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Communication
İnönü Üniversity, Faculty of Education, Department of Educational Sciences, Malatya, Turkey
E-posta: ijare.editor@gmail.com
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*Investigation of the Relationship between Digital Game Addiction and English Listening Skills among University Students**

Ayşenur Ağaoğlu [1]
Erzincan Binali Yıldırım University, School of Foreign Languages, Erzincan, Turkey

Süleyman Nihat Şad [2]
Inönü University, Faculty of Education, Department of Educational Sciences, Malatya, Turkey

Abstract

The main aim of this study is to investigate the relationship between digital game addiction and English listening skills among university students. This quantitative associational research was conducted with 198 university students during the spring semester of 2018-2019 academic year. The data were collected using "Digital Game Addiction Scale" and "English Listening Skills Test". The results suggested that action, puzzle, and strategy games are the game categories most commonly played by the participants. Furthermore, it was found that 54% of the participants (n=101) primarily played English games and they played 132.75 minutes per day on average. Participants' were moderately (x̄=17.38/35; s=6.91) to digital games. Their digital game addiction scores differed significantly by variables of gender and major. The mean score of the participants on the English listening skill test was 54.75/100. When the relationship among participants' level of digital game addiction, English listening skill, and average time (min.) to play English digital games a day was examined, it was found that as the daily time to play English digital games increased, the level of digital game addiction and English listening skills also increased.

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[1] Erzincan Binali Yıldırım University, aysenur.agaoglu@erzincan.edu.tr
[2] Inönü University, nihat.sad@inonu.edu.tr

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INTRODUCTION

Playing games is one of the most important leisure time activities dating back to ancient times and occupying an important place in the lives of people, especially the children (Öztürk, 2007). Turkish Language Institution (TLA, 2019) describes game as "an act of entertainment with certain rules, which provides good time and develops talent and intelligence". Salen and Zimmerman (2003, p.77) describe game as "a voluntary activity which has a goal and involves rules". According to Prensky (2001), game is a multifaceted action that gives people pleasure, motivation, adaptability, power of interaction, problem-solving and learning abilities, a sense of competition and cooperation, creativity, and it is also an action that causes addiction by activating the motive of ambition. As one of the indispensable entertainment activities of all age groups, games allow people to explore their environment and the world, develop specific skills, and socialize (Bilgin, 2015). The game activities performed with real friends in real physical environments such as parks and streets in the past have gradually evolved into virtual activities performed on the internet today, i.e. digital games (Horzum, 2011).

One of the innovations of computer technology brought by the digital age is the concept of "digital game", which affects people of all ages (Erboy, 2010). The concept of digital gaming appears as "the sorts of video games in which the player takes on the role of a fantasy character moving through an elaborate world, solving various problems or in which the player builds and maintains some complex entity, like an army, a city, or even a whole civilization" (Gee, 2003, p. 1). While Vogel et al. (2006, p.231) describe digital games as "an activity which has goals, is interactive, and is rewarding (gives feedback)", Spires (2015, p.126) defines them as "multimodal texts with a combination of different communicative media, such as still and moving images, sound and music and speech and writing." Describing children born in the digital age as "digital natives," Prensky (2006) notes that the key elements of digital games attracting the most attention and interest are the nature of combat, competition, interaction with feelings such as challenge, and virtual reality. Digital games are programmed with various technologies and software and offer a visual environment to their users. Generally, users log into this environment by creating a virtual character. They can be played with multiplayers or single players based on the number of participants. These games are classified as console games, computer games, mobile or online games depending on the way they are programmed (Hazar and Hazar, 2017). Griffiths (2002) has listed digital games as racing games, adventure games, sports simulations, puzzles, platform games, fighting, and gun games according to their original qualities. Adams and Rollings (2006) divide digital games into seven categories: tactics, jigsaw, adventure, action, sports, role-playing, and simulation (as cited in Irmak & Erdoğan, 2016).

The technological platforms used by the new generations in their daily lives have started to change the understanding of education. Müftüoğlu (2018) states that with technological developments, the perception of educators on educational environments has changed and technology now offers new opportunities for the improvement of educational environments. "Educational game" is one of the main student-centered methods that can enable students to actively participate in the learning process by increasing the student's intrinsic motivation (Şahin and Samur, 2017). Nowadays, the concept of educational game has evolved into a more comprehensive concept called "gamification", in which students will interact and collaborate more and can be used to improve their communication skills (Leipzig, Leipzig and Hummel, 2016). Gamification is the use of game components such as scores, awards, tasks, struggles and attainment of learning goals in order to engage students in the process to increase their motivation and create a student-centered learning environment (Banfield and Wilkerson, 2014). Garris, Ahlers and Driskell (2002) argue that through digital games, students actively participate in the learning environment and learn by structuring knowledge.

Foreign Language Teaching is one of the fields where gamification is used extensively. One of the basic conditions of foreign language learning is to be exposed to that language and to communicate using the target language for a prolonged time. Educational games require students to use a foreign language while playing games and allow them to learn while having fun. Digital games are known to be quite useful in creating environments where a foreign language is useful and meaningful in classroom activities (Gömleksiz, 2005). In addition to the educational games used in planned and intentional foreign language courses within the scope of formal education, there are also digital games that individuals play outside the class as a leisure time activity. According to Prensky (2001), in these games, where the only purpose is to win the game, individuals can naturally learn new knowledge or skills. Most digital games require mutual communication with both virtual and real people. Since many international digital games are played in English, international players are encouraged to use English as a foreign language (Can & Türkmen, 2017). Over the past two decades, individuals playing digital games, especially online multiplayer, have been reported to show improvements in foreign language. This has created a new field of research on the benefits of digital games in language learning and teaching (Müftüoğlu, 2018).

Previous studies reveal that the type and language of the digital games played matters in terms of the effects of digital games on students. Griffiths (2002) and Gros (2007) categorized digital games and suggested that action and simulation games require perception and motor ability, while strategy games require cognitive effort. Gee (2003) states that through game types such as action, strategy, and simulation, individuals learn many things on this occasion while integrating themselves with the characters and having fun in a virtual reality environment. Similarly, Csikszentmihalyi and Csikszentmihalyi (1998) investigated the effect of digital games played outside the classroom on students (as cited in Demirbilek and Yücel, 2017). According to the results of the study, they found that the students played digital games types such as simulation, strategy, and action only to win or level up the game, so they focused on the game very well and tried to fulfill the tasks in the game in the best way. Also, Kaptelinin and Cole (2002) note that the game types, which include elements of collaboration and communication, make positive contributions to individuals in learning foreign languages. Larsen-Freeman (2000), on the other hand, expresses the importance of digital games in a foreign language learning environment and states that the types of games that provide students with a real communication environment develop foreign languages. Besides, according to Johnson (2005), thanks to the digital game types that help to make decisions in the short and long term and include complex tasks students' foreign language usage areas and problem-solving skills improve. Furthermore, according to Aydın (2014), digital games played in a foreign language serve as a context for meaningful communication, and as the duration of digital games played in a foreign language increases, students actively participate in foreign language learning processes. Kaptelinin and Cole (2002) note that digital games, with a high rate of interaction between players, add a collaborative atmosphere to the foreign language learning environment, and lead students to communicate. It has attracted the attention of researchers that some types of digital games, designed as a simulation of real life, provide a serious opportunity to motivate people and learn foreign languages as well as the purpose of entertaining (Can & Türkmen, 2017).

Prensky (2001) mentions that the players, whose only goal is to win the game, learn many things without realizing it, creating a new learning culture. Based on this statement of Prensky, it can be predicted that playing digital games, even sometimes at the level of addiction, implicitly contributes to foreign language acquisition. Also, it can be said that while playing these games, individuals are exposed to the foreign language and have to acquire verbal or written communication skills in order to complete the tasks given in the game, skip levels, win awards and have fun, even if the primary purpose is not to learn a foreign language. In this study, the main purpose is to investigate the relationship between playing digital games in their daily lives and the development of their English listening skills. Based on this main purpose, it is also aimed to describe their behaviors about playing digital games according to some variables.

Purpose of the study

The main purpose of this study is to investigate the relations between participating university students' digital game addiction levels and English listening skills. It is also aimed to describe their behaviors regarding playing digital games including the category of digital games participants play, the language of the digital games, how long they play the digital games (especially in English) a day, and their digital game addiction levels. Moreover, it was analyzed whether their levels of digital game addiction differ significantly according to their gender and major. Based on these purposes, it was aimed to answer the following research questions:

1. What are the categories of digital games played by university students?
2. In what languages do university students play digital games?
3. How long do university students play digital games a day?
4. How long do university students play English digital games a day?
5. What is the level of digital game addiction among university students?
6. Do university students' levels of digital game addiction differ significantly according to their gender and major?
7. Are there any significant correlations among students' levels of digital game addiction, English listening skills and average time (min.) to play English digital games a day?

METHOD

Research Design

This research is designed in accordance with the quantitative associational model. In associational designs, it is aimed to examine the relationships between two or more variables from the data obtained (Büyüköztürk et al. 2008). In this study, the digital game addiction levels and English listening skills of the students was investigated. Accordingly, in the study, first, the participants were described regarding the category of digital games they play, the language they play the digital games, how long they play digital games (especially in English) a day, and their digital game addiction levels; and secondly the relations between participants' digital game addiction levels and such variables as gender, major, and English listening skills were investigated.

Study Group

This study was conducted in a higher education institution in Eastern Anatolia with 198 students during the spring term of 2018-2019 academic year. No sampling was performed as all of the students were accessed. The determination of the participants in the study was made on a voluntary basis. Necessary permissions to carry out the study were obtained from the relevant authorities and the data collection tool was administered to the students by the first researcher. The demographic characteristics of the students participating in the study are presented in Table 1.

Table 1. *Information about participants*

Variables		N	%
Gender	Female	99	50.0
	Male	99	50.0
Department	Decorative and Craft Arts	44	22.2
	Laboratory Assistant and Veterinary Health	42	21.2
	Restoration and Architecture	63	31.8
	Tourism Management and Hospitality	49	24.7
Grade	Year 1	85	42.9
	Year 2	78	39.4
	Year 3	16	8.1
	Year 4	19	9.6
		x̄/s	Min-Max.
Age		21.34/3.18	18-50

As it is seen in Table 1, it is observed that participants are distributed according to three different variables. In this study, students were involved from four different departments and class levels at the undergraduate level.

Data Collection Tools

The data was collected by demographic information form, "Digital Game Addiction Scale" and "English Listening Skill Test". The data collection tool was distributed to 200 students in total by the researcher, and all of them returned. After the missing and incorrect ones were removed from these returns, the remaining 198 students' data were used in the analysis.

Digital Game Addiction Scale

In order to measure the level of digital game playing of the participants, Digital Game Addiction Scale, which was developed by Lemmens, Valkenburg and Peter (2009) and adapted into Turkish by Irmak and Erdoğan (2015), was used. The scale is the 7-item short form of the DOB-21 scale consisting of 21 items under 7 sub-scales. This 5-point (1=never 5=always) Likert type scale produces total scores between 7 and 35. In the adaptation study conducted by Irmak and Erdoğan (2015), the Cronbach Alpha internal consistency coefficient of the scale was found 0.72, the total item correlation coefficients were estimated between 0.52-0.76, and the test-retest reliability coefficient was 0.80. In the explanatory factor analysis, the scale explained 56.96% of the total variance under a single factor and the factor loadings ranged between 0.52 and 0.77, while the confirmatory factor analysis revealed favorable goodness of fit values [X2=14.22, p=0.37, df=14, RMSEA=0.012, AGFI=0.92, CFI=0.99, GFI=0.96 and SRMR=0.06] (Irmak and Erdoğan, 2015). In this study, the Cronbach Alpha internal consistency coefficient calculated on the data set of 198 people was found 0.873. The data collection tool also involved students' personal information about their gender, age, department, and grade levels, and the three digital games they played the most in the last 6 months, the average minutes they played these games per day, and the language they played the games.

