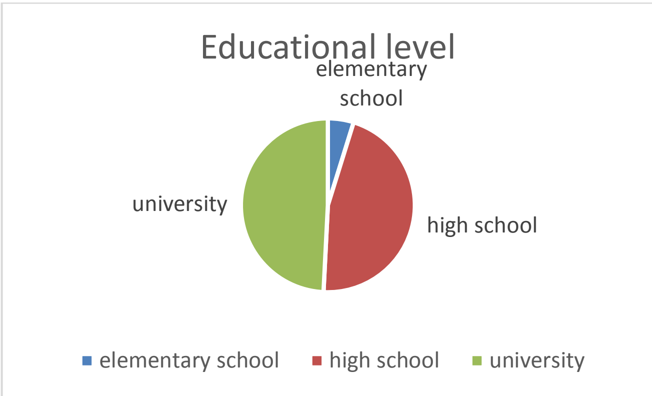
The study involved 96.8% of female respondents and only 3.2% of male respondents which was expected since the occurrence of hypothyroidism is significantly higher in women.

2. Age Distribution



The majority of respondents are aged 30 to 40 (56%), followed by persons aged between 40 and 50, while those younger than 30 and older than 50 contribute to 10%. This age distribution is expected because the disease most often occurs in people's thirties.

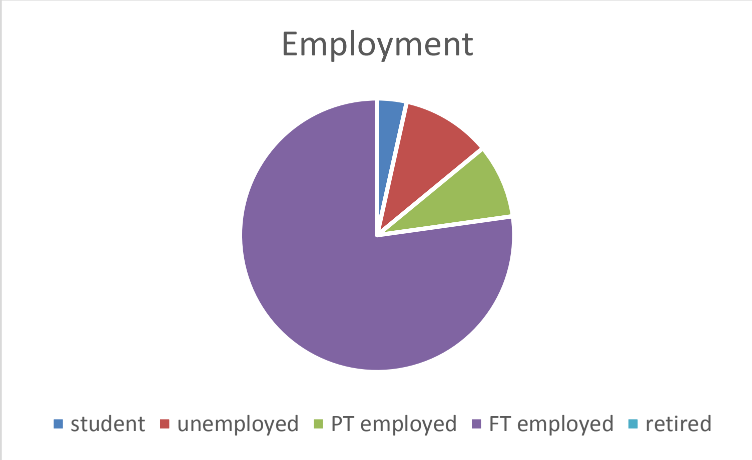
3. Education level



This distribution of educational level is interesting because it differs considerably from the general situation in the Republic of Croatia - as opposed to the general share of highly educated persons in the population of 17.8%, in our sample 49.2% are highly educated persons.

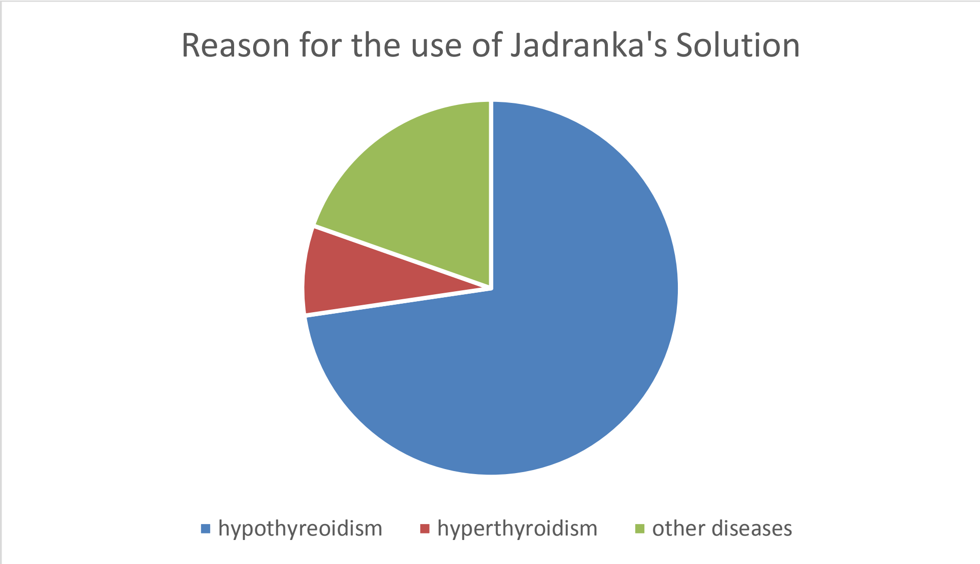
The explanation of this result lies in the fact that highly educated people have more interest in their own health, they try to be informed about the possibilities of treatment and, in particular, are more open to using non-pharmaceutical Solutions. Indeed, information on the long-term effectiveness of the replacement therapy is twofold, and the evidence of the importance of iodine in improving the thyroid function is unquestionable, and it is assumed that more educated persons use more sources of information, in particular they are more literate and use information in the right way.

4. Employment status



These results are very interesting, 68.8% of respondents are employed, which is more than the Croatian average, that mostly comes as high as 50%, but this is explained by the age distribution and educational level (the largest number of respondents is younger).

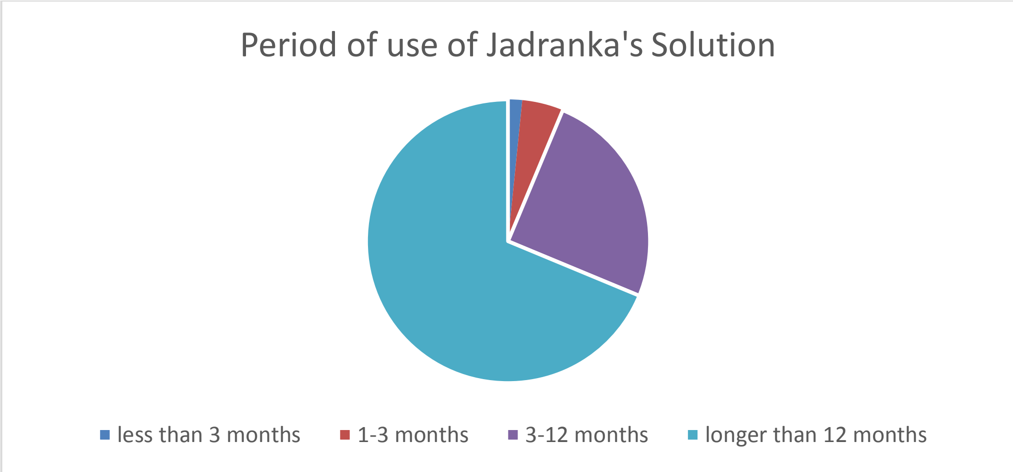
5. The reason for the use of the Jadranka's Solution



Among the participants, the largest share used the Herbal Iodine Solution Concentrate „Jadranka's Solution"for thyroid disease, far more for hypothyroidism (73.4%) and 7.8% for hyperthyroidism. The other respondents generally referred to some of the disorders of reproductive organs, most commonly cysts on the ovaries or menstrual cycle disorder.

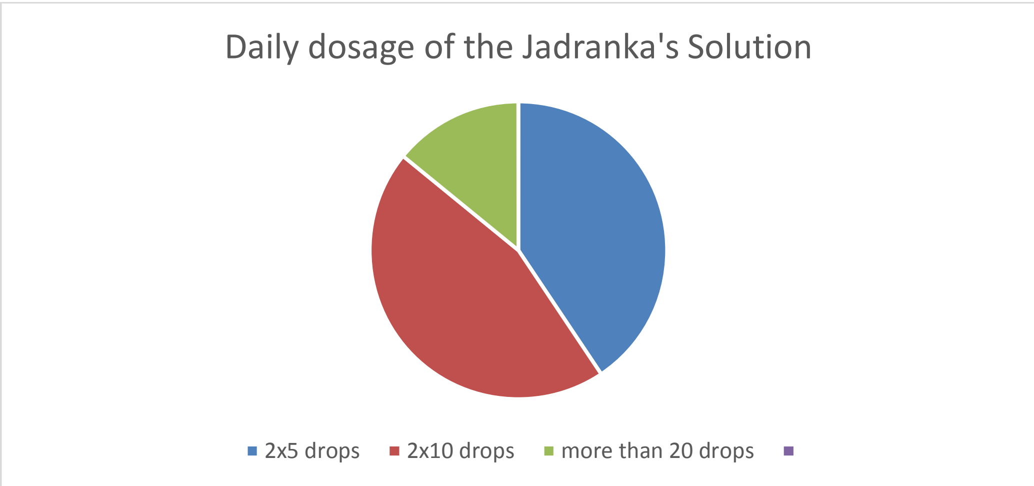
This distribution diagnosis is not a surprise because it is well-known that iodine deficiency affects the functioning of the thyroid and it is a clear need for patients to try to compensate for the deficiency, or, as they usually say, "feed thyroid with the iodine".

6. Period of use of the Jadranka’s Solution



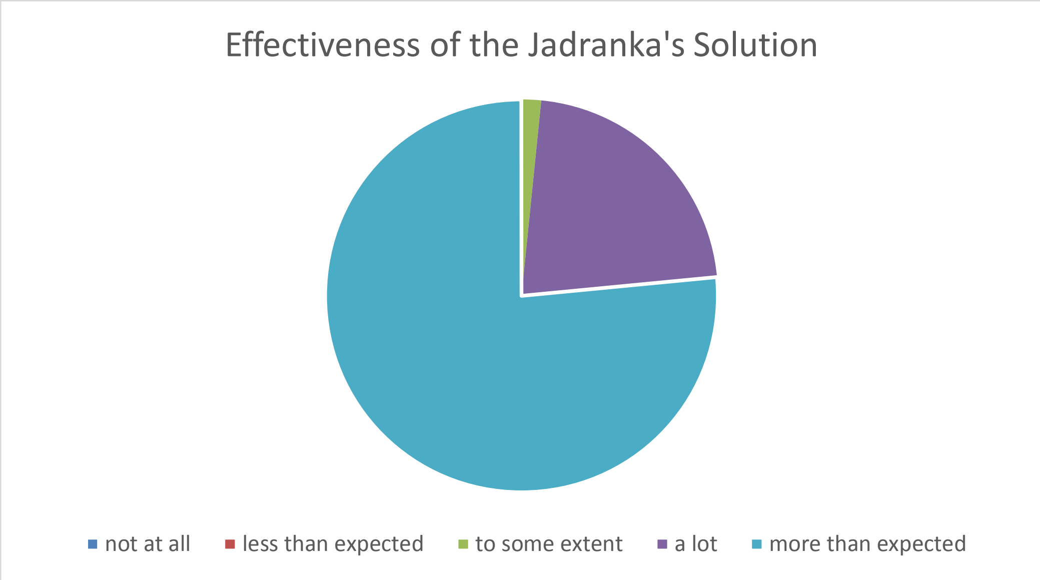
Most participants have taken the Solution for more than a year (68.8%), another 25% longer than three months, therefore, a total of 93.8% take the Solution regularly for more than three months. This information points to two facts, the first is that the subjective feeling of improvement leads to the regularity of taking the Solutions, and besides, those who take longer to take the Solution have rather taken part in the research.

7. Daily doses of the Jadranka’s Solution



Similar number of participants have took 10 drops (40.6%) and 20 drops (45.3%) of Jadranka's Solution daily, divided into two doses. However, 14.1% of subjects received more than the recommended dose which potentially could cause adverse reactions. Subsequently, they were sent a message that they should not take doses larger than the recommended dose.

8. Self-evaluation of the effectiveness of the Herbal Iodine Solution Concentrate „Jadranka's Solution“



This graph shows the subjective feeling of satisfaction with the the Herbal Iodine Solution Concentrate „Jadranka's Solution“. As visible in the graph, participants were asked to evaluate satisfaction with results after taking the Herbal Iodine Solution Concentrate. Five responses were offered, on a scale from 1 to 5, where 1 indicates complete dissatisfaction with the efficacy of the Solution, while 5 indicates that the effects are better than expected. A total of 98.5% of respondents rated the efficacy of Jadranka's Solution 4 and 5, of which 76.6% estimated that Jadranka's Solution helped above expectations. Equally important is the fact that no respondent had estimated that her drops helped less than expected or not.

We have to observe these data in the light of the above-average educational level of younger subjects, therefore by definition, the least accessible people. According to this data, it is clear, even before the examination of laboratory findings, that it is difficult to attribute the placebo effect of the Jadranka's Solution.

Laboratory findings

Table 1.: Correlations of different variables of the questionnaire

			education	employment status	physical illness	length of application	dosage	satisfaction
Spearman's rho	education	Correlation Coefficient	1,000	,384**	,230	,204	,167	-,043
		Sig. (2-tailed)		,005	,104	,152	,242	,767
		N	51	51	51	51	51	51
	employment status	Correlation Coefficient	,384**	1,000	,144	,062	,081	-,193
		Sig. (2-tailed)	,005		,312	,668	,574	,175
		N	51	51	51	51	51	51
	physical illness	Correlation Coefficient	,230	,144	1,000	-,050	-,050	-,254
		Sig. (2-tailed)	,104	,312		,728	,729	,072
		N	51	51	51	51	51	51
	length of application	Correlation Coefficient	,204	,062	-,050	1,000	-,028	,319*
		Sig. (2-tailed)	,152	,668	,728		,847	,023
		N	51	51	51	51	51	51
	dosage	Correlation Coefficient	,167	,081	-,050	-,028	1,000	-,007
		Sig. (2-tailed)	,242	,574	,729	,847		,962
		N	51	51	51	51	51	51
	satisfaction	Correlation Coefficient	-,043	-,193	-,254	,319*	-,007	1,000
		Sig. (2-tailed)	,767	,175	,072	,023	,962	
		N	51	51	51	51	51	51

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

The presented results, those obtained by the correlation method, show the correlation of the examined variables. Table 1 shows the correlation of the individual variables and the correlation method results in a statistically significant association between the length of time taken and satisfaction with the Herbal Iodine Solution

Concentrate „Jadranka's Solution“, i.e. the satisfaction increases with the length of taking the Solution. Table 2 shows the correlation of individual variables with changes in TSH and T4 values. A statistically significant difference was obtained with the association of the disease with the values of TSH and T4.

Table 2.: The correlation of the individual variables of the questionnaire with changes of TSH and T4

			TSH change	T4 change	EUTIROX change
Spearman's rho	education	Correlation Coefficient	,045	-,131	
		Sig. (2-tailed)	,785	,484	
		N	40	31	14
	employment status	Correlation Coefficient	,014	-,086	
		Sig. (2-tailed)	,930	,646	
		N	40	31	14
	physical illness	Correlation Coefficient	,338*	0,000	
		Sig. (2-tailed)	,033	1,000	
		N	40	31	14
	length of application	Correlation Coefficient	,097	-,164	
		Sig. (2-tailed)	,553	,378	
		N	40	31	14
	dosage	Correlation Coefficient	-,054	,352	
		Sig. (2-tailed)	,743	,052	
		N	40	31	14
	satisfaction	Correlation Coefficient	-,225	-,049	
		Sig. (2-tailed)	,162	,793	
		N	40	31	14

Table 3: Pairwise Comparisons for T4

Measure: T4

(I) TIME	(J) TIME	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b] Lower Bound	Upper Bound
1	2	25,152*	,870	,000	23,349	26,956
2	1	-25,152*	,870	,000	-26,956	-23,349

Based on estimated marginal means

*. The mean difference is significant at the ,05 level.

b. Adjustment for multiple comparisons: Bonferroni.

Figure 1.

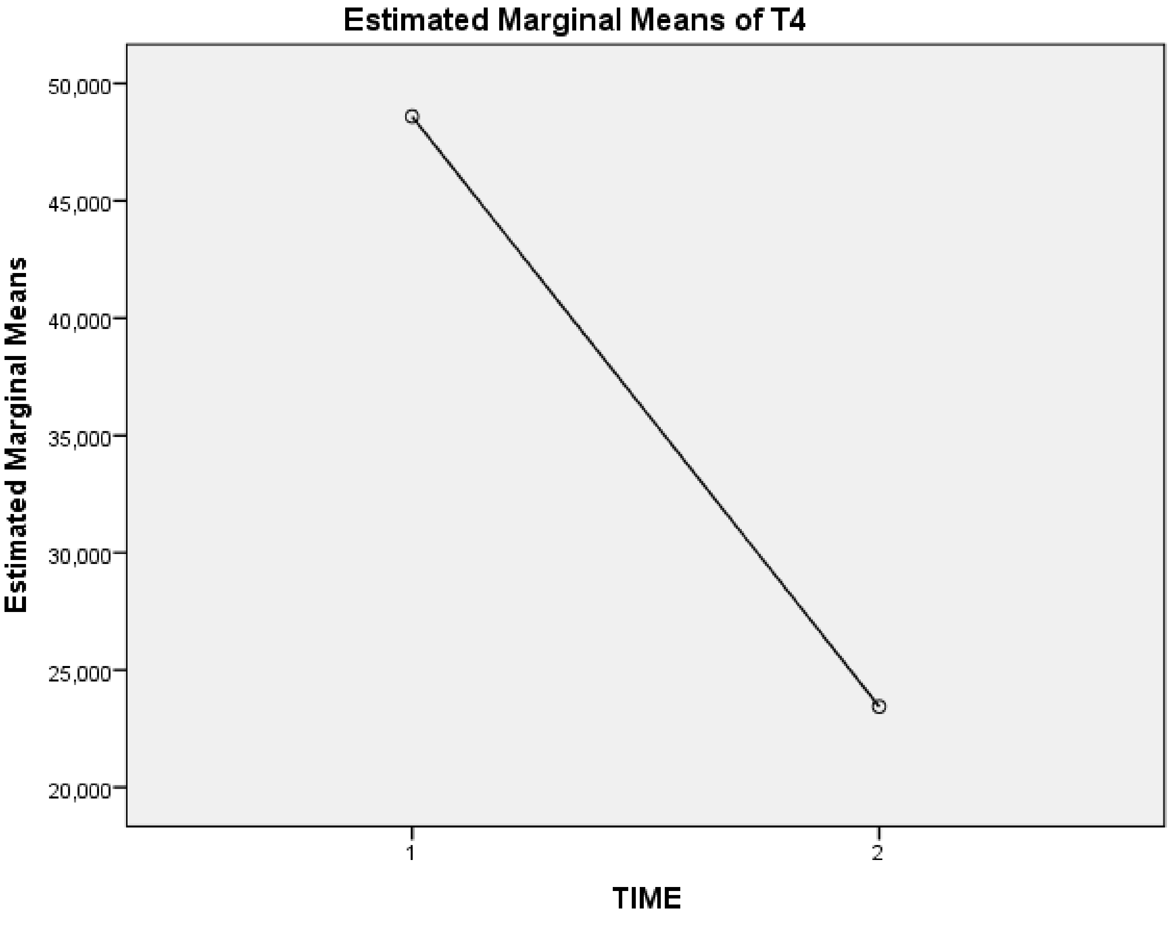


Table 4: Pairwise Comparisons for TSH

Measure: TSH

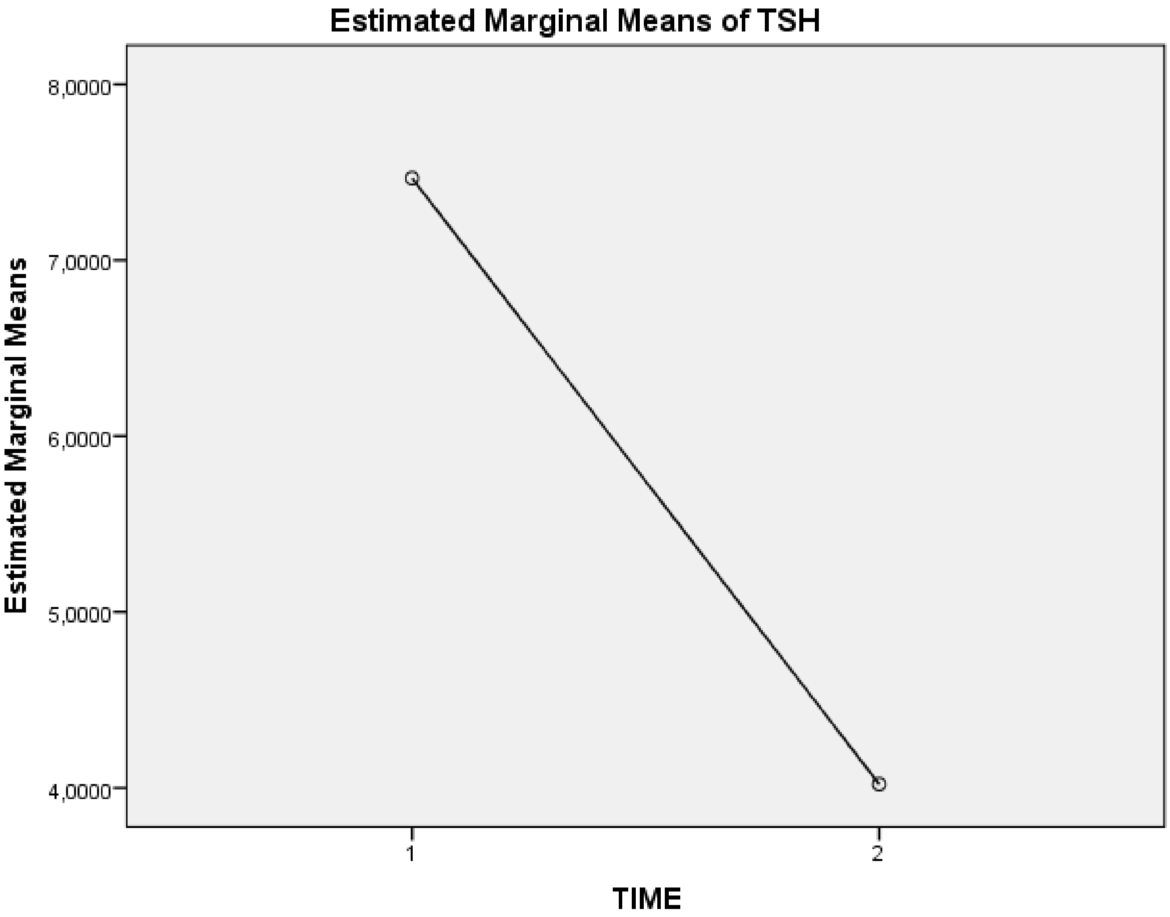
(I) TIME	(J) TIME	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b] Lower Bound	Upper Bound
1	2	3,446*	,865	,000	1,691	5,202
2	1	-3,446*	,865	,000	-5,202	-1,691

Based on estimated marginal means

*. The mean difference is significant at the ,05 level.

b. Adjustment for multiple comparisons: Bonferroni.

Figure 2.



In fact, the most important research results were obtained by Pairwise comparison and are shown in Tables 3 and 4, and in two graphs. Namely, this method confirmed the hypothesis that the use of the Jadranka's Solution results in a positive change in TSH and T4 hormone levels. That is exactly what is shown in Figures 1 and 2 - a statistically significant drop in TSH values after using Jadranka's Solution.

Conclusion

The conducted study of the efficacy of the the Herbal Iodine Solution Concentrate of the brand „Jadranka's Solution“ in the treatment of thyroid diseases confirmed the hypothesis that regular taking of the Solution results in an improvement in the health status of the respondents. The results of the study showed not only that the subjects were subjectively satisfied with the Herbal Iodine Solution Concentrate „Jadranka's Solution“ but the correlation method showed a statistically significant association between the use of the Solution and the reduction of the TSH and T4 hormone levels in the blood and consequent improvement of the clinical image (reduction or complete disappearance of the thyroid node and withdrawal of hypothyroid symptoms).