English Listening Skill Test

A set of 20 questions at B1 level selected from among the sample Preliminary English Test (PET), provided by Cambridge English (ESOL) (2019) website, was used to measure students' listening skills. The validity and reliability indicators of the 20-item listening test were estimated using the data set obtained from the 198 students who participated in the study. Accordingly, the data were subjected to item difficulty, item discrimination and KR20 internal consistency analyses with Test Analysis Program (TAP, Version 14.7.4) (Brooks & Johanson, 2003) software. According to the results of the analysis, the average difficulty level of 20 items in the listening test was 0.549 (min. score = 0 and max. score= 100), the average distinctiveness level was 0.506 (min. = 0.26 and max= 0.72), and the mean of total item correlation coefficient was 0.452 (min. = 0.28 and max.= 0.59) and KR20 internal consistency coefficient was calculated as 0.796. These values indicated that the structure of the listening test was valid, and the scores obtained from the test were reliable.

Data Analysis

The scale and English listening test were applied to the participants. After the data was transferred to the computer, the data were analyzed with SPSS program. In descriptive analysis of the study, frequency, percentage, mean and standard deviations were calculated. In this direction, the answers given by the participants about the digital games they played were classified and presented in categories in line with the research questions.

Prior to the inferential analysis, the data sets were examined in terms of normality assumption. As a result, skewness and kurtosis statistics were found between ±1 across the subgroups of variables, indicating tolerable deviation from normality. For the difference analysis, independent samples t test and one-way ANOVA tests were used, while the correlation analysis was done using Pearson analysis. Significance level was set to $p < .05$.

FINDINGS

Distribution of the Categories of Digital Games Played by Participants during the Last Six Months

In the research, participants were asked to write down the names of three games they played most during the last 6 months. These games were categorized according to the game types such as action, war, educational puzzle, and their frequency and percentages were calculated by the researchers. The distribution of the games by categories is given in Table 2.

Table 2. *Distribution of the Categories of Digital Games Participants Played the Most during the Last Six Months*

Most Played Game #1			Most Played Game #2			Most Played Game #3		
Category	f	%	Category	f	%	Category	f	%
Action	72	36.4	Not playing	113	57.1	Not playing	159	80.3
Not playing	37	18.7	Puzzle	13	6.6	War	6	3.0
Puzzle	23	11.6	Strategy	13	6.6	Puzzle	6	3.0
Strategy	19	9.6	Action	13	6.6	Educational	6	3.0
Educational	12	6.1	Fun	12	6.1	Simulation	5	2.5
Simulation	11	5.6	Educational	10	5.1	Strategy	5	2.5
War	6	3.0	War	9	4.5	Role playing	3	1.5
Race	6	3.0	Sport	5	2.5	Race	3	1.5
Fun	5	2.5	Race	4	2.0	Fun	2	1.0
Sport	4	2.0	Role playing	5	2.5	Sport	2	1.0
Role playing	3	1.5	Simulation	1	0.5	Action	1	0.5
Total	198	100	Total	198	100	Total	198	100

As shown in Table 2, 37 participants (18.7%) stated that they did not play any digital games. On the other hand, for the first game, 36,4% of the participants (f=72) were found to play action games, 11.6% (f=23) played puzzle games, and %9,6 (f=19) played strategy games, 6.1% (f=12) educational games, %5,6 (f=11) simulation games, 3% (f=6) war games, 3% (f=6) race games, 2.5% (f=5) fun games, 2% (f=4) sports games and 1.5% (f=3) played role-playing games. About the second most played games of the participants, 57.1% of the participants (f=113) stated that they did not play a second game in the last six months. However, 13 students (6.6%) stated to play puzzle, action, and fun games the most as a second game, followed by educational games (5.1%) and war games (4.5%). When looking at the categories of the third games the students played most, 80.3% of the students (n=159) did not play a third game. Among the remaining students, the most played games were war, puzzle, and educational games with a ratio of 3.0% (f=6). Based on these findings, it can be said that the digital games that the students played most in the last six months are action, puzzle, and strategy games, respectively. The most commonly played action games among the participants were Pubg, Rope Hero, Crysis, Free Fire and NOVA; In the category of puzzle games, there are games like Word Game, Candy Crash, Trivia Crack, Puzzle Game; In the category of strategy games are Vain Glory, Last Island, Clash of Clans, LOL, Mobile Legends, Arena of Evolution.

Distribution of the Languages of the Digital Games Played by Participants during the Last Six Months

In order to understand the effective of playing the digital games on English listening skills, the participants were also asked in which languages they played the digital games. The distribution of digital games played by participants in the last six months by language is given in Table 3.

Table 3. *Distribution of Digital Games Played by Participants in The Last Six Months By Language*

Most Played Game 1st			Most Played Game 2nd			Most Played Game 3rd		
Game language	f	%	Game language	f	%	Game language	f	%
English	107	54	Not playing	113	57.1	Not playing	159	80.3
Turkish	52	26.3	English	51	25.8	English	24	12.1
Not playing	37	18.7	Turkish	32	16.2	Turkish	15	7.6
Russian	2	1.0	Arabic	1	0.5			
			Russian	1	0.5			
Total	198	100	Total	198	100	Total	198	100

As shown in Table 3, the language of the primary digital game, which 54% of the participants (f = 107) played most in the last six months, is English. Only 26.3% (f = 52) of the participants stated that the language of the primary game they played most was Turkish and only two students played their primary digital game in Russian (1%). When asked the second most played game, 25.8% (f = 51) of the participants stated that they played English games and 16.2% (f = 32) reported that they played Turkish games. When asked the third game they played most, 12.1% (f = 24) of the participants stated that they played English games, while only 7.6% (f = 15) reported that they played Turkish games. Accordingly, it can be said that the languages of the digital games most commonly played by the participants are English and Turkish, respectively. On the other hand, Russian and Arabic digital games are played very few.

Participants' Daily Average Duration of Playing Digital Games

Within the scope of the research, the students were also asked how long (minutes) they played digital games per day in the last six months. The minimum-maximum values and mean-standard deviation values of the answers are given in Table 4.

Table 4. *Participants' Daily Average Duration of Playing Digital Games in the Last Six Months (Minute)*

Time (Minute/Day)	N	Min.	Max	x̄	S
Duration of 1st Game	161	5	840	132.75	112.81
Duration of 2nd Game	85	10	240	86.57	53.97
Duration of 3rd Game	39	15	180	67.80	42.74

When the duration of playing is examined, it is seen that 161 people who play digital games spend an average of 132.75 minutes (min.-max = 5-840 minutes) in a day for the first game they play most. The average daily time spent on the second game by 86 participants who declared to play a second game is 86.57 minutes (min.-max = 10-240 minutes). For the third game, the maximum time spent by 39 participants was 180 minutes, the minimum time was 15 minutes and the average time was 67.80 minutes.

Participants' Daily Average Duration of Playing Digital Games in English

In order to calculate how long (minutes) the participants played English digital games each day; the average daily duration of the English-only games was taken within the three games that students played the most. For those who did not play or not played in English, this period is considered to be zero. The results of the descriptive analysis of the participants' total daily duration of playing in English are given in Table 5.

Table 5. *Participants' Daily Average Duration of Playing Digital Games in English (Minute)*

N	Min.	Max.	x̄	s
198	0	840	109.10	154.50

As a result of the descriptive analysis, it was found that the daily average playing time in English of 198 participants was 109.10 minutes (min.-max. = 0-840 minutes) a day.

Participants' Level of Digital Game Addiction

Table 6 shows the minimum-maximum values and mean, standard deviation values of the scores obtained from the "Digital Game Addiction" scale.

Table 6. *Descriptive Statistics on Participants ' Digital Game Addiction*

Variable	N	Min.	Max.	x̄	s
Digital Gaming Level	198	7.00	35.00	17.38	6.91

The mean score of the participants on the 7-item digital game addiction scale with the lowest score of 7 and the highest score of 35 was 17.38 (s=6.91). From this point of view, it can be said that the digital game addictions of the participants are medium level.

Investigation of Digital Game Addiction Levels in Terms of Different Variables

The results of the independent sample T test for comparing the digital game addiction levels of male and female students are given in Table 7.

Table 7. *T Test Results Based on Gender Variable of Participants' Digital Game Addiction Levels*

Group	N	X̄	Ss	Sd	t	p
Female	99	15.87	6.67	196	-3.143	.002*
Male	99	18.89	6.85			

* p< .05

According to the results of *t* test, a statistically significant difference was found between male and female students in terms of digital game addiction levels in favor of male students [$t(196) = -3.143$, $p < .05$]. Accordingly, digital game addiction levels of male students ($\bar{X} = 18.89$) were found to be significantly higher than that of female students ($\bar{X} = 15.87$). According to the calculated Cohen d value (d = 0.46), it can be said that the effect size of this difference is medium and meaningful in practice, as well.

One-way ANOVA results are given in Table 8 to determine whether the students' digital game addiction levels differ significantly according to the department variable.

Digital Game Addiction	N	x̄	S	Source of variance	Sum of squares	df	Mean square	F	p
A) Decorative and Craft Arts	44	14.45	5.63	Between groups	769	3	256.33	5.75	.001*
B) Laboratory Assistant and Veterinary Health	42	18.67	7.00	Within groups	8639.59	194	44.53		
C) Restoration & Architecture	63	16.67	7.31	Total	9408.59	197			
D) Tourism Management	49	19.81	6.37						
Total	198	17.38	6.91						

Levene (3; 194)=1.189, p<.05
* p< .05

As a result of One-way ANOVA test, it was observed that the digital game addiction levels of the students studying in different departments differed significantly, F(3; 194)= 6,234; p< .05. The Eta Square effect size value for this difference was calculated as η^2= 0.081. Accordingly, approximately 8% of the variance observed in students' level of digital game addiction is due to the department variable. As a result of post-hoc Bonferroni test conducted to find out the difference between the groups, the level of digital game addiction of Decorative and Craft students (x̄ = 14.45) was significantly lower than both Laboratory Assistant and Veterinary Health students (x̄ = 18.67) and Tourism Management and Hospitality students (x̄ = 19.81).

Participants' Levels of English Listening Skill

The descriptive results of the participants' scores from the “English Listening Skill” test are given in Table 9.

Table 9. *Descriptive Statistics on Participants' English Listening Skill Levels*

Variable	N	Min.	Max.	x̄	s
English Listening Skill	198	.00	20.00	10.97	4.34

The average of the correct answers given to the 20-question test was 10.97 (s = 4.34). Considering that this value corresponds to 54.75% success, students' listening skills in English can be said to be at a moderate level.

Relationship between Participants' Level of Digital Game Addiction, English Listening Skills and Total Duration of Playing

To answer the last research question of the study, it was examined whether there is a significant relationship between the levels of digital game addiction, English listening skills and total duration of playing English digital games by students. The results of Pearson correlation analysis are given in Table 10.

Table 10. The Results of Relationship Analysis between Participants' Level of Digital Game Addiction, English Listening Skills and Total Duration of Playing English Games

Variable		Level of Digital Game Addiction	English Listening Skills	Total Duration of Playing English Games
1) Level of Digital Game Addiction	r	1	,404*	,500*
	p		,000	,000
	n	198	198	198
2) English Listening Skills	r	,404*	1	,495*
	p	,000		,000
	n	198	198	198
3) Total Duration of Playing English Games	r	,500*	,495*	1
	p	,000	,000	
	n	198	198	198

*P<.05

As can be seen in Table 10, Pearson correlation analysis showed that there was a moderate significant positive correlation between the level of digital game addiction and English Listening Skill (r=0,404) and the total duration of playing in English (r=0,500). In addition, a moderate significant positive correlation was found between the total duration of playing English games and English Listening Skill (r=0,495). These findings indicate that as the students' duration of playing digital games increases, their digital game addiction levels increase and English listening skills improve. From this point of view, it can be concluded that university students' playing digital games in English is related to the development of English listening skills, despite the risk of addiction.

DISCUSSION & CONCLUSION

In this study, it was aimed to first describe participating university students' behaviors regarding playing digital games and secondly the relations between participants' digital game addiction levels and such variables as gender, major, and English listening skills were investigated within the context of a higher education institution in Eastern Anatolia.

When the games written by the students were analyzed and categorized, it was seen that the genre of the games most played was action games with a rate of 43.5% (n = 86). On the other hand, the distribution of digital games played by the participants in the last six months according to their languages was examined. The participants' English language usage rate for the first game they preferred was 54%; for the second most played game, it was 28.8% and for the third most played game, it was 12.1%. According to these results, the majority of participants were observed to play digital games in the English language.

In order to measure the frequency of playing digital games, participants were asked how long (minutes) they played digital games. When the results were analyzed, the participants' maximum time spent was 840 minutes, the minimum time spent was 5 minutes and the average time spent was 90 minutes. Afterward, it was examined whether the level of digital game addiction differed according to gender variable. According to the results of the analysis, it was observed that the level of digital game addiction

of male students was higher than female students. Ko et al. (2005) stated that playing digital games is more common among men than women, and game addiction is also higher in men than women. Games are generally produced by men and for men. They mostly contain a masculine image and women stay away from games with harshness and aggression. Also, men get higher scores in games and they desire to continue playing (Griffiths and Davies, 2005). These can be seen as the reasons that push men to play more than women. Besides, it was seen that the levels of digital game addiction of the students studying in different departments differed significantly. It was concluded that the level of digital game addiction of Tourism Management and Hospitality students was significantly higher than the other departments. Since the students in this department are more exposed to a foreign language due to their courses, they are not only limited to games in their own language but also have the opportunity to play games in a foreign language. As the variety of games played by these students increases, game addiction levels may increase as well.

As a result of the correlation analysis conducted to determine whether there is a significant relationship between the levels of digital game addiction, English listening skills and the total duration of playing digital games of the students; the findings indicate that both students' digital game addiction levels and their English listening skills increase as their duration of playing digital games increases. From this point of view, it can be concluded that university students' playing digital games in English is related to the development of English listening skills.

Supporting this study Aydın (2014) mentions that digital games that people play outside of the classroom in line with their own interests and desires provide positive communication skills in language education. Gömleksiz (2005) mentions that digital games, whose main purpose is to entertain individuals, facilitate the acquisition of foreign languages because they provide a more comfortable and pleasant environment, and make it permanent. When people play these games, their goal is not to learn a foreign language, but to complete the tasks given within the game, skip level, win awards, and have fun. However, as a result of this research, individuals exposed to foreign language while playing digital games can be said to have acquired some skills in foreign language. Especially the individuals who gain vocabulary and listening skills, the foreign language is developing unwittingly thanks to digital games. In this case, there is a significant relationship between English language skills and the digital games played in the English language subject to the research.

In this study, the results provide guidance to researchers and practitioners studying in the field of Education. Based on the findings, some suggestions can be made to foreign language teachers. For example, in order to integrate digital games with the educational environment, in-class and out-of-class activities can be carried out. With these activities used in the classroom, the course content can be enriched by adding different digital games to the foreign language units to attract the attention of the students. In addition, the technologies used in the digital gaming platforms can be compared with the technologies used in the field of education to intensify and develop foreign language education. In this way, digital games can be developed that will attract students' interest and, at the same time, improve their foreign language skills in parallel to the curriculum. On the other hand, although it develops language skills based on the relationship between digital game addiction and English listening skills, studies can be conducted to identify games with inconvenient or potentially dangerous content (violence, betting, etc.) that children and young people should avoid.

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Usage of Benchmarking as Organizational Development Technique in Educational Organizations

Damla AYDUĞ [1]
Anadolu University, Eskişehir, Turkey

Beyza HİMMETOĞLU [2]
Anadolu University, Eskişehir, Turkey

Esmahan AĞAOĞLU [3]
Anadolu University, Eskişehir, Turkey

Abstract

In this study, benchmarking technique, which is one of the organizational development techniques, and its use in education were reviewed. Firstly, history of benchmarking, benchmarking types, stages of the benchmarking process, advantages and disadvantages of benchmarking technique were examined. Then, it was investigated on which subjects benchmarking technique can be used in educational organizations. As a result of literature review, it was found that benchmarking technique can be used in many different areas such as evaluating the organization, determining the vision, improving administrative processes, developing teaching methods, improving financial management, and using technology more effectively and efficiently in educational organizations. Therefore, it has been concluded that benchmarking is a very useful tool that can provide both practical and theoretical benefits to educational organizations.

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INTRODUCTION

[1] Anadolu University, Faculty of Education, Deparment of Educational Sciences, damlaaydug@anadolu.edu.tr
[2] Anadolu University, Faculty of Education, Deparment of Educational Sciences, beyzahimmetoglu@anadolu.edut.tr
[3] Anadolu University, Faculty of Education, Deparment of Educational Sciences, esagaogl@anadolu.edu.tr

In management literature, benchmarking is defined as the process of searching the best practices and adapting them to organizations. Benchmarking, which is considered a managerial tool, is generally the adaptation process of an organization by identifying best practices within itself or in other organizations in order to increase its performance level (Stapenhurst, 2009). It is not a new approach for an organization to compare its own activities and the goals it has achieved as a result of these activities with other competitors or compare them with past values. However, the benchmarking technique offers a much broader perspective on management compared to such older implementations (Genç, 2007).

Benchmarking is a process in which organizations aim to find the best, learn and develop by adapting what they have learned to their own processes (Kalder, 1997). By benchmarking, organizations observe their current situation and make predictions about their future performance levels. In addition, through mutual sharing of experience and knowledge between organizations, organizations are informed in a way similar to human learning processes. For this reason, benchmarking both sets the stage for organizations to compete and creates synergies because it provides inter-functional cooperation (Kalder, 1997). In addition, benchmarking is a continuing search to make things better and more qualified and follow the most successful examples in this business (Koçel, 2014). Therefore, benchmarking is a continuous process. When considering that the pursuit of perfection and continuous healing is a process that will not end, it can be said that benchmarking is not a method that can be applied and abandoned once, but a dynamic process that constantly renews itself (Akat et al., 1999).

Organizational goals are the basis for ensuring organizational development in the benchmarking process. In particular, organizations use the benchmarking process to identify goals and determine how these goals can be achieved. It is impossible for organizations to survive unless they understand the important points of competition and monitor the best organization in the same industry (Karalar and Sınmaz, 1998). According to Fisher (1998), the reasons why organizations use the benchmarking technique is to determine the differences between themselves and competing institutions, to set the highest possible standards in the industry, to learn from the best in their classes, to create synergy from new ideas obtained and to ensure focusing on performance.

In terms of many ways such as defining goals or increasing effectiveness, educational organizations are among the organizations that benchmarking technique can be appropriate to use. Owing to the fact that educational organizations are responsible for educating individuals who will shape the future of societies, it is crucial to fulfill the organizational goals for them. Hence, organizational evaluation technique which they use, has the same vitality on development of society. For this reason, many techniques such as strategic planning, accreditation, 360-degree performance evaluation, Total Quality Management have been used for the development of educational organizations. In this sense, it is believed that one of the techniques that educational organizations could benefit from to provide competitive advantage and achieve the best is the benchmarking technique.

Purpose of the study

This study examines the usability of benchmarking, as an organization development technique in educational organizations. For this purpose, firstly history of benchmarking, types of benchmarking, stages of the benchmarking process, advantages and disadvantages of the benchmarking process was reviewed, and then the subjects which the benchmarking technique can be used in educational organizations was examined.

THEORETICAL FRAMEWORK

The concept of "Benchmarking" comes from benchmark. A benchmark is a triangulation sign that surveyors on land make on a rock, wall, or building, and those who make measurements on land then use this sign as a reference point to make other measurements. In 1970, the benchmark concept moved away from its technical meaning and began to be used in the field of management (Uzun & Yelkikalan, 1997). For organizations, benchmarking means more than the comparison of an organization itself with a better organization. It can be said that the concept of comparison and benchmarking should not be confused, because benchmarking not only includes comparing but also adapting good practices to the organization. In the literature, there exists lots of definitions of benchmarking. According to Camp (1992), benchmarking is the process of continuously measuring products, services, and applications compared to the strongest competitors or industry leaders. Grayson (1992) defines benchmarking as continuous comparison of the organization's own processes with the best organizations from within or outside the sector. Freytag and Hollensen (2001) define benchmarking as a management technique to measure the strategies and performance of organizations by comparing them with the best in their class, both within and outside the organization.

In order to understand what benchmarking technique is, it is necessary to first address other concepts mixed with benchmarking. Benchmarking is sometimes being used in the same meaning with competitive analysis. However, the aim of competitive analysis is to reveal what results the organization has achieved compared to its competitors. However, in benchmarking, it is essential to provide detailed information about how an organization achieves the best results (Smith, Ritter & Tuggle III, 1994). Table 1 shows the differences between competitive analysis and benchmarking.

Table 1. *The differences between competitive analysis and benchmarking*

Competitive analysis	Benchmarking
Looks at the results.	Looks at processes.
Checks what's going on.	Controls how things are done.
Makes comparisons within the sector.	Makes comparisons with different sectors.
Conducts research without sharing.	Conducts research with mutual gains principle.
Always competitive.	It may not be competitive.
It is maintained in secrecy.	Sharing is essential.
Works separately.	Works with the understanding of partnership.
It is independent.	Cooperation is based on mutual agreement.
It is used to control competition.	It is used to achieve development goals.
The aim is to corporate knowledge.	The aim is to process information.
Focuses on organization's needs.	Focuses on customers' needs.

Reference: Smith, G. A., Ritter, D., Tuggle III, W.P. (1994). Benchmarking: The fundamental questions. *Marketing Manegement,* 2(3), p.47.

While competition analysis focuses on finished products or outputs, benchmarking focuses on processes (Karalar & Sınmaz, 1998). Benchmarking is not a competitive analysis, nor just a copying technique (Ertürk, 2009). In copying, a certain application is taken in the same way without any learning or examination of its suitability for the organization (Küçük, 2012). However, benchmarking emphasis on learning and adaptation of the application. Different from copying, benchmarking is an inspiration for organizations to achieve new goals and make new inventions (Çatı et al., 2007; Ertürk, 2009). Benchmarking should also not be perceived as industrial espionage, a tourist trip to other organizations, a

competitive analysis, or a marketing research (Kalder, 1997). Furthermore, benchmarking should not only be considered as a measurement study. The presence of numerical data in the benchmarking application does not indicate that benchmarking consists only of comparing numbers or measuring the indicators of the benchmarking partner (Küçük, 2012). Benchmarking is not a simple and inexpensive management tool that can be realized in a short time (Kalder, 1997).