Research results are an excellent foundation for a longitudinal study that will be conducted on a larger sample, under controlled conditions and with the monitoring of a large number of parameters. It is our intention to include a greater number of people using the Herbal Iodine Solution Concentrate „Jadranka's Solution“ for other reasons, not just for thyroid disease. Besides the laboratory findings in the longitudinal study we will also observe the clinical findings of the examinees.

Finally, we think that this research was a multiple challenge. In spite of the well-known fact of the importance of iodine for the preservation of health and the impact of iodine deficiency on the development of various diseases, there is almost no research in Croatia or in the world that has studied the influence of iodine on health and diseases. An additional challenge was to deal with a solution that belongs to the so-called "alternative solutions“ because there are still many prejudices in the medical community.

References

L.E. Braverman (1994): Iodine and the thyroid: 33 years of study.Thyroid 4/3:351-356

Katagiri R., Yuan X., Kobayashi S. (2017): Effect of excess iodine intake on thyroid diseases in different populations: A systematic review and meta-analyses including observational studies. PLOS ONE 10.1321

Laurberg P., Bulow Pedersen I., Kundsten (2001): Environmental iodine intake effects the type of non-malignant thyroid disease, Thyroid 11/5:457-464

Lee K.W., Shin D., Cho M.S., Song W.O.(2016): Food Group Intakes as Determinants of Iodine Status among US Adult Population; *Nutrients*, 2016;8(6): 325-336

Nenon K., Skeaff S.: Iodine: Iodine Deficiency Disorders (IDD) In: Cabalero B., Finglas P.: The Encyclopedia of Food and Health; Vol 3 (437-443); Oxford Academy Press, 2015.

Prete A., Paragliola R.M., Corsello S.M. (2015): Iodine Supplementation: Usage „With a Grain of Salt“. *International Journal of Endocrinology*, vol.2015 (2015-223)

Zimmerman M.B., Boelaert K. (2015): Iodine deficiency and Thyroid disorders; *Lancet*, vol 3 (4)

THE RELATIONSHIP BETWEEN SERUM VISFATIN LEVELS AND METABOLIC PARAMETERS WITH DIFFERENT BODY MASS INDEXES

Esen Karaca
esen.karaca@acibadem.edu.tr
Gülgün Ersoy
gersoy@medipol.edu.tr

Objective: The aim of this study is to evaluate the relationship between the grade of obesity and serum visfatin, role of serum visfatin in the relation between obesity and insulin resistance, and association of serum visfatin levels with fasting insulin, fasting blood glucose and lipid parameters.

Material and methods: This study was performed in 55 female and 35 male patients between 18-65 years of age who admitted to Family Medicine and Internal Medicine policlinics; also who had no chronic systemic, endocrinal and neurologic diseases. Lipid profiles [total cholesterol, triglyceride, HDL-cholesterol, LDL-cholesterol, VLDL-cholesterol], fasting blood glucose, fasting insulin) and serum visfatin levels of patients were tested.

Results: Minimal serum visfatin level was found 5.1 mg/dL, maximal serum visfatin level was found 26.8 mg/dL and mean serum visfatin level was found 10.7 mg/dL. There was statistically significant relation between serum visfatin level and fasting blood glucose as well as fasting insulin ($P=0.009$). There was statistically significant relation between BMI and serum visfatin levels ($p=0.006$); however according to gender there was no correlation with visfatin levels and body fat percentage ($p > 0.05$). It was determined that mean serum visfatin level of patients whose BMI values were lower than 25kg/m2 was significantly higher than others. As BMI increased, serum visfatin level decreased. As a result of the data obtained by this study, serum visfatin resulted in lower levels in patients with high BMI.

Conclusion: Negative correlation between serum visfatin level and fasting blood glucose as well as fasting blood insulin indicates that serum visfatin level may be associated

THE USE OF A SENSOR NETWORK IN THE PROMOTION OF THE HEALTH OF THE DEPENDENT ELDERLY AT HOME

Vitor Rodrigues[1,2], Maria João Monteiro[1,3], Salviano Soares[5,7], António Valente[5,6], Sérgio Silva[8], Madalena Sousa[1], Diogo Duarte[1], Conceição Rainho[1], Isabel Barroso[1], Carlos Almeida[1], João Castro[1], Amâncio Carvalho[1,4], Cristina Antunes[1], Filomena Raimundo[1]

[1]University of Trás-os-Montes and Alto Douro, School of Health, Vila Real, Portugal
[2]Research Center in Sports Sciences, Health Sciences and Human Development, University of Trás-os-Montes Alto Douro
[3]Center for Health Technology and Services Research, University of Porto, Portugal
[4]Research Centre on Child Studies, University of Minho, Braga, Portugal
[5]University of Trás-os-Montes and Alto Douro, School of Science and Technology, Vila Real, Portugal
[6]Institute for Systems and Computer Engineering - Technology and Science, Porto, Portugal
[7]Institute of Electronics and Telematics Engineering, University of Aveiro, Portugal
[8]Globaltronic, Águeda, Portugal
e-mail contact author: vmcpr@utad.pt

Abstract: The aging population and the increasing longevity of individuals is a challenging reality for today's healthcare, as it brings increased dependency and need for continuous care, which is often left to informal caregivers. This will be an "almost experimental" study as the investigators will attempt to control some independent variables through the implementation of a therapeutic plan's assistance and vigilance program from a sensor network, which will monitor and assist (alarm sending) in complying with medication, raisings and positionings. 28.6% of the elderly cannot move alone in bed and 100% of the elderly take medication regularly. In the control group, there are 6 elderly people with total dependence, 3 moderately dependent elderly and 5 elderly with slight dependence. So, knowing that Portugal has a high rate of informal home care, it was relevant to develop this project for the application of information and communication technologies in the development of a prototype of a system focused on the monitoring and aid of the execution of the therapeutic plan in two strands, mobilization and medication.

Keywords: Sensor network; Health; Elderly

Introduction

The aging rate has been rising dramatically. In 2017 the aging rate reached 153.2%, accompanied by an increase in longevity, but also an increase in dependency (Pordata, 2017). Older people over the age of 60 are in the highest age range and it is estimated that over the next few years the number of people over 65 years old will exceed the number of children under the age of 5 (Le Deist & Latouille, 2016).
Considering the numbers of aging and dependency, and also knowing that, according to the Health Regulatory Entity, Portugal has the highest rate of informal home care provided by a person in the same residence, therefore, the development of this project was relevant to help these caregivers in the routines, that take practically their whole day, improving their quality of life.
Some elderly people, who are in home care carried out by informal caregivers, have difficulty in locomotion and are often immobile in bed. Immobility produces musculoskeletal pathophysiological changes that cause deformities and postural alterations, promoting the appearance of pressure lesions. If there is no regular care and dedicated interventions, these changes will affect the quality of life of the elderly and predispose to the appearance of diseases (Assis, Vidal, & Dias, 2015).
The pressure ulcers is defined as localized damage to the underlying skin and / or soft tissue, striking regions of bone prominence or in regions of prolonged contact with equipment or devices that cause prolonged or intense pressure, combined or not, with friction. The pressure on bone prominence affects the blood circulation promoting the cell death and consequent appearance of these lesions in places of greater risk, such as the occipital, scapular, elbow, sacral, malleolus and calcaneal regions (Silva, Santos, Zoche, Argenta, & Ascari, 2017).
Depending on the need for care, in its complexity or duration, caregiving may require from the caregiver a restructure of his life, often having to change customs, routines, habits, not always being easy and leading to feelings of tension and distress that lead to overload. For this reason, the caregiver may, on the one hand, ignore his

own needs or, on the other, neglect the care of those for whom he is responsible (Nunes, Brito, Corona, Alexandre, & Duarte, 2018).
When we talk about the needs of the elderly, we must mention the need for therapeutic compliance at the medication level. Most of the elderly have several comorbidities and are polymedicated. Sometimes these schemes are complex, which hampers correct compliance and increases the risks of misuse of medicines (Marin, Rodrigues, Druzian, & Cecílio, 2010)
This project is being developed with the objective of applying information and communication technologies in the development of a prototype of a system focused on the monitoring and assistance of the execution of the therapeutic plan in two strands: mobilization and medication.

Materials and Methods

This will be an "almost experimental" study as the investigators will attempt to control some independent variables through the implementation of a therapeutic plan's assistance and vigilance program from a sensor network, which will monitor and assist (alarm sending) in complying with medication, raisings and positionings.
Therefore, 2 groups will be defined: the experimental group, on which the program will be applied, and a control group.
This study was authorized by the Ethics Commission of UTAD (nº 37/2019 of 20/02/2019) as well as the elderly and their caregivers who participated in the study gave their informed consent.

Results and Discussion

At the moment, in the experimental group (where the sensors will be placed), there are already 9 elderly people with total dependency, 1 elderly with severe dependence, 3 elderly with moderate dependence and 8 elderly with slight dependence, 10 elderly people in this group have a high risk of developing pressure ulcers, see (Table 1).

Table 1: Dependency – Experimental Group

	N	%
Total Dependency	9	42,8
Severe Dependency	1	4,8
Moderate Dependency	3	14,3
Slight Dependency	8	38,1
Total	21	100,0
High Risk of Developing Pressure Ulcers	**10**	**47,6**

In the control group, there are 6 elderly people with total dependence, 3 moderately dependent elderly and 5 elderly with slight dependence. In this group, 6 elderly people are at high risk of developing pressure ulcers, see (Table 2)

Table 2: Dependency – Control Group

	N	%
Total Dependency	6	42,9
Severe Dependency	0	0
Moderate Dependency	3	21,4
Slight Dependency	5	35,7
Total	14	100,0
High Risk of Developing Pressure Ulcers	**6**	**42,9**

In the experimental group there are more women than men, 57,1% are female and 42,9% are male.
28.6% of the elderly cannot move alone in bed, were 33,3 % never get out of bed and 23,8% don't even get seated during daytime. 100% of the elderly take medication regularly, see (Table 3)

Table 3: Gender, mobility and medication – Experimental Group

Variables		N	%
Gender	Male	12	57,1
	Female	9	42,9
Move alone in bed	Yes	15	71,4
	No	6	28,6
	Doesn't get seated during the day	5	23,8
	Bedridden	7	33,3
Does medication	Yes	21	100
	No	0	0
	Needs help	21	100
	Knows time and name of medication	0	0
AGE MEAN – 75,9 years old			

In the control group there are the same number of men and women, 28.6% of the elderly cannot move alone in bed, were 28,6 % never get out of bed and the same 28,6% stay bedridden. 100% of the elderly take medication regularly, see (Table 4)

Table 4: Gender, mobility and medication – Control Group

Variables		N	%
Gender	Male	7	50
	Female	7	50
Move alone in bed	Yes	10	71,4
	No	4	28,6
	Doesn't get seated during the day	4	28,6
	Bedridden	4	28,6
Does medication	Yes	14	100
	No	0	0
	Needs help	14	100
	Knows time and name of medication	0	0
AGE MEAN – 81,2 years old			

The selection of dependent elderly people at home has already been made (experimental group and control group). There have also been applied scales that determinate functional independence in the domains of personal care and mobility and scales that gives us the type of risk of development of pressure ulcers. We will also assess the difficulties and overload of the informal caregiver, and will apply sensors to test respiration, heart rate, humidity, temperature, change of position and detection of falls to implement programs of assistance and surveillance of therapeutic plans.

Regarding the sensors we will test:
- Bed sensors (placed in the bed of the elderly, allows the evaluation of breathing, heart rate, estimate the cardiac output and detects the occupation of the bed);
- RFID's (radio frequency identification for humidity and temperature detection);
- Accelerometer (this sensor will allow detection of falls);
- Fixtures (consisting of an LED rule that will be associated with an elderly person and that will serve as a way to quickly see some of the warnings regarding the elderly in question: detection of falls, heart rate and respiratory cycles, medication and change of position of the elderly);
- Two buttons (one will be to check if the medication is given by the informal caregiver, and another that would serve as an alarm, which is used by the elderly);
- Gateway FE - Central computing unit (which will have all the sensors connected to it, wireless, and will process all the data).

Conclusion

Technology application in healthcare has been arousing engineering's attention for a long time in support to health recovery and maintenance therapy practices.
In this regard, creating support systems to watch the fulfilling of the therapeutic plan, assisting healthcare professionals and informal caregivers on dependent elders' care may be an added value.
The advantages of the installation of a sensor network are endless, since the possibility of scheduling alarms to warn of positioning at predetermined times, alarm in case of forgetfulness or delay in positioning and warning of medication time. These written alarms will be available to the informal caregiver, as well as to health professionals, since there will be a web interface where health professionals and / or the family will be able to visualize the values of the sensors, the state of the elderly and warnings.

Acknowledgements

This work was supported by the project SAICT-POL/23428/2016 – IPAVPSI - The impact of an aid and surveillance programme backed up by a sensor network in the health care promotion of the dependent elder at their home, with reference NORTE-01-0145-FEDER-023428, project financed by the Foundation for Science and Technology (FCT) and co-financed by the European Regional Development Fund (FEDER) through the Northern Regional Operational Program (NORTE2020).

References

Assis, V., Vidal, A., & Dias, F. (2015). Avaliação postural e de deformidades em idosos acamados de uma instituição de longa permanência. RBCEH, Passo Fundo, 12(2), 123–133. http://dx.doi.org/10.5335/rbceh.v12i2.4926

Le Deist, F., & Latouille, M. (2016). Acceptability Conditions for Telemonitoring Gerontechnology in the Elderly Optimising the Development and Use of This New Technology. IRBM, 37, 284–288. https://doi.org/10.1016/j.irbm.2015.12.002

Marin, M., Rodrigues, L., Druzian, S., & Cecílio, L. (2010). Nursing diagnoses of elderly patients using multiple drugs. Revista Da Escola de Enfermagem Da USP, 44(1), 47–52. https://doi.org/10.1590/S0080-62342010000100007

Nunes, D., Brito, T., Corona, L., Alexandre, T., & Duarte, Y. (2018). Idoso e demanda de cuidador: proposta de classificação da necessidade de cu..: Sistema de descoberta para FCCN. Revista Brasileira de Enfermagem, 71(suppl2), 897–904. http://dx.doi.org/10.1590/0034-7167-2017-0123

Pordata (2017). Índice de envelhecimento. Fundação Francisco Manuel dos Santos. Lisboa. https://www.pordata.pt/Municipios/%C3%8Dndice+de+envelhecimento-458

Silva, J., Santos, C., Zoche, D., Argenta, C., & Ascari, R. (2017). Diagnósticos e cuidados de enfermagem para pacientes com risco de lesão por pressão: relato de uma experiência. Brazilian Journal of Surgery & Clinical Research, 20(1), 98-103. Retrieved from https://www.mastereditora.com.br/periodico/20170905_173650.pdf

UNIVERSITY WEBSITE EVALUATION: CASE STUDY OF RANGSIT UNIVERSITY, THAILAND

Malivan PRADITTEERA

College of Digital Innovation and Information Technology, Rangsit University, Pathumthani, Thailand

malivan@rsu.ac.th

Abstract: Rangsit University, established in 1985, is one of the top private higher educational institutions in Thailand. At present, the University has offered 138 degree programs in 36 faculties/colleges. In the 2019 Webometrics Ranking of World Universities, Rangsit University ranked 24th among universities of Thailand, and the 2nd among Thai private universities. Webometrics was first published in 2004 and updated periodically twice a year in January and July. The main purpose of Webometrics is to support Open Access Initiatives to improve access to information on scientific research and scholarly materials published under the electronic form. With the signification of digital transformation, Rangsit University has taken seriously on applying the technology in the teaching-learning process as well as for the marketing outreach. Over the last few years, its faculties and colleges have developed their webpages in order to provide information and communication channel. The University website and faculty webpages become the 24/7 hours communication channel between the University and students, prospective students, parents and public. All websites/webpages have provided the available information of their faculties and colleges such as: academic programs, professor information, research and publications, and students activities, etc. Regarding to the important role of websites and webpages, the objective of this study is to evaluate and report the result for the continuous website development. The webpages of the 36 faculties/colleges of Rangsit University have been evaluated in five (5) components: page and site design, content design, navigation, accessibility and usability. The 28 indicators checklist form has been developed. The results show that there are varieties in webpage component evaluation. For the page and site design component, regarding the units under the same parental institution, there are very different styles in fonts, color, graphic user interface, and homepage presentation. According to content design component, the qualified and accuracy of information are very concerned. More than 30 percent of linkages are broken. Most of websites are developed and hosted under the University main page. Whereas, the navigation technologies and tools are some different standards, for examples: html, asp.net, php, etc. Therefore, the evaluation shows that most of webpages provide the needed and beneficial information for users and readers, especially the academic program offering. The evaluation result indicates that the University shall take part in website development of its faculties and colleges in order to make the website as a digital university. The guideline of website design and development shall be established to create as a corporate identity. University shall constantly strive to maximize the utility and depth of information on their websites while offering pleasing and powerful image to attract potential students and public.

Keywords: Website Evaluation, Webpage Evaluation, Webometrics, Thai University Website, Rangsit University

Introduction

University websites are the gateway to an educational institution and the public face for both academics and athletics. According to Ruffalo Noel Levitz's study on consumer behavior (Levitz, 2014), websites play an important role in providing information for prospective students (both new and transfer), current students, parents, and alumni. Universities have started to create marketing and communication strategies which directly involve the website content and especially the redesign of their home page (Halvorsen, 2014). These strategies help convey various rhetorical messages for visitors. Both the textual treatment and graphic design/photography by designers play large roles in creating a site that gains aesthetic interest and continues to provide better information to the targeted audience.

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Literature Overview

Webometrics

The Ranking Web or Webometrics (2019b) is the largest academic ranking of Higher Education Institutions. The original aim of the Ranking is to promote academic web presence, supporting the Open Access initiatives for increasing significantly the transfer of scientific and cultural knowledge generated by the universities to the whole Society. The objective is not to evaluate websites, their design or usability or the popularity of their contents according to the number of visits or visitors. Web indicators are considered as proxies in the correct, comprehensive, deep evaluation of the university global performance, taking into account its activities and outputs and their relevance and impact.

At present, the website is the key for the future of all the university missions. It reflects significantly as the most important scholarly communication tool, the future channel for the off-campus distance learning, the open forum for the community engagement and the universal showcase for attracting talent, funding and resources (Ranking Web of Universities, 2019c).

University Website Design

The credibility of a website affects a user's interest in the site's content and consequently, users tend to spend longer sessions on the site and access more information. Aesthetics and the use of enhanced visual elements (i.e. color, graphics, texture, text formatting, lines, icons) increases the credibility of a website. Studies have shown that judgments on website credibility are 75% based on a website's overall aesthetics" (Alsudani & Casey, 2009, 1). This effect is made truly significant when observing that web users tend to value the professional appeal of a website when deciding which site to select for the same information and services.

Literature reviews shows there are theories and guidelines for universities and academic website design. University and college websites are the digital version of information window for students, parents and public. The design shall focus on an easy navigation, optimizing user experience, consistent information, clear identity, quality of content, and well-designed (Manoverboard, 2014). It is becoming more

concerned to make the university website more successful, more inviting, and attractive, such as simplicity, concise and detailed, keep contact or outreach links to a minimum external link providing, and embed media and images. Therefore, usability is considered the key credentials of effective higher education website design.

The core theory of website design has been focused in 2 concepts: **usability and accessibility**.
1. **Usability of a website** corresponds to how easy it is to find information and navigate the many pages of the site. Usability, or how easy it is to use a site, is critical because if a site is difficult to use, users will go elsewhere for the information or service. Poor usability has been demonstrated to undermine overall site credibility (Youngblood, 2013). It is a web designer's primary responsibility, for the sake of user retention, to create a design that makes it easy for users to find information through a clean and simple navigation system and well-organized content.
2. A**ccessibility of a website** is the usability of a site for users with disabilities related to vision, hearing, cognition, and motor skills, among others. "When websites are not accessible, disabled users are at a disadvantage in an arena that should serve as an equalizer rather than a barrier" (Youngblood, 2013). When designing for accessibility, designers need to create a layout that is adaptable to a variety of disabilities, including those related to vision, hearing, mobility, speech, cognition and learning (W3C, 2008). Designers should refer to the W3C rules and make sure that their design complies with accessibility standards, especially when designing websites for a governmental organization (universities sites included); otherwise, the organizations may face lawsuits related to lack of access. A website can be simultaneously accessible and aesthetically pleasing for the user; the two concepts are not necessarily separate.

University Website Evaluation

There are many frameworks in evaluation the website and related educational web-based systems. Khan (2010) stated that there are 8 dimensions in e-Learning system evaluation. Those are: institution, management, technological, pedagogical, ethical, interface Design, resource support, and evaluation.

1. Institutional: the institutional dimension is concerned with issues of administrative affairs, academic affairs and student services related to e-learning.
2. Management: the management of e-learning refers to the maintenance of learning environment and distribution of information.
3. Technological: the technological dimension of e-learning examines issues of technology infrastructure in e-learning environments. This includes infrastructure planning, hardware and software.
4. Pedagogical: the pedagogical dimension of e-learning refers to teaching and learning. This dimension addresses issues concerning content analysis, audience analysis, goal analysis, medium analysis, design approach, organization, and learning strategies.
5. Ethical: the ethical considerations of e-learning relate to social and political influence, cultural diversity, bias, geographical diversity, learner diversity, digital divide, etiquette, and the legal issues.
6. Interface design: the interface design refers to the overall look and feel of e-learning programs. Interface design dimension encompasses page and site design, content design, navigation, accessibility and usability testing.
7. Resource support: the resource support dimension of the e-learning examines the online support and resources required to foster meaningful learning.
8. Evaluation: the evaluation for e-learning includes both assessment of learners and evaluation of the instruction and learning environment.

Regarding the instruction for learning and teaching in academic environment, the website or homepage was an important interface for learners. Many academic institutions, namely Cornell University, Purdue University, Dalhouse University, etc., applied and developed the website checklist evaluation framework for faculty members and students in order to assess the quality of websites as knowledge sources. The evaluation framework which has been used the most is the 6 (six) criteria for websites. These six criteria deal with the content of Web sites rather than the graphics or site design.

1. Authority: authority reveals that the person, institution or agency responsible for a site has the qualifications and knowledge to do so.

2. Purpose: the purpose of the information presented in the site should be clear. Some sites are meant to inform, persuade, state an opinion, entertain, or parody something or someone.

3. Coverage: it is difficult to assess the extent of coverage since depth in a site, through the use of links, can be infinite. One author may claim comprehensive coverage of a topic while another may cover just one aspect of a topic.

4. Currency: currency of the site refers to: 1) how current the information presented is, and 2) how often the site is updated or maintained. It is important to know when a site was created, when it was last updated, and if all of the links are current.

5. Objectivity: objectivity of the site should be clear. Beware of sites that contain bias or do not admit its bias freely. Objective sites present information with a minimum of bias.

6. Accuracy: there are few standards to verify the accuracy of information on the web. It is the responsibility of the reader to assess the information presented.

Interface Design is one of the important components in website design. Khan (2005) states that there are 5 main components in checklist for e-learning interface design: 1) Page and Site Design 2) Content Design 3) Navigation 4) Accessibility and 5) Usability Testing. Whereas Waterhouse (2005) stated that the website design could be evaluated in 3 issues: 1) reliability 2) quality and 3) content.