As a result, benchmarking is an approach beyond these expressions and concepts and is a technique aimed at improving quality and providing a competitive advantage. For this reason, it is considered an extremely useful continuous improvement tool (Genç, 2007) and a management technique used to improve organizational performance (Şimşek, 2007). Benchmarking is an examination of best practices that will lead to superior performance and can be applied to all levels and processes of the organization. Benchmarking improves organizational performance by improving the whole system or some parts of it (Akat et al., 1999). In short, benchmarking is characterized as a guide, program determinant, and standard protector for organizations to find the answer to where they are now, where they expect to be, and how they will get there (Şimşek, 2007).

History of benchmarking

The first applications of benchmarking worldwide were carried out in Japan (Demirdöğen & Küçük, 2003). In Japanese, the word *dantotsu* is used instead of benchmarking. The word “Dantotsu" means striving to be the best of the best. This word reflects that benchmarking is a positive and proactive process that requires a planned change of organizational practices to achieve better performance (Camp, 1992). The first systematic study of benchmarking was conducted by Xerox in America in 1979 (Genç, 2007). While the company was the market leader in the copying machine market, it began to lose market share due to increased competition and feel the pressure of its competitors (Elmuti & Kathawala, 1997). For this reason, the company decided to start a study that would compare production fees in America with foreign and domestic competitors. This study showed that competitors sold their products at the same price as Xerox's production cost. Xerox has started the benchmarking process to identify this large performance gap between its competitors and determine how to reduce and eliminate this gap. Although benchmarking results show that Xerox is significantly behind its competitors, the company has achieved great success with this study (Küçük, 2012). Then, Xerox adopted benchmarking as a company-wide application, not just on production operations. Xerox today uses benchmarking as a key element of its total quality works. In addition, the company has expanded its benchmarking works to include analysis of good practices in any industry (Camp, 1992).

After Xerox, many successful national and international companies such as LL. Bean, Alcoa, Motorola, AT&T, Florida Power & Light, General Electric, Toyota (Longbottom, 2000), Beko Elektronik, Eczacıbaşı (Bedük, 2002) have used benchmarking technique in their quality development processes. In 1991, International Benchmarking Clearinghouse (IBC) was established within American Productivity and Quality Center (APQC) in Houston, Texas to support, facilitate and improve benchmarking techniques worldwide due to the rapid expansion of the benchmarking method and the increase in the number of applications. Today, quality awards in Europe and America require organizations to apply the benchmarking technique (Grayson, 1992). For example, Malcolm Baldrige Quality Award and European Quality Award, which are internationally recognized and respected quality awards, use benchmarking as an evaluation criterion (Bedük, 2002). For this reason, organizations often apply to the benchmarking method as part of quality and performance improvement tools in their Quality Management Systems. Therefore, the benchmarking technique has become a new approach used in defining organization goals and is becoming increasingly common (Şimşek, 2007).

Types of benchmarking

Benchmarking studies can be performed for all activities, products, services, functions and business processes in an organization (Düren, 2002). Because benchmarking can be applied in many different dimensions in organizations, there are many types of benchmarking in the literature. Some examples of benchmarking classifications were shown in Table 2.

Table 2. *Some examples of benchmarking classifications*

Author	Benchmarking classification
Camp (1993)	Internal benchmarking
	Competitive benchmarking
	Functional benchmarking
Yasin and Zimmerer (1995)	Internal benchmarking
	Competitive benchmarking
	Functional/generic benchmarking
Elmuti and Kathawala (1997)	Internal benchmarking
	Competitive benchmarking
	Functional/Industry benchmarking
	Process/generic benchmarking

As can be seen in Table 2, there is no consensus between benchmarking classifications among researchers. However, it is possible to examine benchmarking types according to two basic elements. These elements are what the focus is on benchmarking practice and who the benchmarking partner is (Özer, 1999). Thus, benchmarking types can be examined under two main groups according to the point of focus and the selected partner (Pekdemir, 2000).

The first one of the benchmarking classifications is related to what the organization's goal is to make benchmarking. Organizations may benchmark a product/service, a process in which a product or service has produced, or strategies beyond the product and process (Özgür, 2011). In other words, this classification uses focus of the benchmarking study as criteria and reveals 3 different types of benchmarking. These are product-oriented benchmarking, process-oriented benchmarking and strategic benchmarking (Akat et al., 1999; Çatı et al., 2007; Özer, 1999; Özgür, 2011).

- *Product-oriented Benchmarking:* Products produced by other organizations are the focus of product-oriented benchmarking, the oldest and most commonly used type of benchmarking. The organization examines products by breaking them into pieces (Bolat et al., 2008). The first benchmarking study conducted by Xerox in the United States can be shown as an example of product-oriented benchmarking. In order to get the desired benefit from product-oriented benchmarking, products to be benchmarked must have similar characteristics. In the application of this type of benchmarking, the organization can benefit from many ways, such as purchasing product, using or observing the service, collecting data from outside, or cooperating with other organization (Bolat et al., 2008).
- *Process-oriented Benchmarking*: It is also named as functional or generic benchmarking in the literature (Bedük, 2002). It focuses on the best business processes (Elmuti and Kathawala, 1997). The goal of process-oriented benchmarking is to determine how an organization known for its excellence has reached this point in the process of benchmarking to adapt the successful aspects of this process to the organization and to improve the performance of the selected process.

(Akat et al., 1999). This type of benchmarking can be done with a direct competitor, or with an organization in a completely different sector, having similar processes. It is a great advantage of process-oriented benchmarking that it is easy to find an organization to cooperate with in case of organizations are not in same competition sector (Yatkın, 2003). Process-oriented benchmarking is considered a very effective method, but it is quite difficult to implement because it requires the conceptualization of all processes in the organization and a thorough understanding of procedures (Freytag & Hollensen, 2001).

- *Strategic Benchmarking*: It simply examines how organizations compete (Eryılmaz, 2009). In strategic benchmarking, it is essential to benchmark different organizational strategies to identify key elements of a successful strategy. The goal of strategic benchmarking is to identify strategies behind successful organizations. This kind of work is very important for organizations to make basic decisions that are guiding, especially in their medium-and long-term activities (Shetty, 1993). In strategic benchmarking, one-to-one comparisons are made between the organization's own strategy and exemplary competitor's strategy. Strategic benchmarking studies address specific problems such as defining goals and objectives in the strategic plan, selecting key business processes for development, and defining areas needed to be developed technologically. The essence of strategic benchmarking is to combine the organization's planning process with the strategic benchmarking process. This combination supports development of main goals by top management and guides selection of appropriate sub-goals for middle management (Uzun & Yelkikalan, 1997). In addition, through strategic benchmarking, different organizational strategies are examined and the strengths and weaknesses of intra-organizational strategies are tried to be identified (Özalp, 2001). Japanese companies are the leading organizations that implement strategic benchmarking. These companies use strategic benchmarking in their long-term plans to gain and maintain a competitive advantage in accordance with their management understanding (Çatı et al., 2007).

Benchmarking is also divided into 3 groups according to who the partner is. These are internal benchmarking, competitive benchmarking and non-industry benchmarking (Bedük, 2002; Çatı et al., 2007; Özer, 1999).

- *Internal Benchmarking (Intra-organizational Benchmarking):* It is the benchmarking of internal actions and processes of an organization (Yasin & Zimmerer, 1995). Since it is a type of benchmarking within the organization itself, it is considered the most basic and simplest benchmarking type. The basic assumption of internal benchmarking is that many organizations have similar functions within their departments. Benchmarking common points of departments like metal, machinery, electricity, electronics etc. in a vocational high school or benchmarking between classes in same grades can be shown as examples of internal benchmarking (Kocabaş, 2004). The main purpose of internal benchmarking is to establish organizational performance standards (Freytag & Hollensen, 2001). According to Yasin and Zimmerer (1995), internal benchmarking is a typical starting point of all benchmarking process because organizations should know their business processes, services or products before starting the benchmarking process with other organizations. So, the organization can determine the best practices within its own organization and transfer them to other parts of the organization. Internal benchmarking allows information share within the organization (Elmuti & Kathawala, 1997) and stimulates intra-organization competition (Yatkın, 2003). Also, in internal benchmarking, unlike other types of benchmarking, the leak of information outside the organization is prevented. However, internal benchmarking is often applied in multinational companies and holdings because it is not always possible to find predefined and well-functioning processes that will be benchmarked in small organizations (Ertürk, 2009). If organizations that practice internal

benchmarking do not use internal benchmarking as a basis for external benchmarking, this causes the organization to maintain only an introverted perspective (Freytag & Hollensen, 2001). Therefore, organizations should evaluate these advantages and disadvantages of internal benchmarking before applying it. Briefly, internal benchmarking is only one, maybe the first step to achieve perfection (Saraç, 2005).

- *Competitive Benchmarking:* It is an external action involving the examination of a direct competitor (Yasin & Zimmerer, 1995). Competitive benchmarking means to benchmark products, services and processes of competing organizations in the same sector (Freytag & Hollensen, 2001). In this benchmarking type, best practices are determined by making comparisons with organizations competing in the same sector and they are tried to be adapted to the organization. Therefore, comparability is essential element for competitive benchmarking (Saraç, 2005). Many applications of competitors, such as resource management, internal audit, human resource management, wage and premium systems, purchasing, etc. can be the subject of competitive benchmarking. Moreover, competitive benchmarking can be done simultaneously with multiple organizations (Yatkın, 2003). By competitive benchmarking, organizations get the opportunity to see practices which are different from their own practices (Saraç, 2005). It also gives organizations a long-term perspective. To take expected advantages from competitive benchmarking, being successful of the competing organization in the sector must be paid attention (Çatı et al., 2007). Another point to paying attention about competitive benchmarking must be performed after internal benchmarking was applied. According to benchmarking experts, most organizations fail in their competitive benchmarking efforts because they engage in external actions without fully understanding their own internal work processes. However, internal state of the organization must be documented and analyzed before benchmarked with external data (Yasin & Zimmerer, 1995). The most important problem in competitive benchmarking is the difficulty to obtain information from competing organization due to the concern that it will provide a competitive advantage. The most easily accessible information about competitors are the ones that are publicly available. Another method of obtaining information is to take opinions of competitors' customers, but this method is also considerably costly (Freytag & Hollensen, 2001). For this reason, it is important for the organization, using competitive benchmarking technique, to make the necessary agreements with the organization chosen for benchmarking to avoid from knowledge sharing problems. In this agreement, it should be stated particularly what information will be requested from competitor organization (Çatı et al., 2007).
- *Non-industry Benchmarking:* It is the benchmarking of similar operations, functions and processes of an organization with organizations that are not competing with it (Ertürk, 2009). In this type benchmarking, it is essential that an organization focuses on the best examples in all sectors without limited to its own sector. So, it is evaluated as the most advanced type of benchmarking (Bedük, 2002). An organization with similar technological or marketing characteristics is usually chosen as a benchmarking partner. Similar with competitive benchmarking, non-industry benchmarking focuses on specific functions, too (Elmuti & Kathawala, 1997). Services, productions and business processes can be focus of non-industry benchmarking practices. Benchmarking of teaching methods used in the Education Department of any organization and teaching methods in a school can be shown as examples of non-industry benchmarking (Turhan, 2002). One of the important advantages of non-industry benchmarking is that the number of organizations which can be selected as benchmarking partners increases (Bedük, 2002). In addition, in this type of

benchmarking, since the organization does not directly face a competing organization, benchmarking partners are more willing to share information and collaborate. However, organizations, chosen often as benchmarking partners for non-industry benchmarking applications, can evaluate the cost and time spent on such benchmarking as a disadvantage (Elmuti & Kathawala, 1997).

Benchmarking types can also be classified as intra-sector and cross-sector according to selected benchmarking partner. According to this classification, internal benchmarking and competitive benchmarking are intra-sector benchmarkings, and non-industry benchmarking is cross-sector benchmarking. Yasin and Zimmerer (1995) state that regardless of benchmarking type, the benchmarking process consist of similar phases. Therefore, organizations should carefully evaluate what they will benchmark and how they will implement this process in accordance with their own needs. This assessment is one of the most effective methods for initiating benchmarking practices (Elmuti & Kathawala, 1997).

Stages of benchmarking process

Benchmarking technique is an extroverted and systematic process that allows the organization to identify, analyze and use the best practices and then measure them. Furthermore, the basis of this technique is research and understanding (Akat et al., 1999; Şimşek, 2007). Benchmarking is a comprehensive practice that requires some stages to be completed to determine the best practices of other organizations and adapt them to the organization (Özalp, 2001). However, in the literature, the stages of benchmarking process are classified and named differently by authors and institutions. Some examples of stages of the benchmarking process in literature were presented in Table 3.

Table 3. *Some examples of stages of the benchmarking process in literature*

Author/Institution	Stages of Benchmarking Process
Camp (1992)	1. Planning
	2. Analysis
	3. Integration
	4. Action
	5. Maturity
Yasin and	1. Think
Zimmerer (1995)	2. Act
	3. Evaluate
	4. Plan
	5. Look ahead
Kalder (1997)	1. Preparation
	2. Data collection and analysis
	3. Application
	4. Review and development

Table 3 (Continued). *Some examples of stages of the benchmarking process in literature*

Author/Institution	Stages of Benchmarking Process
Xerox (as cited in Özer, 1999)	1. Determining of benchmarking subject 2. Determining of benchmarking partner 3. Determining of information collection methods and collecting information 4. Determining the current competitive deficiency 5. Determining future performance 6. Analyzing findings 7. Forming functional objectives 8. Implementing action plans 9. Monitoring progress of action plans 10. Reapplying benchmarking

In Table 3, it is seen that researchers and practitioners focus on different benchmarking stages in benchmarking process, but these stages basically involve the same processes (Çatı et al., 2007). In this context, it is possible to summarize the benchmarking process as 4 stages. These are planning, analysis, integration and action (Ağaç, 2001; Düren, 2002).

Planning stage

Planning stage includes determining the activity to be benchmarked, determining the organization to be benchmarked, determining data collection methods and collecting data (Camp, 1992). Determining the activity to be benchmarked is important in terms of effective usage of resources and effect of results on goals, success and continuous improvement of the organization (Kalder, 1997). Each activity in organizations offers a number of outputs such as products, services, or methods. For this reason, all organizational activities can be determined as benchmarking subjects in benchmarking process aimed at improving organizational performance (Camp, 1992). However, it is recommended to select activities that are important in providing a competitive advantage to the organization (Shetty, 1993). At the planning stage, firstly critical business processes are determined in the organization. Then, success factors affecting these business processes are identified. After these processes and factors are identified, they are measured using an existing or newly developed measurement tool in accordance with the purpose. The reason why standardized measurements are made is to ensure effectiveness of benchmarks which will be made to determine processes that the organization needs to develop. As a result of comparing measurement results, processes that need to be worked on for development of the organization are determined (Fong et al, 1998).

The second step is to identify the best performing organizations for benchmarking. The main problem in benchmarking studies is to investigate best organizational practices and choose a benchmarking partner having these practices. But a common mistake, named as “Halo effect” is made in choosing a benchmarking partner. This mistake results from the assumption that a famous organization is successful in all areas and excellent in all aspects without exception (Fitz-enz, 1992). However, best practice on the subject to be benchmarked can be found in any organization. For this reason, according to benchmarking subject, organizations should make a list of all possible benchmarking partners, including direct competitors and organizations that are considered best in their sector. This method is especially useful for organizations that do not have a direct competitor, such as public organizations. Then, members of benchmarking team should collect information from all sources about possible benchmarking partners

(Fong et al, 1998). After benchmarking partner has been identified, the organization should contact the partner and ask partner whether wants to participate in the study. The organization should clearly state to the partner why it was chosen as a benchmarking partner, goal of the study, expected achievements, needed time and information sharing rules. The next step is to determine data collection methods and then to collect data. Purpose of data collection is to find answers to questions such as why practice of benchmarking partner is better, what can be learned from it, and how these learnings can be adapted. The most common data collection methods are study visit, correspondence/survey and telephone call (Kalder, 1997). Each of these methods has its own advantages and disadvantages. By considering pros and cons of these methods, organizations should determine appropriate method of data collection for themselves. Then, necessary data is collected from the benchmarking partner with this method.

Analysis stage

At the analysis stage, studies are carried out to identify the performance gap between the organization and leading organizations or important competing organizations and to determine performance goals to be achieved (Camp, 1992). The basis of analysis depends on complete understanding of both organization's own processes and benchmarking partner's processes. Data analysis should focus on processes and applications rather than just results. At the analysis stage, firstly, differences between measurements are determined by comparing data obtained from the benchmarking partner and organization's own data. Thus, performance gap between organization and benchmarking partner is defined (Shetty, 1993). The performance gap can be defined as negative, positive, or equal. The negative performance gap indicates that observed performance or practices of benchmarking partner are better than the organization itself. In this case, organization should focus on causes that make the difference, so it can select and improve the most important of them. Equal performance gap means that there is no obvious difference between organization and benchmarking partner in the chosen subject. In this case, instead of ending benchmarking, it is recommended that continuous observations should be made so that competitors can continue to constantly improve. The positive performance gap indicates that organization has superior performance or practices than its benchmarking partner (Düren, 2002). In this case, goal of the organization should be identifying ways to maintain superiority (Shetty, 1993). Next step after determining the performance gap is to define future performance goals based on this result. Defining future performance goals refers to defining the situation that the organization wants to achieve. As well as accurate analysis of the performance gap in the benchmarking process, realistic determination of future performance goals is important for effectiveness of the studies to be carried out (Düren, 2002).

Integration stage

Integration stage includes activities like explaining benchmarking results, ensuring agreement between members of the organization and establishing functional goals. Participation of employees and support of top management are necessary for benchmarking practice. Benchmarking practice can be successful if the support of employees and top management is provided and they adopt benchmarking results. Therefore, employees must be informed about results obtained from planning and analysis stages of benchmarking and the desired goals to be achieved (Küçük, 2012). After informing, employees should be given enough time to evaluate benchmarking results and agree on the desired goals (Shetty, 1993). A consensus should be reached on benchmarking results in line with suggestions and criticisms of employees. Thus, it is possible to increase commitment of employees to the benchmarking process (Fong et al., 1998). The next step in integration phase is to convert performance goals into functional goals. Functional goals can be defined for the whole organization or a unit of it. It is proposed to define functional objectives in a hierarchical order from top management to base (Düren, 2002).

Action stage

Action stage includes activities such as preparing action plans to achieve desired goals in benchmarking subject, implementing them, monitoring their progress and evaluating success (Camp, 1992). Organizations should prepare specific action plans such as improving product design, quality control, or packaging to achieve their goals. Action plans should also cover who the team to implement the plan consists of, what areas to focus on, which activities to be organized and what support activities are needed. In addition, issues such as required resources, legal responsibility and timeline for implementation process should also be specified in action plans. If the relationship between action plans, goals and mission of the organization is explicit and there is no mismatch between them, action plans will be implemented more effectively. To solve possible problems that may arise in this process, progress must be monitored (Fong et al., 1998). Thus, if performance level is not sufficient to achieve desired goals, a number of recovery actions can be applied. Feedbacks obtained from monitoring also help to set new performance goals (Shetty, 1993).

Shortly, since benchmarking is a cyclical and dynamic process, it is essential to constantly review application results, spread positive results all over the organization and initiate new benchmarking activities for continuous improvement (Düren, 2002). In this context, benchmarking is an endless process aimed at continuous development (Ertürk, 2009). The last point to be reached in the benchmarking technique is spread of benchmarking to all areas of the organization and its institutionalization within the organization. For this reason, the organization must keep up with the constant change in its sector by constantly benchmarking and updating the organization's practices (Camp, 1992).

Advantages and disadvantages of the benchmarking process

Benchmarking is a managerial tool which makes possible getting knowledge about the methods, processes and practices used by other organizations, defining higher level of objectives according to this knowledge and developing new ideas and methods to achieve these objectives to get better results. This tool generally serves such objectives of organizations as providing competitive advantage, increasing customer satisfaction, developing new ideas, defining goals, improving organizational performance and making strategic planning (Akat et al., 1999). Benchmarking, as an evaluation method, makes comparing performance levels possible, provides new information as input to the organization continuously and shows how to achieve perfect performance by defining reasons which are keys to success of leading organizations (Yatkın, 2003). In this regard, usage of benchmarking technique helps organizations to evaluate their resources more rationally and function more successfully (Çatı et al., 2007). Hence, benchmarking has lots of advantages for the organization which uses this technique depending on areas being used.

Organizations could get both financial and non-financial advantages via a successful implementation of benchmarking. Financial advantages of benchmarking are generally about cost and time. Reasons of this situation are adaptation of the best processes and implementations of benchmarking partners to the organization and disposal of challenges which planning, testing and implementing firstly bring (Genç, 2007). On the other hand, non-financial advantages of benchmarking are as following (Pekdemir, 2000):

- Defining and evaluating crucial processes,
- Making competition analysis and market search,
- Finding the best organizations both in sector and out of sector,
- Wishing to have best practices,
- Developing learning culture and being a learning organization,

- Developing short-term and long-term plans,
- Preparing strategic plans,
- Creating new ideas by getting out of organization's usual practices,
- Finding the opportunity of comparing products, outcomes and processes with the organizations which have the best practices or with the competitors,
- Providing satisfaction for customers,
- Being in the search of the best continuously.

In addition to these advantages, benchmarking has such other practical advantages as defining customer needs and efficient goals, developing proper productivity criteria, achieving the best by creating competition and to make technology-transfer easy (Genç, 2007). Besides the organizations using benchmarking, this technique has some advantages for benchmarking partners, too. These are as following:

- ✓ Assessing the organization in different ways,
- ✓ Realizing the aspects which need to be improved,
- ✓ Learning the implementations of other organizations,
- ✓ Learning the benchmarking process and using it in future (Pekdemir, 2000).

As seen, benchmarking is a process which provides mutual advantages for the sides who take part in benchmarking process. But to take these advantages, it is important to consider some basic principles during the benchmarking process. These basic principles are mutuality, similarity, measurement and accuracy (Yatkın, 2003).

- Mutuality: Participants should take advantage from each other. Only one side should not be gaining.
- Similarity: Processes being examined should have similarities and comparable features for the success of benchmarking technique.
- Measurement: Benchmarking is a measurement technique. Main purpose of this technique is to learn how to achieve high performance on examined fields. So, measurements should be systematic and objective.
- Accuracy: Data being used should be objective and reliable. Using predictive and subjective evaluations should be avoided.