Research Approach

This study aims to evaluate the webpages of the faculties/colleges of Rangsit University, Pathumthani, Thailand. The evaluation includes five (5) components of website: page and site design, content design, navigation, accessibility and usability. The webpage evaluation indicator checklist form has been developed and used for the evaluation and analysis. Each component has been set its checklist indicators: page and site design (8 indicators), content design (6 indicators), navigation (4 indicators), accessibility (6 indicators) and usability (4 indicators). The evaluation process started on February 1, 2019 and ended on March 3, 2019.

Results

Website information

Rangsit University has 38 faculties and Colleges but only 36 of faculties and colleges which offer the academic degree programs have been selected in this study. The website URLs are listed in Table 1.

Table 1: Websites and URL of Faculties and Colleges of Rangsit University

Faculties/Colleges	Website URL
1. College of Medicine	https://www.rsu.ac.th/medicine/
2. College of Dental Medicine	1. http:// www.rsu.ac.th/dental/ 2. http://110.164.186.95/dental/
3. College of Pharmacy	https://www.rsu.ac.th/rsupharmacy/
4. Faculty of Nursing	https://www.rsu.ac.th/nurse/mainpage.php
5. Faculty of Science	https://www.rsu.ac.th/science/
6. Faculty of Physical Therapy and Sport Medicine	https://www.rsu.ac.th/ptrsu/
7. Faculty of Medical Technology	https://www.rsu.ac.th/medtech/page/home.html
8. College of Oriental Medicine	https://www.rsu.ac.th/orientalmed/
9. Faculty of Optometry	https://www.optometry-rsu.com/
10. College of Biomedical Engineering	http://bme.rsu.ac.th/
11. Faculty of Radiological Technology	https://sites.google.com/rsu.ac.th/rtrsu
12. Aviation Institute	https://www.rsu.ac.th/pilot/
13. College of Engineering	https://www.rsu.ac.th/engineer/
14. College of Digital Innovation and Information Technology	https://it.rsu.ac.th/
15. College of Agricultural Innovation Food and Biotechnology	https://www.rsu.ac.th/cab/
16. College of Communication Arts	http://ca.rsu.ac.th/
17. Faculty of Liberal Arts	https://www.rsu.ac.th/libarts/Index.asp
18. Faculty of Law	https://www.rsu.ac.th/law/
19. College of Social Innovation	http://www.csirsu.com/
20. Suryadhep Teachers College	https://www.rsu.ac.th/education/
21. Institute of Criminology and Justice Administration	https://www.rsu.ac.th/cja/
22. School of Politics, Economic and Globalization	http://www2.rsu.ac.th/PUBLIC-GOVERNANCE/Default.aspx
23. Institute of Public Policy and	http://www2.rsu.ac.th/PUBLIC-GOVERNANCE/Course-Public-

Management	Administration.aspx
24. Institute of Political Science	http://www2.rsu.ac.th/PUBLIC-GOVERNANCE/Course-Political-Science.aspx
25. Institute of Diplomacy and International Studies	https://idis.rsu.ac.th/
26. Institute of Economics	https://www.rsu.ac.th/econ/
27. Faculty of Business Administration	http://www.rbsrsu.com/
28. College of Tourism and Hospitality	https://www.rsu.ac.th/hospita/Default.aspx
29. Faculty of Accountancy	http://acc.rsu.ac.th/
30. Conservatory of Music	https://www.rsu.ac.th/music/
31. Faculty of Architecture	https://sites.google.com/rsu.ac.th/archrsu/
32. College of Design	http://www.artanddesignrangsit.com/
33. Digital Art	https://www.rsu.ac.th/digital/
34. International College	https://www.rsu.ac.th/international/
35. International Chinese College	http://www.rsuicc.com/index.php/th/
36. Rangsit Cyber University	https://cyberuonline.rsu.ac.th/

Source: Rangsit University Website, 2019.

Evaluation Results

1) Page and site design

As shown in Table 2, regarding the units under the same parental institution, there are very different styles in fonts, color, graphic user interface, and homepage presentation.

Table 2: Page and site design

No	Indicators	Yes	No
1	Institutional design	29	7
2	proper fonts and type setting; the text size and color readable	36	0
3	proper color and theme	36	0
4	colors are used harmoniously	25	11
5	appropriate composition	30	6
6	a site map menu	0	36
7	website visitor measurement/web countering	4	32
8	webmaster information on webpage	2	34

2) Content design

According to content design component, there are varieties on content. The most standard contents are provided on the website such as academic programs, lecturers, research, awards, student projects and activities. The similar content may be presented differently. Some presented as static photos and texts while some as multimedia ones. In other way, the currency and accuracy of information are very concerned.

Table 3: Content design

No	Indicators	Yes	No
1	Required contents/information are presented on website	32	4
2	content and information on website are organized in a good sequent	32	4
3	each page has a clear purpose	36	0
4	copywriting style appropriate for target group	36	0
5	any spelling errors or outdated content	16	20
6	contact information provided	36	0

3) Navigation system

Most of websites are developed and hosted under the University main page. However, the navigation technologies and tools are some different, for examples: html, asp.net, php etc. Most of them are not compatible for mobile device platform in term of page presentation and screen fitness.

Table 4: Navigation system

No	Indicators	Yes	No
1	How intuitive is it to navigate on website	30	6
2	Standard Navigation tool/technology used	36	0
3	Website can be browsed by any internet browser	36	0
4	Website can be surfed from mobile application platform	21	15
5	more than 10 seconds on website/webpage loading	6	30

4) Accessibility

There are 2 ways in accessing the websites, direct by its URL and redirect from the University main page. Most of websites are developed and hosted under the University webserver. However, 30 percent of websites have the broken linkages and not accessibility. The 10 webpages are found that the important links such as faculty member's curriculum vitae and research profile, academic program offers cannot be accessed or browsed.

Table 5: Accessibility

No	Indicators	Yes	No
1	Website can be accessed via direct URL	33	3
2	Website can be accessed indirectly from the University main page	33	3
3	Website can be browsed and presented the same by any internet browser	36	0
4	Website can be access and browsed via mobile platform	30	6
5	Website can be search from any search engine (Google, Yahoo, etc.)	36	0
6	Any Broken linkage	10	26

5) Usability

The evaluation shows that most of webpages provide the needed and beneficial information for users and parents, especially the academic program offering, professor information and research profiles. The webpages are designed in simple and user friendly concept. Therefore, a few webpages do not provide the access for downloading. In addition, when assessing the functional menus on pages, they are found that there are some lacks of important and related links such as library, student services, intranet registra service, research services, etc.

Table 6: Usability

No	Indicators	Yes	No
1	the provided information is really valuable for visitors	32	4
2	Any process on website is working through well	33	3
3	database on website is reachable	33	3
4	totally be comfortable and convenient to use (user friendly design)	36	0

Conclusion and suggestions

The websites of faculty, school and college of Rangsit University are mostly qualified in term of the website component indicators of 1) Page and Site Design 2) Content Design 3) Navigation 4) Accessibility and 5) Usability. The evaluation shows they are mostly developed under the same platform (on university hosting service). The standards of web technology development are varied but the presentation of content and process are quite similar. There are 30 percent of webpages that contain the broken links and inaccessible contents. There are a few that put the database links on its websites and cannot be reachable. Totally they are all user friendly and simple to use.

The evaluation result indicates that the University shall take part in website development of its faculties and colleges in order to make the website as a digital university. The guideline of website design and development shall be established to create as a corporate identity standard. University shall constantly strive to maximize the utility and depth of information on their websites while offering pleasing and powerful image to attract potential students and public.

References

Alsudani, F., & Casey, M. (2009). The effect of aesthetics on web credibility. Retrieved from: http://www.bcs.org/upload/pdf/ewic_hci09_paper66.pdf

Beck, Susan. (1997) "Evaluation Criteria." The Good, The Bad & The Ugly: or, Why It's a Good Idea to Evaluate Web Sources. New Mexico State University. Retrieved from: http://lib.nmsu.edu/instruction/evalcrit.html

Bordbar, Fatemeh. (2016). The Effectiveness of Website Design in Higher Education Recruitment. Master Degree Thesis in Professional Communication, Southern Utah University.

Caglar, Ersin and Mentes, S. Ahmet. (2012). "The usability of university websites - A study on European University of Lefke" International Journal of Business Information Systems 11(1):22-40 (August 2012).

Cornell University Library. (2019) "Website evaluation." Retrieved from: http://www.library.cornell.edu/olinuris/ref/research/webeval.html

Dalhouse University. (2019) "6 Criteria for Websites." Retrieved from: https://cdn.dal.ca/content/dam/dalhousie/pdf/library/CoreSkills/6_Criteria_for_Websites.pdf

"5 Lessons for Designing a Good University Website." Manoverboard.com. (2014). Retrieved from: https://manoverboard.com/5-lessons-for-designing-a-good-university-website/

Gardner, Susan A., Benham, Hiltraut H. and Newell, Bridget M. (1999) "Oh, what a tangled web we've woven! Helping students evaluate sources." English Journal, (Sept. 1999) : 39-44.

Halvorsen, T. (2014). Breaking the Mold.edu. Retrieved from: https://www.fastspot.com/blog/breaking-the-edumold/

Khan, B. H. (2010). The Global E-Learning Framework (Chapter 5). In B. H. Khan (Ed.), Elearning (pp. 42-51). Englewood Cliffs, NJ: Educational Technology Publications.

Levitz, R. (2014). 7 things we learned this year about college students and higher education enrollment management. Retrieved from: http://blog.noellevitz.com/2014/12/11/2014-noel-levitz-researchhighlights-7-things-learned-year-college-students-higher-education-enrollment- management/

Manzoor, Mirfa, Hussain, Walayat, Ahmed, Aftab, and Iqbal, Mohammad Javid. (2012). "The Importance of Higher Education Websites and its Usability" International Journal of Basic and Applied Sciences, 1 (2) (2012): 150-163.

Purdue University (2019) CORE (Comprehensive Online Research Education). Retrieved from: http://gemini.lib.purdue.edu/core/default.cfm

Rangsit University (2019) "College and Faculty" Retrieved from: https://www2.rsu.ac.th/faculties/faculty

Ranking Web of Universities. (2019a) "Thailand Ranking Web of Universities." Retrieved from: https://www.webometrics.info/en/Asia/Thailand

Ranking Web of Universities. (2019b) "Webometrics Ranking of World's Universities: Methodology." Retrieved from: http://www.webometrics.info/en/Methodology

Ranking Web of Universities. (2019c) "Objectives of the Webometrics Ranking of World's Universities." Retrieved from: http://www.webometrics.info/en/Objetives

W3C. (2018) Web Content Accessibility Guidelines (WCAG) 2.1. Retrieved from: https://www.w3.org/TR/WCAG/

Waterhouse, Shirley. (2005) The power of eLearning: the essential guide for teaching in the digital age. Pearson's Pubishing.

Youngblood, N. E. (2013). Integrating usability and accessibility into the interactive media and communication curriculum. Global Media Journal: American Edition, 1-37.

"Your guide to a successful university website" (2016). Retrieved from: https://www.studyportals.com/blog/your-guide-to-a-successful-university-website/

USING VIDEO-ANALYSIS OF MOTIONS IN PHYSICS TEACHING AND LEARNING

Peter HOCKICKO

University of Žilina, Faculty of Electrical Engineering and Information technology, Slovakia

hockicko@fyzika.uniza.sk

Abstract: This paper describes using video-analysis based tasks in the educational process of the students at the technical university. The attention is paid to university students and their knowledge of physics and conception/misconception.
The role of students in video analysis is to realize necessary physical characteristics, to choose a suitable way to a problem solution and from the relations among physical quantities to find a solution to a task. The tasks can be considered being the problem-solving tasks with a well-defined problem and according to Bloom´s taxonomy of cognitive domain they require higher level solution – mostly application, analysis and synthesis. On the other hand, it is also possible to demonstrate students, by a simple mathematical analysis, the use of integrals and derivatives in physics.
Using the method of video-analysis by interactive program Tracker the level of knowledge of students can be increased and some misconceptions can be eliminated.