In brief, first of all adopting these basic principles is a necessity to achieve desired results from benchmarking process. Besides adopting these basic principles, obeying some rules increases the success chance of benchmarking technique, too. Some of these rules are approaching benchmarking technique as a team work, implementing it under the leadership of top management, knowledge sharing among members, diffusion of learning culture around the organization and considering the interests of benchmarking partner (Bolat et al., 2008; Efil, 2010). However, failure of benchmarking can be based upon some other reasons rather than not obeying these rules. Some of these reasons are not having adequate knowledge, skills and coordination of benchmarking team to operate effectively, focusing on results rather than process, not planning the process appropriately, not generating an efficient learning structure (Karalar & Sınmaz, 1998; Özalp, 2001). Additionally, some other reasons as resource deficiencies, starting implementation before truly understanding benchmarking process and taking necessary trainings, not ensuring the integrity of management and organization, choosing wrong partner, ignoring alternatives, trust-related concerns and time constrains can cause the failure of benchmarking process (Genç, 2007). So, it is really important to learn about the basic principles and rules of benchmarking technique before implementation and to take attention to these principles and rules during implementation.

It is obvious that benchmarking technique which means examining organizations and adapting their most effective practices have lots of advantages for organizations. On the other hand, this technique also has some limitations. Some of these limitations are ignoring what customers truly want, not giving any information about the employees' situation during the implementation, bringing high travel expenses, necessitating an efficient communication structure and giving so much information to competitors (Küçük, 2012). However, when the advantages and disadvantages of benchmarking technique are compared, it is clear that advantages for organizations are more. So, it can be said that implementing benchmarking technique by choosing a benchmarking data gathering type which is appropriate for the goals and resources of the organization will be useful for organizations to develop and achieve better results.

Benchmarking in educational organizations

Camp (1992), who has leaded development of benchmarking technique in the field of management science defines the main aim of this technique as to increase success change of the organization by providing competitive advantages to the organization. In this sense, benchmarking aimed at improvements in manufacturing sector when it first came out. However, success of benchmarking in manufacturing sector has raised the idea of using this technique in other sectors (Kocabaş, 2004). Today, it is used in several sectors such as education, health, security and service. A study conducted in England shows the usage levels of benchmarking technique in different sectors. Table 4 presents the usage prevalence of benchmarking technique in different sectors according to the mentioned study.

Table 4. *Prevalence of benchmarking technique in different sectors (Holloway, Francis, Hinton, Mayle, 1998)*

Sector	Total number	Number claiming to be benchmarking
Government	55	32 (58%)
Education	37	23 (62%)
Health	52	36 (69%)
Manufacturing and construction	269	135 (50%)
Financial services	57	19 (33%)
Service and retailing	189	68 (36%)
Utilities	18	14 (78%)
Others	49	19 (39%)

As seen in Table 4, education sector is ranked as the second among of organizations using benchmarking in England. Reason of this situation is that the only aim of benchmarking is not getting competitive advantage. Yet, an apparent competition doesn't exist among educational organizations which are within the structure of a centralized education system. However, since benchmarking is a tool to keep up with change and to achieve better performance (Kocabaş, 2004), it could be a useful tool for educational organizations, too. In this regard, it can be said that usage of benchmarking is a necessity for educational organizations. Kocabaş (2004) explains this necessity with the reasons presented below:

- Results being achieved/not achieved,
- Complaints from students, parents and school environment,
- Acceptability level of implementations in educational organizations,
- Changes in performance measurements,
- Changes in task priorities,

- Changes in mission, vision and aims of educational organizations,
- Expansion of services,
- Changes in citizens' perspectives about the government,
- Changes in qualifications demanded from education workers.

There are many reasons which make usage of benchmarking in educational organizations a necessity. So, as any other organization, educational organizations need benchmarking, too (Kocabaş, 2004). Benchmarking in educational organizations can be defined as a process of searching the best practices in other educational organizations or in different sectors and adapting these practices. It can be said that using benchmarking as a tool for development by learning from each other or learning from other organizations is quite useful to improve quality for educational organizations. Besides, it can be used as an effective tool at schools to adopt quality management procedures and to keep up with the changes which quality management necessitates (Turhan, 2002).

Benchmarking tehcnique in education is a tool which has the capacity of meeting a wide range of needs from evaluation of educational organizations to defining vision (Turhan, 2002). In this regard, it is possible to use benchmarking tehcnique at schools as serving cross-purposes. Schools can use this tehcnique to adopt changes needed for school improvement and to achieve specifis strtaegic goals faster. Benchmarking can be utilised in education to improve managerial processes and develop teaching methods. Besides, schools can benefit from benchmarking technique while evalutaing resource usage (McCathern, 1999). According to Turhan (2002), benchmarking in education can be used as a tool for problem-solving, transforming schools to learning organizations, creating and maintaining competition, making measurements and facilitating change. Additionally, it can be implemented to get knowledge about how to use technology more effectively and to define technology needs of schools (Thornton, 1998). In Turkey, in a qualitative study conducted at a private primary school campus in Eskişehir, the usage areas of benchmarking at primary schools are defined as implementing the educational program of Ministry of Education in classes, making weekend courses, introducing school to the environment, conducting public relations, communicating with students and parents (Keskin, 2017). Shortly, when the usage areas of benchmarking tehcnique in education are considered, it can be said that this technique have both practical and theoretical benefits for educational organizations and so it is really useful for these organizations. The literature also states that using benchmarking in education will provide lost of advantages to schools. These can be summarized as following (Turhan, 2002):

- ✓ Defining society's demands,
- ✓ Defining effective goals for schools,
- ✓ Increasing productivity of schools,
- ✓ Creating competition at schools,
- ✓ Learning and adapting best practices which will increase quality in education.

Epper (1999), who states that benchmarking has a powerful potential to enable schools learn from each other and from other organizations, explains advantages of benchmarking for educational organizations based on benchmarking practices at educational organizations. These are as following (Epper, 1999):

- ✓ Benchmarking not only provides data, but also provides an action plan.
- ✓ It differentiates famous organizations from innovative organizations.
- ✓ It encourages developing different perspectives.
- ✓ It enables new learnings.
- ✓ It increases knowledge about the technique and improves internal processes of the organization.
- ✓ It creates collaboration chance by helping to develop communication networks.

When the educational levels are considered, it can be seen that benchmarking is general related to higher education. Such reasons like increased competition and internationalization pressures on higher education institutions and benchmarking reports published for higher education institutions in OECD countries are among the reasons causing this situation. Besides, factors such as working with concrete data and using scientific methods systematically of higher education employees increase usability of benchmarking technique for higher education institutions when compared to educational levels (Alstete, 1995). Despite of readiness of higher education institutions' employees and possible advantages of benchmarking technique, it can be said that there are not adequate benchmarking implementations at higher institutions (Levy & Ronco, 2012).

DISCUSSION & CONCLUSION

This study makes a literature review about benchmarking and its use in education. As a result, it is revealed that benchmarking, which dates back to 1970s, is a technique used for organizational improvement that can be used in several services such as education, health, security and service etc. According to Elmuti and Kathawala (1997), organizations use benchmarking since it increases productivity and learning, provides growth potential and is a tool of strategy, continuous improvement, performance evaluation and performance improvement. In short, the main aims of organization while using benchmarking are making the necessity changes in the organization and taking necessity precautions to increase competitive advantage (Koçel, 2014). Therefore, it is aimed to achieve the best performance or build a learning and continually improving structure by creating benchmarking process with competitor organizations (Bedük, 2002). Since improving organizational performance and surviving for a long time depend on following the competitor organizations and environment of the organization, it is important for educational organizations to use benchmarking technique systematically like other organizations. Because benchmarking can be used to develop a learning culture, shorten the improvement period, organization goals and budget, solving problem, meeting the necessities of job excellence models and identifying the weaknesses of competitor organizations (Stapenhurst, 2009).

Based on the advantages of benchmarking, it is possible to claim that this technique will lead more effective practices for educational organizations which shape the future of societies and so will contribute to increase quality of outputs of these organizations. However, when literature is examined, it is determined that usage of benchmarking at educational organizations is not so widespread (Thornton, 1998). Studies conducted at educational organizations indicate that benchmarking technique is generally used at higher education institutions (Alstete, 1995; Levy & Ronco, 2012; Thornton, 1998). Reasons of benchmarking usage at higher education lastly are emergence of competition, increase in accountability demands and accumulation of knowledge. Thereby, using benchmarking has become crucial to survive and compete for higher education institutions (Alstete, 1995). According to results of related studies employees of organizations using benchmarking state that it helps organization to overcome the resistance to change, provides a framework for external evaluation and develops new communication networks among schools to share valuable information and experiences (AASCB, 1994, p.16-17 as cited in McCathern, 1999).

Despite of all the advantages of benchmarking technique, it has not taken expected attention from higher education institutions since each institution assumes itself unique, defining and measuring the outputs of educational organizations are difficult, stakeholders' approach to change with suspicion and so do not encourage benchmarking, implementing benchmarking necessitates an expensive and demanding process (Levy & Ronco, 2012). Besides not getting attention from higher educational institutions, some features of benchmarking makes it difficult to be implemented at these institutions. Because benchmarking process necessitates examining themselves deeply, defining weaknesses of the schools

and searching examples from other organizations to improve these weaknesses of school members (Epper, 1999). On the other hand, despite of the challenges implementing benchmarking at educational organizations, when the advantages considered, it could be accepted as a useful technique and should be used to improve at all educational levels.

Lastly, rapid changes encountered at all aspects of life affect educational organizations, as any other organization. So, demands of society from educational organizations get different in time. Educational organizations should keep up with environmental developments, meet the demands, search and find the needed knowledge and practices to go beyond the organization walls. In other words, educational organizations need to become learning organizations. Benchmarking technique is accepted as one of the tools which transforms organizations to learning organizations (Görmüş, 1999). In brief, benchmarking is a managerial tool which can be used while transforming educational organizations to learning organizations. It is possible to keep up with change, learn from each other and so improve performance for educational organizations by using benchmarking technique.

At the end of the study, it can be suggested to conduct empirical studies to test mentioned advantages of benchmarking at educational organizations. Similarly, it can be suggested to quality assurance or benchmarking institutions to prepare prescriptions to guide benchmarking implementations at educational organizations. So, it can be possible for both implementers and researchers to constitute a reference framework for applicability of benchmarking technique at educational organizations. Besides, using benchmarking technique for educational organizations at the same level is important to adopt benchmarking technique and embed it in organizational culture to increase quality of education by considering the advantages and disadvantages of the technique.

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*Elementary Teacher Candidates' Opinions about Science and Scientific Research**

Zehra KAYA [1]
Uşak University, Faculty of Education, Uşak, Turkey

İrfan EMRE [2]
Firat University, Faculty of Education, Elazığ, Turkey

Abstract

The concept of nature of science, which deals with the structure of science and scientific research methods, has a very important place in science education. However, teachers, teacher candidates, and students have various scientific myths. In this study, elementary teacher candidates' views of nature of science were examined. This non-experimental quantitative study was designed by using a survey method with participation of 119 (63 female and 56 male) elementary teacher candidates. Student Understanding of Science and Scientific Inquiry (SUSSI) was used to determine elementary teacher candidates' views of nature of science. The survey consists of 24 items with six factors. For data analysis, descriptive and inferential statistics were performed. Results show that the teacher candidates had mostly transitional/mixed or less informed views related to the objectivity of scientists, variation in their observations, scientific laws as proven theories, social and cultural effects on science, and creativity and imagination. On the other hand, they had scientifically sufficient knowledge regarding that there is not a single scientific way in the formation of scientific knowledge and that experiments are not the only way to produce scientific knowledge. In addition, no significant gender difference was observed in terms of teacher candidates' opinions related to nature of science.