Keywords: STEM education, FCI test, program Tracker

Introduction

We have already presented students' understanding of the real physical processes in previous works that is not correct (Hockicko et al, 2013). Many authors confirmed that during the last decades, entry-level engineering students' basic abilities in Physics (and Mathematics) have decreased dramatically (Pinxten et al, 2017). Physics are often considered to be difficult subjects. The fundamental laws are expressed in the language of mathematics. Teachers constantly work on improving students´ understanding of various phenomena and fundamental laws. One of the creative methods of teaching physics which makes natural sciences more interesting for students is video-analysis (VAS method) using the program Tracker. Collaborative projects based on digital video-analysis provide an educational, motivating and cost-effective alternative to traditional course-related activities in introductory physics (Laws et al, 1998).
The traditional teaching of Newtonian mechanics in the early years of university studies eliminates the wrong perception of students acquired during their secondary school studies only to a small extent. It was also shown that traditional lectures help to acquire only basic knowledge without deeper understanding and the ability of problem solving; students do not show conceptual understanding of the subject which should result from a sufficient number of solved quantitative tasks and from logically clear lectures (Redish, 2003).
This led us to producing a video set, by means of which we explained physical laws in lectures and realized video-analysis in seminars (Hockicko, 2013). The tasks can be considered being the problem-solving tasks with a well-defined problem and according to Bloom´s taxonomy of cognitive domain they require higher level solution – mostly an application, an analysis and a synthesis. Many tasks based on video-analysis are suitable to demonstrate a simple mathematical analysis, the use of integrals and derivatives in physics. The use of tasks based on video-analysis in physics can significantly affect the differences in knowledge when students solving traditional tasks from printed textbook (Hockicko et al, 2015).
We try to prepare our students for teamwork and collaboration with scientists and engineers, so they can work in interdisciplinary fields at the interface between Physics and technical departments. As a result, we consider theoretical training not as the goal but to an end, and therefore it should always be followed by practical application. It is very important to use the multimedia tools also in other subjects including basic education to make science and technology more appealing and to address the scientific apathy crisis of young people (Bussei, 2003). Game provides many examples that can bring physics to life in the classroom. Especially, the kinematic and dynamic characteristics of motions are worth a physics classroom discussion. It enables the students to work in much the same way as sport scientists do (Heck 2010). Therefore, we decided to support freshmen by interactive lectures using video and video analysis and find out whether interactive lectures are more effective in increasing students prior knowledge level of Physics than traditional lectures.

Methodology of teaching physics

Using the program Tracker students can detect the relationship between physical quantities and describe a motion using time dependencies. Tracker offers time dependencies of 22 physical quantities (+ we can define other), data processing by means of graphs and tables. From the number of frames per second (30 fps or 120 fps usually) the time is deduced ($\Delta t = 0.033$ s or $\Delta t = 0.0083$ s) while the position can be measured in two dimensions (x, y) using a video image after calibration. The function autotracking in this program allows for accurate tracking without mouse. The studied motion can be divided into two parts: the horizontal component and the vertical component. These two components can be analysed independently of each other and afterwards the results can be combined to describe the total motion ($x(t)$, $y(t)$, $v_x(t)$, $v_y(t)$, $a_x(t)$, $a_y(t)$).
The students can fit the time dependencies of position, velocity, acceleration and other using a data tool which provides a data analysis including automatic or manual curve fitting of all or any selected subset of data. The position and the velocity can be plotted and fitted to see the correlation between the real data and the kinematic equations. For example, students have found that the trajectory of the free fall ball is always a parabola (Hockicko 2011).
The example of the task for students:

The cylinders with different mass are rolling down an incline that is placed at a certain height above ground. What will be the horizontal distances of the points at which the cylinders hit the ground from the end of the incline? (Length of the black square segment: 1 cm, frequency of taking pictures: 120 fps, masses of cylinders: m1 = 1.807 kg, m2 = 0.640 kg, m3 = 0.264 kg)

The solution using video-analysis using program Tracker:

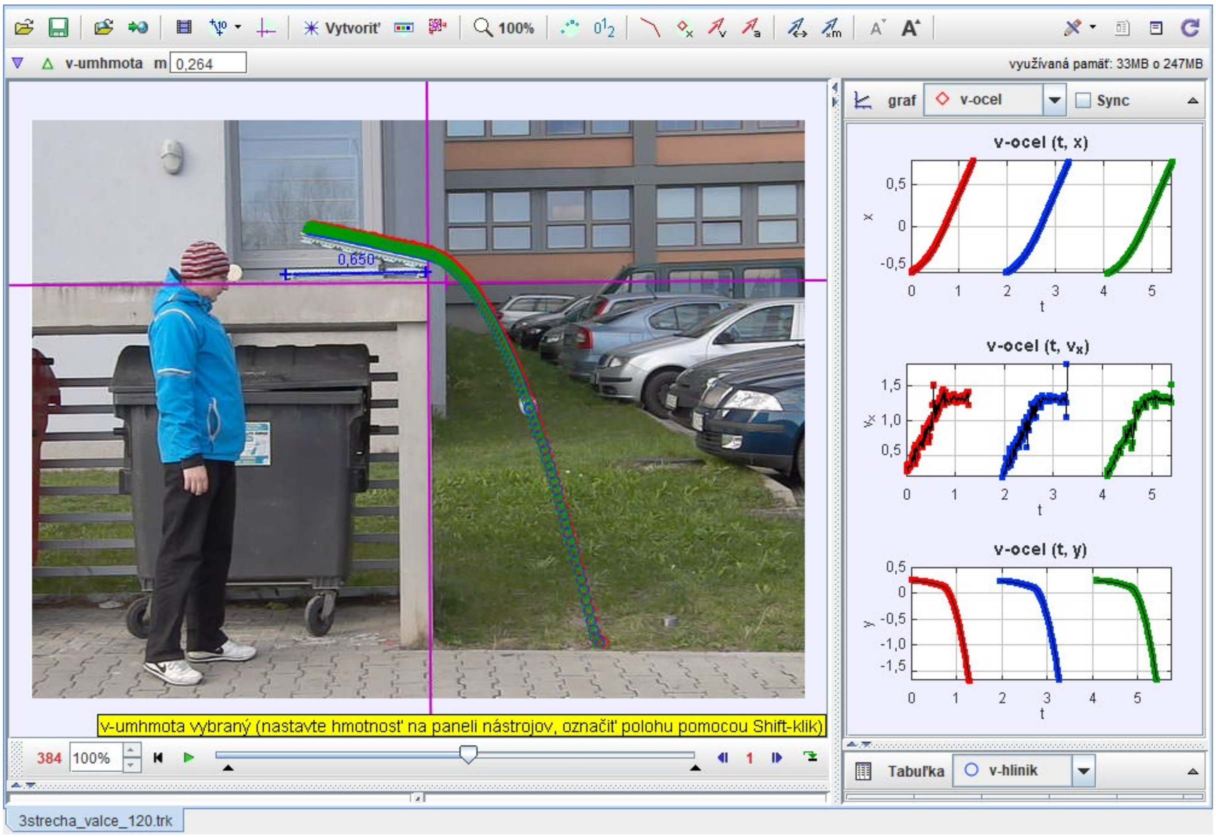

Figure 1. The analysis of motion using program Tracker. Red – a metal cylinder, blue – aluminium, green – plastic.

The next task: *Compare the motions of cylinders with different mass and the same diameter. If they all start moving from rest at the same elevation and roll down without slipping, which of them reaches the bottom as the first? Which reaches it as the last? Try to compare the velocities at the end of an incline.*

Using Data Tool in Tracker which provided a data analysis including automatic or manual curve fitting of all or any selected subset of data, the students can fit the time dependencies of the position, velocity (Fig. 1), acceleration and other. The position and the velocity can be plotted and fitted to see the correlation between motions of different cylinders. Using the fit function, the students can find that all cylinders are rolling down an incline with basically

the same acceleration and velocity of their centres of mass. For the students during the lecture and watching the video these results were quite interesting since both the speed and the acceleration of the centre of mass of the cylinder were independent of their mass.
Using this video (http://hockicko.uniza.sk/Priklady/video/strecha_valce_120.avi), we can change the misconception that *"heavier objects fall faster"* and show that the time of free fall does not depend on mass of body. We can analyse velocity and the position of cylinders in x-direction and show that the results do not depend on mass of cylinders in rolling motion, too.

Methodology of Evaluating

At the beginning of the second semester of academic year 2018/19, the Force Concept Inventory (FCI) (Hestenes el al., 1992) was administered to students at the Faculty of Electrical Engineering and Information Technology (FEEIT) University of Žilina (UNIZA) to find out their prior knowledge level of Physics. The pre-test was carried out at the beginning of the second semester during the first week, post-test was carried out at the end of the semester (the 13th week, after the semester course 'Physics') and it was attended by 64 students who participated in the both pre- and post-test.
The students were assigned to two groups – the experimental (attended by 44 students) and the control group (attended by 20 students). Only those students who participated actively in the lectures took part in the experimental group. Students who did not attend lectures took part in control group.
The lectures were conducted in an interactive way aimed at clarity - using real-life videos related to the topic. All videos were analysed with the help of the program Tracker (using VAS method). Students from both groups attended compulsory computational Physics seminars. The subject 'Physics' consists of 3 - 2 - 1 (lectures - exercises - labs) lessons per week, presence study. The semester consists of 13 weeks. The only difference between the experimental and the control group was that students from experimental group actively attended 13 interactive lectures while students from control group did not attend lectures.

Results and Discussion

These results (Fig. 2, Tab. 1) indicate that there is no statistical difference in the mean pre-test FCI score between the experimental and the control group at the beginning of the semester.

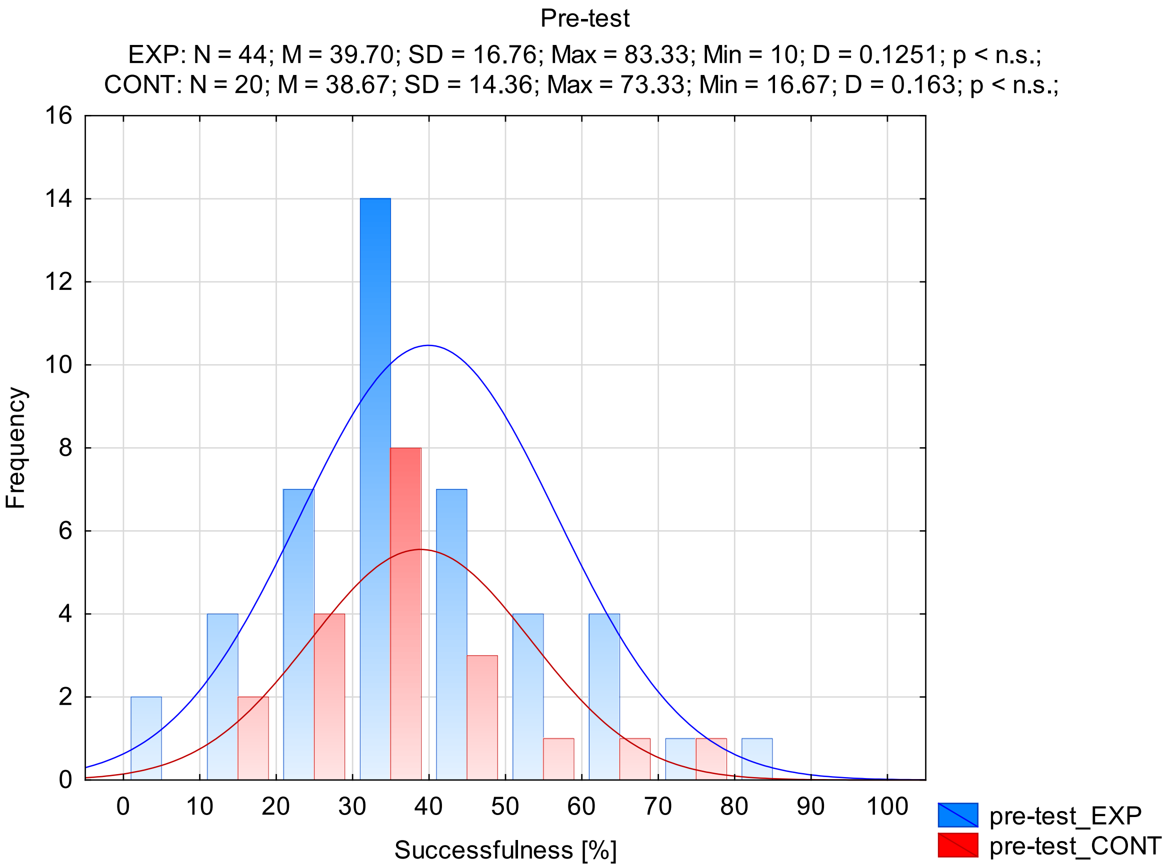

Figure 2. FCI score of pre-tests for the experimental and the control groups.