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[1] Uşak University, Faculty of Education, Department of Basic Education, zehra.kaya@usak.edu.tr
[2] Fırat University, Faculty of Education, Department of Basic Education, iemre@firat.edu.tr

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INTRODUCTION

The main purpose of science education is to teach science concepts, the nature of science, and how to make science relevant, which results in individuals to be raised as science-literate (MEB, 2005; Uluçınar Sağır & Kılıç, 2013). With the effective use of scientific processes in learning environments, students attempt to make sense of the world through research starting from the first years in school and they experience scientific process directly (MEB; 2018). In this respect, one of the most important criteria for raising science literate individuals is to know the nature and functions of science (Lederman, 1992; Bayır, Çakıcı & Ertaş Atalay, 2016). McComas, Clough and Almazroa (2002) define the nature of science as a comprehensive field that includes what science is, the way scientists research, and their perspective towards research. In another definition, it is considered as the expression of values and beliefs in the structure of scientific knowledge, which takes into account the sociological and epistemological aspects of science (Lederman, 1992; Özden & Cavlazoğlu, 2015). Realization of the exact information related to the nature of science also provides a basis for the accurate understanding of science (Han & Bilican, 2018).

The nature of science as a concept is seen as the common intersection of four different fields including philosophy, history, psychology, and sociology, and it deals with what science is, how scientists act, and how societies react to science (McComas, Clough & Almazroa, 2002; Karaman & Apaydın, 2014). There exist properties of nature of science including the fact that scientific knowledge has changeable properties, it is subjective, scientific knowledge depends on social and cultural elements, it is a product of imagination and creativity, and scientific theory and laws form different types of scientific knowledge and they have different roles in science (Altındağ, Tunç Şahin & Saka, 2012; Karaman & Apaydın, 2014). In science education, it is observed that teachers and students have insufficient knowledge about nature of science, especially in subjects such as theory, law, and scientific knowledge (Tatar, Karakuyu & Tuysuz, 2011). Indeed, one of the biggest obstacles to the sound understanding of nature of science is non-scientific information expressed as scientific myths (Eyceyurt Türk & Tüzün, 2017). Statements such as theories are transformed into law, there is only one universal scientific method, the real way of reaching information is the experiment, hypotheses are carried out by competent people, science and scientific method provide definite proof, scientific models represent reality, and science and technology are the same things are considered as scientific myths (Peşman, Arı & Baykara, 2017; Eyceyurt Türk & Tuzun, 2017).

Bağcı Kılıç (2003) examined TIMMS-1999 results and concluded that countries ranked in the first five among other countries were also successful in terms of overall TIMMS-1999 scores. This result is critical to understand the nature of science. When the literature is examined, it is seen that the studies were generally carried out with teachers, teacher candidates or students at various levels in the field of science (Aslan, Yalçın & Taşar, 2009; Bayır, Çakıcı & Ertaş Atalay, 2016; Seyis Uğurlu, 2019). Also, some of the studies in the literature were related to teaching the nature of science (Çokadar & Demirtel, 2012; Önen, 2013; Han & Bilican, 2018) or existing textbooks, curriculums or undergraduate programs related to the nature of science (Abd-El-Khalick, Waters & Le, 2008; Erduran & Dagher, 2014; Özden & Cavlazoğlu, 2015). Specifically, there exist fewer studies on elementary teachers or elementary teacher candidates in the literature (Tatar, Karakuyu & Tuysuz, 2011; Sarac & Capellaro, 2015).

Purpose of the study

The aim of this study is to determine elementary pre-service teachers' opinions about the nature of science. In this context, the following research question was addressed.

1. What are the elementary teacher candidates' views of the nature of science?

METHOD

This non-experimental quantitative study was designed in accordance with survey design (Johnson 2001; Johnson & Onwuegbuzie, 2004). Survey design is a research approach based on collecting data in a certain period of time, aiming to describe a situation in the past or present as it exists and to compare the relationship between the variables (Karasar, 2000).

Participants

The participants of this study was conducted on junior and senior students of Department of Elementary Education, Faculty of Education, with 119 samples (63 female and 56 male).

Data Collection Tool

In order to determine elementary teacher candidates' opinions of the nature of science, Student Understanding of Science and Scientific Inquiry (SUSSI) survey developed by Liang, Chen, Chen, Kaya, Adams, Macklin, and Ebenezer (2008). The survey was translated and adopted into Turkish by Kaya and has 24 items with six factors: observations and inferences, nature of scientific theories, theories against scientific laws, social and cultural effects on science, creativity and imagination in scientific research, and scientific research. The five-point Likert type questionnaire has a reliability coefficient value of .72. In addition to the questionnaire, a form with five questions was used to identify demographic information of the participants.

Data Analysis

Descriptive statistics, mean value and standard deviation, were used to identify the teacher candidates' views of nature of science. The following guide was used to interpret the mean values of each item in the SUSSI: Naive (1-1.80), Poor (1.81-2.60), Transitional or Mixed (2.61-3.40), Less Informed (3.41-4.20), Informed (4.21-5.00). An independent samples t-test was conducted to determine whether there is a difference between teacher candidates' opinions of nature of science in terms of gender.

FINDINGS

Table 1 shows the results about the first aspect of nature of science, observations and inferences. According to the findings, while the participants held transitional or mixed views for the item B and C, they generally had less informed views on the item A and D.

Table 1. Results related to the aspect of observations and inferences

1. Observations and Inferences		Mean	SD
A.	Scientists may have different observations about the same event because their prior knowledge may affect their observations.	4.08	0.96
B.	Scientists should have the same observations about the same event since they are objective people.	3.08	1.36
C.	Scientists should have the same observations about the same event since observations reflect the facts.	3.11	1.22
D.	Scientists may have different interpretations about the same event.	3.97	0.96

Table 2 provides average scores for the second aspect of nature of science the nature of scientific theories. The participants generally had less informed views on the item A and C, and held informed view on the item B. However, for the item D they had transitional or mixed view.

Table 2. Results related to the aspect of nature of scientific theories

2.	Nature of scientific theories	Mean	SD
A.	Scientific theories are subject to constant adjustments and testing.	4.07	0.81
B.	Scientific theories may be completely changed by new theories in the light of new evidence.	4.31	0.69
C.	Scientific theories may change since scientists always reinterpret existing observations.	4.06	0.92
D.	Scientific theories developed based on accurate experiments do not change.	3.34	1.18

For the aspect of theories against scientific laws, the results are provided in Table 3. According to the findings, while the participants had transitional/mixed or partial view for the item B, they held less informed views on the item A and D. On the other hand, they had naïve views on the item C.

Table 3. Results related to the aspect of theories against scientific laws

3.	Theories against scientific laws	Mean	SD
A.	Scientific theories exist in the natural world (they are hidden in nature) and are uncovered as a result of scientific research.	4.20	0.77
B.	Unlike theories, scientific laws are not open to change.	3.05	1.19
C.	Scientific laws are proven theories.	1.79	0.64
D.	Scientific theories explain scientific laws.	3.45	1.04

The results related to the aspect of social and cultural effects on science are provided in Table 4. Overall, the participants had transitional/mixed or partial views for all items under this aspect.

Table 4. Results related to the aspect of social and cultural effects on science

4. Social and cultural effects on science		Mean	SD
A.	Scientific research is not affected by social and cultural values since scientists are trained to conduct original and unbiased studies.	2.83	1.22
B.	Cultural values and expectations determine which science will be conducted and accepted.	3.04	1.17
C.	Cultural values and expectations determine how science is made and accepted.	2.91	1.22
D.	All cultures carry out scientific research in the same way since science is universal and independent of society and culture.	3.01	1.38

Table 5 provides results related to the aspect of creativity and imagination in scientific research. The participants held less informed views on the items A, B, and C. On the other hand, they had transitional/mixed views on the item D.

Table 5. Results related to the aspect of creativity and imagination in scientific research

5. Creativity and imagination in scientific research	Mean	SD
A. Scientists employ their creativity and imagination when they collect data.	3.55	1.10
B. Scientists employ their creativity and imagination when they analyze data and interpret findings.	3.45	1.01
C. Scientists do not employ their creativity and imagination since creativity and imagination contradict with logical reasoning.	3.70	1.13
D. Scientists do not employ their creativity and imagination since they prevent being objective.	3.39	1.34

The results related to the aspect of scientific research are provided in Table 6. According to the results, while the participants had informed view on the item A and less informed view on the item D. On the other hand, for the item B and C, they held transitional or partial views.

Table 6. Results related to the aspect of scientific research

6. Scientific research	Mean	SD
A. Scientists use a variety of methods to produce successful results.	4.49	0.66
B. Scientists follow the same scientific method step by step.	2.70	1.23
C. When scientists use the scientific method correctly, their results are accurate and precise.	2.82	1.08
D. Experiments are not the only way to develop scientific knowledge.	3.93	1.00

Overall, out of 24 items in the SUSSI, the participants had transitional/mixed views on 11 items and less informed views on 10 items. In addition, they had informed views on 2 items and naïve views on only the following item: "Scientific laws are proven theories."

In order to identify any differences in the participants' opinions about the nature of science in terms of gender, an independent samples t test was performed. The test results are provided in Table 7. According to the findings, no significant difference was observed in terms of gender.

Table 7. Independent samples t test results related to gender differences

Factors	Gender	N	X	SS	t(117)	p	η2
1. Observations and inferences	Male	56	13.85	3.64	.997	.321	0.0008
	Female	63	14.47	3.06			
2. Nature of scientific theories	Male	56	15.37	2.61	1.481	.141	0.0001
	Female	63	16.03	2.16			
3. Theories against scientific laws	Male	56	10.16	1.93	.103	.918	0.007
	Female	63	10.12	1.60			
4. Social and cultural effects on science	Male	56	12.05	3.73	.812	.419	0.001
	Female	63	11.53	3.08			
5. Creativity and imagination in scientific research	Male	56	14.48	3.51	1.243	.217	0.0004
	Female	63	13.76	2.69			
6. Scientific research	Male	56	13.71	2.55	1.039	.302	0.0007
	Female	63	14.12	1.61			

DISCUSSION & CONCLUSION

In this study, elementary teacher candidates' opinions about the nature of science were investigated. According to the results, it was found that teacher candidates had partial understandings in terms of observations and inferences. In contrast, Yenice, Özden and Balcı (2015) found that 83.4% of their teacher candidate participants had sufficient knowledge in terms of scientists' observations. In this study, also, teacher candidates had transitional or mixed views about the item "Scientific theories developed based on accurate experiments do not change" and the items related to the relation between scientific laws and scientific theories. In their study related to the nature of science, Tatar, Karakuyu and Tüysüz (2011) found that some elementary teacher candidates described scientific theory, scientific law, and hypothesis as hierarchical structure and law as unchangeable. In another study, majority of elementary teacher candidates was found to have insufficient knowledge about the relationships among scientific theory, scientific law, and hypothesis (Yenice, Özden & Balcı, 2015). Similar results were found in the other studies (Lederman, Abd-El-Khalick, Bell & Schwartz, 2002; Abd-El-Khalick & Akerson, 2004; Saraç & Capellaro, 2015; Aydemir, Kazanç & Karakaya Cirit, 2016). Their results reveal that teachers and teacher

candidates have traditional perspective about the nature of science (McComas, 2000; Yenice, Özden & Balcı, 2015). In addition, Yenice, Özden and Balcı (2015) revealed that 34.9% of the elementary teacher candidates who participated in their study believed that social and cultural values have an effect on science.

The teacher candidates held less informed views on the first three items in the creativity and imagination in scientific research factor. However, for the item "scientists do not use their creativity and imagination since they prevent objectivity", they had transitional or mixed view. This finding may be interpreted that the participants may have stereotypes that scientists are objective. In another study, researchers stated that 76.19% of science teachers and 57.89% of pre-service teachers expressed partially at the scientific level regarding the imagination and creativity in science (Aydemir, Kazanç & Karakaya Cirit, 2016).