Table 1: Pre-test: F-Test Two Sample for Variances and t-Test: Two Sample Assuming Equal Variances.

	Experimental group	Control group
Mean	39.70	38.67
Variance	281.04	206.32
Observations	44	20
df	43	19
F	1.36	
P(F<=f) one-tail	0.24	
F Critical one-tail	2.02	
Pooled Variance	258.14	
Hypothesized Mean Difference	0	
df	62	
t Stat	0.24	
P(T<=t) one-tail	0.41	
t Critical one-tail	1.67	
P(T<=t) two-tail	0.81	
t Critical two-tail	2.00	

But results in Fig. 3 and Tab. 2 indicate that there is a statistical difference in the mean post-test FCI score of the experimental and the control group at the end of the semester.

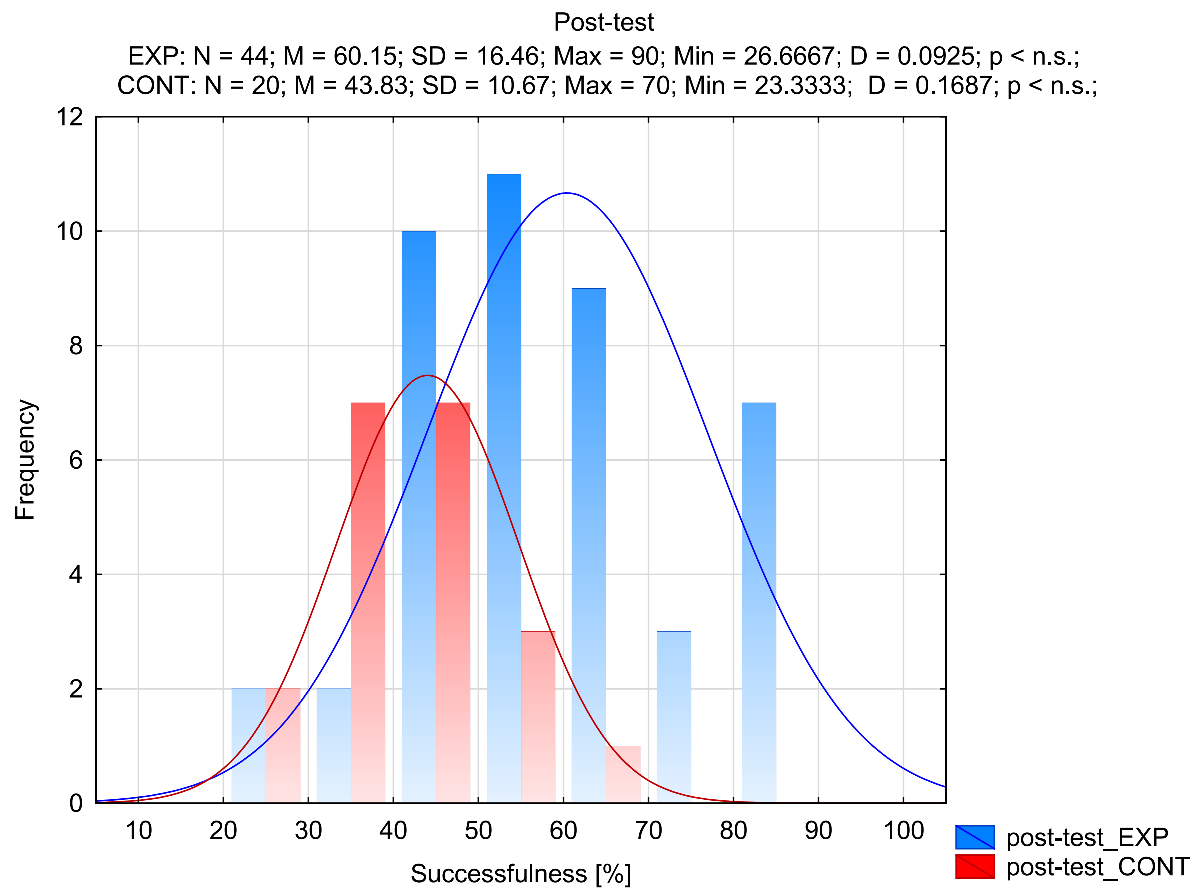

Figure 3. FCI score of post-tests for the experimental and the control groups.

Table 2: Post-test: F-Test Two Sample for Variances and t-Test: Two Sample Assuming Unequal Variances.

	Experimental group	Control group
Mean	60.15	43.83
Variance	270.78	113.77
Observations	44	20
df	43	19

F	2.38	
P(F<=f) one-tail	0.02	
F Critical one-tail	2.02	
Hypothesized Mean Difference	0	
df	54	
t Stat	4.74	
P(T<=t) one-tail	7.94E-06	
t Critical one-tail	1.67	
P(T<=t) two-tail	1.59E-05	
t Critical two-tail	2.00	

After that analysis we try to use Student t-test and compare pre and post-test results of experimental and control groups (Fig. 4, 5).

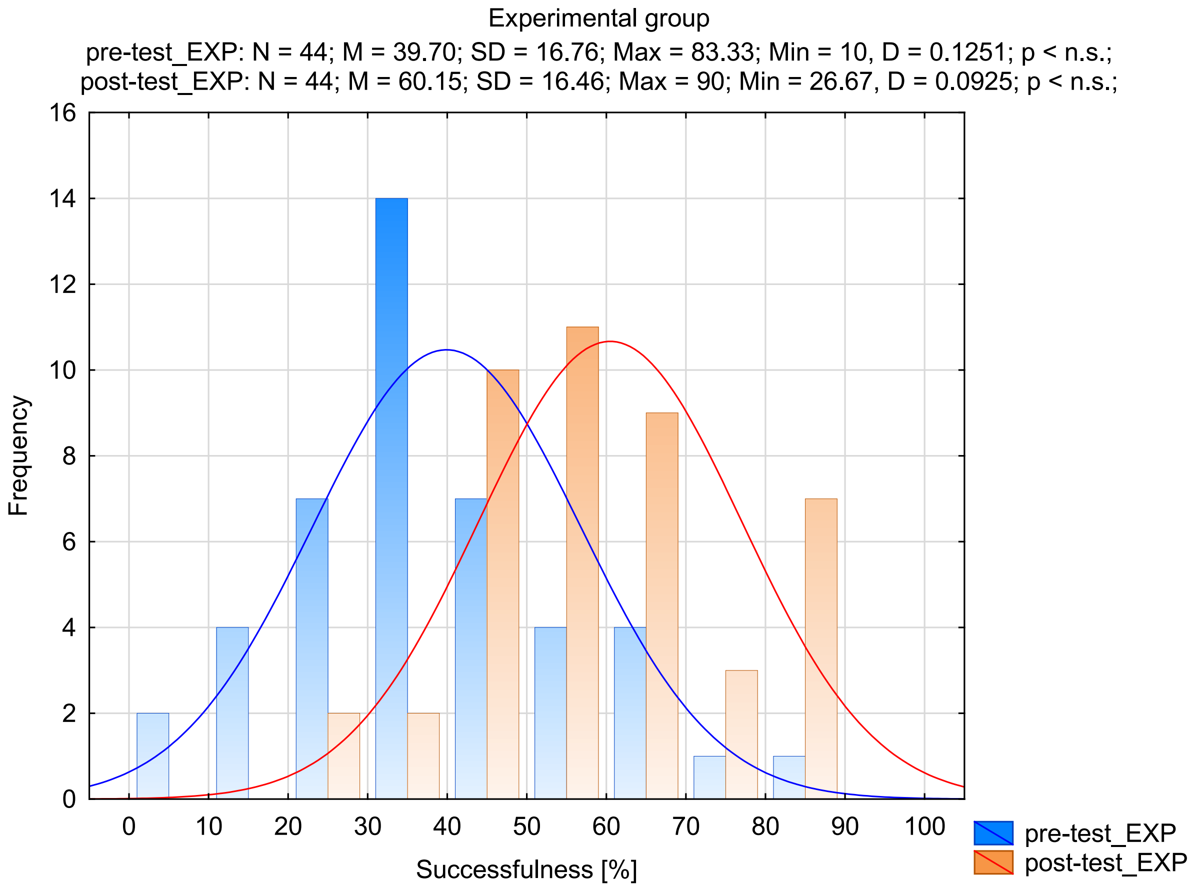

Figure 4. FCI score of pre and post-test for the experimental group.

Table 3: t-Test: Paired Two Sample for Means – Experimental group.

	Post-test	Pre-test
Mean	60.15	39.70
Variance	270.78	281.04
Observations	44	44
Pearson Correlation	0.53	
Hypothesized Mean Difference	0	
df	43	
t Stat	8.45	
P(T<=t) one-tail	5.47E-11	
t Critical one-tail	1.68	
P(T<=t) two-tail	1.09E-10	
t Critical two-tail	2.02	

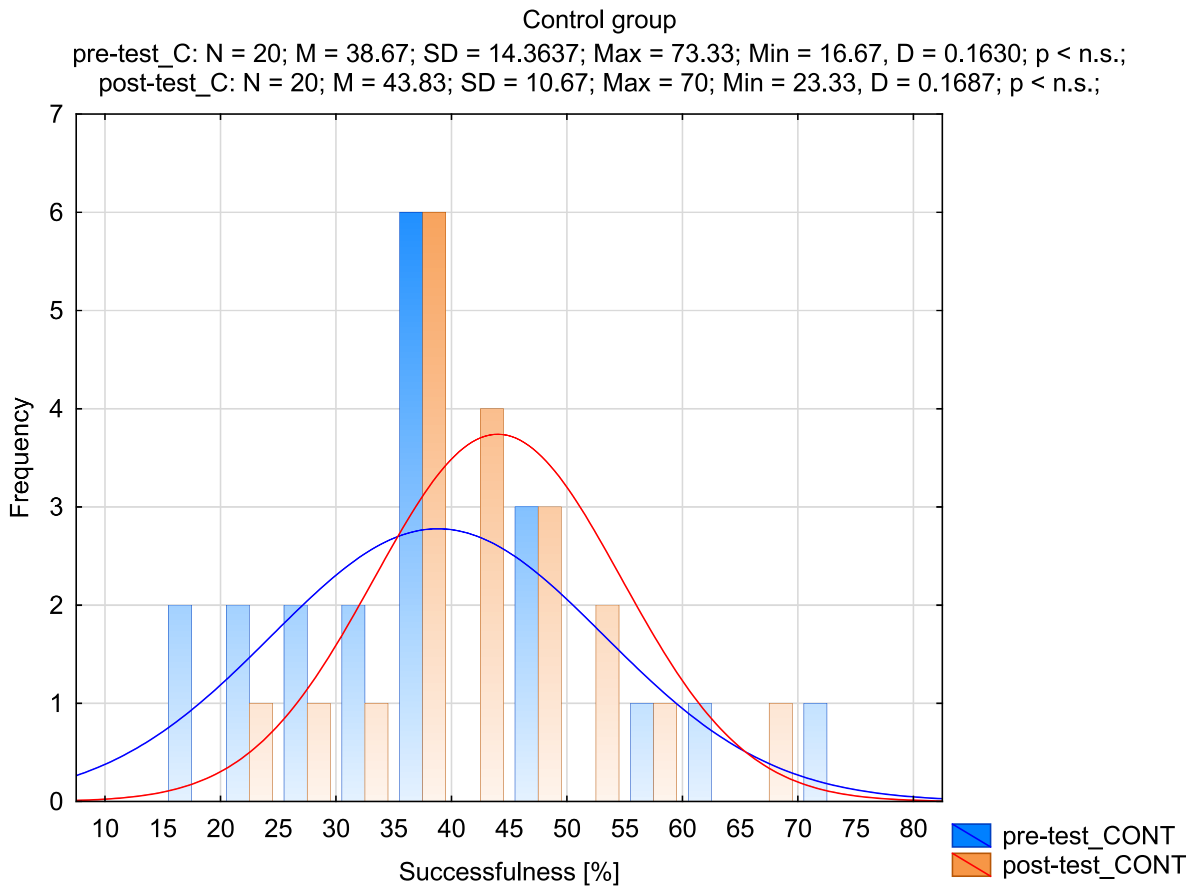

Figure 5. FCI score of pre and post-test for the control group.

Table 4: t-Test: Paired Two Sample for Means – Control group.

	Post-test	Pre-test
Mean	43.83	38.67
Variance	113.77	206.32
Observations	20	20
Pearson Correlation	0.83	
Hypothesized Mean Difference	0	
df	19	
t Stat	2.87	
P(T<=t) one-tail	0.0049	
t Critical one-tail	1.73	
P(T<=t) two-tail	0.0098	
t Critical two-tail	2.09	

The evaluation of pre-test and post-test of the experimental group at the beginning and at the end of semester (Fig. 4, Tab. 3) confirmed statistically significant difference between mean at the beginning and end of semester ($p < 0.001$).
The evaluation of pre-test and post-test score of the control group at the beginning and at the end of semester (Fig. 5, Tab. 4) confirmed statistically significant difference between mean at the beginning and end of semester, too, ($p < 0.005$) but p-value is lower in the case of the experimental group.

Discussion

We used Force Concept Inventory (FCI) test to verify students' knowledge of Physics (Kinematics and Dynamics). FCI test contained 30 qualitative multiple-choice tasks that focused on conceptual understanding of Newtonian mechanics (Hestenes et al., 1992).
As the authors of FCI test claim (Hestenes et al., 1992) it is necessary to point out that 60% of FCI test, for empirical reasons, is minimal threshold so that a student could continue in understanding Newtonian mechanics effectively. Below this threshold, a student's grasp of Newtonian concepts is insufficient for effective problem

solving. Otherwise a student is not able to overcome difficulties which caused him/her misconception and thus s/he learns physics by heart. 80 – 85% FCI score represents the mastery level when a student thinks in terms of intentions and Newtonian physics. As the authors state such an outcome does not depend on what teacher, in what country and what kind of school s/he teaches. The results of pre-test (Fig. 2) reveal that only 14% of students in the experimental and 9% in control group reached the level of 60% or higher from FCI score.
In post-test (Fig. 3) the results reveal that 44% of students in the experimental and only 18% in control group reached the level of 60% or higher from FCI score. 16% of students in experimental group reached the mastery level from FCI score in post-test.
We also try to compare the pre-test results of students from other Slovak and foreign universities. Other research results using FCI tests reveal that the input knowledge level of UNIZA students concerning force, mass point kinematics and dynamics is at lower level in comparison with the students from university from Finland (Tampere University of Applied Sciences (TAMK)) (Mean(UNIZA) = 23 %, Mean(TAMK) = 45 % in academic year 2014/15) (Hockicko et al., 2015). There is also statistically significant difference between the average pre-test FCI score of the students in Slovakia and Russia (UNIZA and RSREU) at the beginning of the winter term 2018/2019 (Mean (UNIZA) = 32 %, Mean (RSREU) = 46 %) (Hockicko et al., 2019).
The video analysis and simulations (VAS method) of problem tasks using interactive program Tracker is one of the methods that considerably helps to form conceptual thinking and at the same time eliminating misconceptions, to develop manual skills and intellectual capabilities of students and increase the level of knowledge of students and the results in post-test, too (Hockicko et al. 2014, Hockicko et al. 2016).
If we want to achieve better results with current student quality, it seems to be necessary to use more effective, interactive methods and to focus more on an active and creative, more conceptual approach in order to enhance the students' expertise rapidly in the beginning of their studies. The video-based problems, problem-based learning, project-based learning, inquiry-based teaching methods, internet-supported learning, conceptual question application and other enhance higher order cognitive skills and students do better than those attending a traditional lecture-lab type instruction (Hockicko, 2010, Hockicko et al., 2014, 2015, 2016).

Conclusion

Our results confirmed that the difference in the knowledge level between the experimental and control group was statistically significant, at the significance level of $\alpha = 5\%$ (the experimental group consisted only from those students who actively participated in the lectures from Physics in comparison with the control group – consisted of the students who did not attended lectures).
Watching real physics concept videos and their subsequent video analysis had a positive impact on the growth of knowledge and improving of conception of Newtonian mechanics at the end of the semester in the experimental group. The methods of video-analysis using the program Tracker presented in this contribution make learning physics easier for the students, they can set individual pace for their work and they have fun when analysing videos. We assume that with the help of interactive way of teaching physics it would be possible to eliminate misconceptions of students, decrease of the dropout of the first-year students and also to improve students' level of knowledge in the introductory courses of general physics. A detailed analysis of FCI tests can help us to detect preconceptions and problems in the conception of physics basic principles and the work of this world.

Acknowledgements

This work was supported by the Slovak Grant Agency KEGA through the project No. 012TU Z-4/2017 and KEGA No. 029ŽU-4/2018. Authors would like to thank to David Koch from Arizona State University for providing the FCI test.

References

Bussei, P., Merlino, S. (2003). European workshop on Multimedia in Physics Teaching and Learning. *Europhysics News*, 34(3), pp. 116-117. ISSN 0531-7479.

Dirner, A. et al. (2011). Students discover the beauty of particle physics Masterclasses 2011. *Proceedings of the conference Creative teacher of physics IV, National festival of physics 2011,* 1st ed. Bratislava: Slovak Physical Society, pp. 50 - 63, ISBN 978-80-970625-3-8.

Heck, A., Uylings, P. (2010). In a Hurry to Work with High-Speed Video at School. *The Physics Teacher* 48, pp. 176 – 181. ISSN 0031-921X.

Hestenes, D., Wells, M., Swackhamer, G. (1992). Force Concept Inventory, *The Physics Teacher*, vol. 30, no. 3, pp. 141–158.

Hockicko, P. (2010). Nontraditional Approach to Studying Science and Technology. *Communications*, Vol. 12, No. 3, pp. 66 – 71. ISSN 1335-4205.

Hockicko, P. (2013). Fyzika v príkladoch a videopríkladoch / Video-analysis based tasks in physics. 1.ed. Žilina: Edis, [DVD]. ISBN 978-80-554-0811-8. on-line: http://hockicko.uniza.sk/Priklady/video_tasks.htm

Hockicko, P. (2011). Forming of Physical Knowledge in Engineering Education with the Aim to Make Physics

More Attractive. *Proceedings of International Conference Physics Teaching in Engineering Education PTEE 2011*, Mannheim, Germany, 2011. ISBN 978-3-931569-18-1.

Hockicko, P., Krišťák, Ľ., Němec, M. (2015). Development of students' conceptual thinking by means of video analysis and interactive simulations at technical universities. *European Journal of Engineering Education*, 40(2), pp. 145–166. DOI: 10.1080/03043797.2014.941337, ISSN 0304-3797 (Print), 1469-5898 (Online).

Hockicko, P., Rochovská, I. (2013). Detection, analysis and the possibilities on eliminating misunderstandings and misconceptions in the physics education at technical universities. *Proceedings of the conference Creative teacher of physics VI, National festival of physics 2013*. 1st ed. Bratislava: Slovak Physical Society, pp. 126 - 132, ISBN 978-80-971450-0-2.

Hockicko, P., Tarjányiová, G., Kopylova, N., Dyagilev, A. (2019). Video-analysis as an effective method for improving physics teaching and learning understandment, *Proceedings of the 10th International Conference on Physics Teaching in Engineering Education PTEE 2019*, The Hague University of Applied Sciences, Delft, The Netherlands, May 23-24, 2019, ISBN 978-90-9031874-5.

Hockicko, P., Tiili, J. (2015). Comparison of the Entering Students' FCI Results – Tampere UAS and University of Žilina, *Proceedings of the 43rd SEFI Annual Conference 2015 Diversity in engineering education: an opportunity to face the new trends of engineering*, Co-organised by SEFI and Polytech Orléans, Brussels, Belgium, on USB key, ISBN 978-2-87352-012-0.

Hockicko, P., Trpišová, B., Ondruš, J. (2014) Correcting Students' Misconceptions about Automobile Braking Distances and Video Analysis Using Interactive Program Tracker. *Journal of Science Education and Technology*, 23(6), pp. 763-776, DOI: 10.1007/s10956-014-9510-z, ISSN 1573-1839.

Hockicko, P., Tarjányiová, G. (2016). Force concept inventory of first year students attending Faculty of Electrical Engineering. *Proceedings of 11th International Conference ELEKTRO 2016*: Slovakia, Štrbské Pleso – High Tatras, May 16-18, 2016, pp. 665-669. IEEE Catalog Number: CFP1648S-DVD, 2016. ISBN 978-1-4673-8697-5.

Kopylova, N. (2018). The Use of E-Learning at Foreign Language Practical Lessons in a Technical University, *Proceedings of the conference: 12th International Conference Elektro 2018*, Location: Mikulov, Czech Republic, May 21-23, 2018, IEEE, 345 E 47TH ST, NEW YORK, NY 10017 USA, ISBN 978-1-5386-4759-2.

Laws, P., Pfister, H. (1998). Using Digtal Video Analysis in Introductory Mechanics Projects. *The Physics Teacher*, 36 (5), 282 – 287.

Mazgut, R, Spanik, P., Koscelnik, J., Sindler, P. (2014). The Measurement of Balance by the Accelerometer and Gyroscope, *Proceedings of the ELEKTRO 10th International Conference*, pp. 192 – 196, MAY 19-20, 2014, IEEE, 345 E 47TH ST, NEW YORK, NY 10017 USA. ISBN:978-1-4799-3721-9.

Ondrus, J, Karon, G. (2017). Video System as a Psychological Aspect of Traffic Safety Increase, *Proceedings of 17th International Conference on Transport Systems Telematics (TST)*, Katowice, Poland, Smart Solutions In Today's Transport Book Series: Communications in Computer and Information Science, vol. 715, pp. 167-177.

Pinxten, M., Laet, T. De., Van Soon, C., Peeters, C., Kautz, C., Hockicko, P., Pacher, P., Nordstrom, K., Hawwash, K., Langie, G. (2017). Approaches to the Identification of STEM Key Competencies in European University systems, *Proceedings of the 45th SEFI Annual Conference 2017*, 18 – 21 September 2017, Portugal, pp. 389 -397, ISBN 978-989-98875-7-2.

Redish, E. F. (2003). *Teaching Physics*, John Wiley and Sons, New York.

Spanik, P., Dobrucky, B., Frivaldsky, M., Drgona, P., Kurytnik, I. Measurement of swtitching losses in power transistor structure, *ELEKTRONIKA IR ELEKTROTECHNIKA*, Issue: 2, pp. 75-78, 2008, ISSN: 1392-1215.

Tarjányi, N., Tarjányiová, G. (2016). Sounds from the Country of Wave. *Proceedings of the conference Creative teacher of physics VIII, National festival of physics 2015,* 1st ed. Bratislava: Slovak Physical Society, pp. 215 - 222, ISBN 978-80-971450-8-8.