In the last factor of the questionnaire, the participants had less informed and informed views for the items "Scientists use a variety of methods to produce successful results" and "Experiments are not the only way to develop scientific knowledge.", respectively. The results showed that teacher candidates' opinions for both items were compatible with the characteristics of the nature of science and their knowledge was scientifically sufficient. On the other hand, in another study, Ecevit, Yalaki and Kingir (2018) stated that only 33% of elementary school teacher candidates believed that scientific knowledge is experimental. Aydemir, Kazanç and Karakaya Cirit (2016) also found that 66.67% of science teachers and 78.95% of teacher candidates had a scientific perception that scientific knowledge is experimental based. In addition, the remaining items "Scientists follow the same scientific method step by step" and "When scientists use the scientific method correctly, their results are accurate and precise", revealed participants' transitional or mixed view. It may be interpreted that teacher candidates are a little bit further away from stereotyped scientific myths about the nature of scientific research. In their study, Palmquist and Finle (1997) stated that teacher candidates were traditional in scientific theory, the role of the scientist, and the scientific method. When the independent samples t test results related to the views of nature of science were examined in terms of gender variable, there was no significant difference between the groups in terms of sub-dimensions. Similarly, the results of the different studies conducted by Kubilay (2014) and Gül and Erkol (2016) with prospective teachers showed that there was no difference between the views on the nature of science in terms of gender variable.

The inadequacies in teachers' knowledge about the nature of science negatively affect students' learning related to the nature of science (Lederman, 1992). More specifically, science related courses in teacher education programs and the way in which the nature of science is included in the curriculum and textbooks are among the reasons for the insufficient views of teachers and students on the nature of science (Abd-El-Khalick, Waters & Le, 2008). In this respect, it is important for teachers to have science-related competencies in order for their students to learn the nature of science (İnce & Özgelen, 2017). On the other hand, teacher candidates' insufficient knowledge in the nature of science and misconceptions may be formed in their early education and those misconceptions have effects on shaping their opinions about the nature of science (Ecevit, Yalaki & Kingir, 2018). More specifically, teachers and teacher candidates' knowledge about the nature of science has critical importance in teaching science-related concepts (Dorsah, 2020). While Murcia and Schibeci (1999) stated that elementary teacher candidates' understanding of the nature of science contributes greatly to science education, Lederman and colleagues (2001) stated that teacher candidates who do not internalize the importance of the nature of science do not teach in accordance with the nature of science. Students also reported that they did not have scientific myths, and these myths were taught by their teachers (McComas, 1996). In his study with elementary teacher candidates, Kıran (2019) attributed that sophomores in undergraduate education has the lowest level of knowledge about the nature of science and the reason for this is that there are no courses related to the nature of science at this grade level.

Along with the results of this study, the scientific insufficiencies such as transitional or mixed views in some of the sub-dimensions of the questionnaire may be because teacher candidates do not learn enough about the nature of science in their undergraduate education, which may be considered as an insufficiency in undergraduate programs. Also, this situation continues throughout their professional lives. In this respect, increasing the intensity of the nature of science in theoretical and practical courses in elementary education undergraduate programs at every grade level and providing connections to the nature of science in other courses are recommended to increase teacher candidates' understandings about the nature of science.

Suggestions

1. Future studies should consider using different data collection tools with different research models in order to determine teacher candidates' knowledge about the nature of science.
2. Future studies should be conducted with teachers as well as students in order to find out insufficiencies in their knowledge about nature of science and possible reasons for these insufficiencies.
3. Future studies should consider evaluation of elementary teacher education programs in terms of the nature of science.
4. For practice, elementary teacher candidates must participate in activities to advance their knowledge about the nature of science in order to overcome their shortcomings in science.

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Readers Typology: Can Poor Readers Advance to Good Readers?

Sevim Kutlutürk[1]
Inonu University School of Foreign Languages, Malatya, Turkey

Abstract

This study aims to determine the reader's typology among the preparatory class students regarding their use of reading strategies while they read texts written in English, and to find out whether cognitive and metacognitive strategy training can make students advance from poor readers to good readers. The participants of the study were 27 evening education students with the age range between 18 and 22 at the preparatory school of Inonu University School of Foreign Languages in Malatya, Turkey. The students were instructed cognitive and metacognitive reading strategies with the purpose of the study for eight weeks. The study has provided an exciting opportunity to advance both the researcher's and the participants' knowledge of cognitive and metacognitive reading strategies. Throughout the study, the researcher, as the instructor of the participating group, and the students have improved their understanding of reading comprehension of an English written text. Qualitative method was used to collect data. Qualitative data collection instruments involving Think-Aloud Protocol (TAP), learner and researcher's diaries were descriptively analyzed. Findings revealed that the participants raised their awareness on strategy use after involvement in cognitive and metacognitive strategy training. The findings from TAPs also indicated that poor readers could advance to good readers by taking part in the lessons so that weaker students were able to indicate the problems they had encountered, and stronger ones could reveal what made them successful.

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[1] İnönü University, School of Foreign Languages, sevim.kutluturk@inonu.edu.tr

INTRODUCTION

Reading is an integrative skill in learning English along with writing, speaking and listening. As a result of changes in understanding of language, however, there has been an increasing concern over teaching cognitive and metacognitive reading strategies. Learners need to be taught how to read and develop their reading abilities through some reading materials using the appropriate strategies. Keene & Zimmermann (2013) state "the beauty of the comprehension strategies is that they give teachers a way to make explicit and visible the thinking that goes on in the minds of good readers" (p. 605). What makes a good reader different from a poor reader is the fact that good readers are the fluent readers, and they can spontaneously use a number of strategies to understand what they read. Good readers and poor readers use different reading strategies when they comprehend a text (Spring, 1985). A good reader makes use of various strategies to comprehend a text during reading comprehension process (Brown et al. 1982). He or she receives new information through the text and integrates it with his or her own previous knowledge.

A good reader does not mean highly skilled at his or her reading speed. A high-speed reader can only be a good one if he or she is able to utilize the key words to understand a sentence without having completely read it in a quick manner. McLaughlin (1969) claimed to have a high-speed reader in his study group, but did not claim that the reader was more skilful than the others in comprehending the text (as cited in Carver, 1985). Carver also mentioned that the speed-reading group in his study did not summarize the text better than the slower ones (Carver, 1985). Cubukcu (2008) points out that the poor readers are unable to use the right strategies where required, and are unable to monitor their reading comprehension process. In a study which set out to determine good and poor readers' awareness, Garner (1980) found "good readers noticed the disruptive effect of the altered material and poor readers did not" (p. 55). Grenfell & Harris (1999) suggest that poor readers should be given the reasons for their comprehension failure because they are deficient in their strategy use. Similarly, Rubin (1975) claims that poor readers are not aware of interchangeable usage of the strategies. On the other hand, McDonough, Shaw & Masuhara (2013) assert, a good reader can identify his or her strategy according to the purpose of the text to be read. If the purpose of reading is to get an overall idea, there is no need for reading the text in detail. On the contrary, if the instructional goal of the reading activity is to learn vocabulary and structure, it is necessary to read the text in detail.

Review of Related Literature

Language Learners

Rubin (1975) stated that all individuals were capable of easily learning the language used in the community they were born. She also pointed out that some language learners were good at second language learning, but some of them were poor. Rubin suggested identifying the strategies which were followed by those successful learners, and teach them to poor ones. She defined the good learners as successful guessers, inference makers, and clues users. According to Rubin, good language learning depends on three variables: "aptitude, motivation, and opportunity" (1975, p.42). As cited in Ellis (2015), "Carroll saw language aptitude" is determined by the time taken by a student to learn a given task (p. 39). According to Ellis (1985), "aptitude refers to the special ability a learner has for learning a second language" (p.293). Krashen (2000) also claimed that some learners had the special aptitude to understand the target language. Rubin pointed out that the second variable which good language learning depended on was motivation (1975). As teachers, we need to demand the use of the language in the classroom as reading alone does not suffice. Macnamara (1971) acknowledged the deficiency of motivation in the classroom for language learning and added that the streets were better places for language learners. In contrast to Macnamara, Rubin (1975) argues that good language learners are motivated to use the target language, no matter where they are. Likewise, Ellis (2015) holds the view "a learner's motivation is

influenced by other learners; the dynamics of classroom or of a learning group affect the extent to which individual learners are motivated, both overall and when performing specific tasks" (p. 55). The third variable, opportunity, enables the language learners to practice what they have learned. As Rubin noted that good language learners will create opportunities to use the language which they have learnt, where poor learners will merely passively conduct what has been assigned (1975). Grenfell & Harris (1999) pointed out "if we can find out what good language learners do, then maybe we can tell the other learners in order to improve their chances (p. 46). Huang (2006) explains that learners may be in a position to read for various reasons, but they have similar needs that should be fulfilled for them to provide the learning effort, that is reading. As teachers, we should train the language learners to use their competences in order to interpret the text they read. When the students acquire the strategies they are instructed, they will be fluent readers. Fluent readers do not need to make a plan, but can make immediate decisions and interchangeably, whenever necessary, use different strategies.

Language Learning Strategies

Language learning strategies help learners to organize and manage the ways in which they learn and, therefore, reach a proficient level in reading (O'Malley & Chamot, 1990; Oxford, 1990; Cohen, 1995). Macnamara (1971) explained language learning process at different stages;

> … babies pick up their mother tongue with what seems like great ease, and young children in suitable environments pick up a second language with little trouble, whereas adults seem to struggle ineffectively with a new language and impose the phonology and the syntax of their mother tongue on the new language (p.480).

O'Malley & Chamot (1990) set apart the learning strategies into three distinct groups: cognitive strategies, which are more involved with individual learning tasks, and social/affective strategies, which are concerned with the influence of social and affected process on learning, and "metacognitive strategies involve thinking about the learning processes, planning for learning, monitoring of comprehension or production while it is taking place" and they also add, subsequently, there is self-evaluation which takes place after the task has been completed (O'Malley & Chamot, 1990, p. 8). According to Oxford, relevant learning strategies focus on attaining communicative competence amongst learners. She mentions that this can be done in either general or specific ways and done in order to encourage the development of communicative competence. The aim of these strategies is to help learners to participate actively in authentic communication, by using meaningful and contextualized language to create realistic interaction amongst learners (Oxford, 1990). She also reports that cognitive strategies are the mostly applied strategies by the language learners, and a combination of four strategies, namely, practicing, receiving and sending messages, analyzing and reasoning, and creating a structure for input and output. Among them, 'practicing strategies' are the most important ones to make the students foster the formulas and patterns of the language through many repetitions. 'Receiving and sending messages' strategies such as skimming and scanning strategies are used to grasp the main idea quickly, or lift the specific information from a text. 'Analyzing and reasoning strategies' are those that learners use to create a mental bridge between incoming information and the previous knowledge in their mind. The last group of strategies Oxford highlights is creating a structure for input and output strategies which are used for underlining the focused information, taking notes, or summarizing the paragraph to comprehend (Oxford, 1990). Gagne & White (1978) claimed if the images were added during the process of comprehension, the verbal items would be easily stored. According to them, using imagery creates mental links with images to help the learner remember information.

Process of Reading Comprehension

Reading comprehension is a process which simultaneously extracts and constructs the meaning of a text. Comprehension can be divided into three parts as the reader who does the comprehending, the text that is being comprehended, and the activity that is part of the comprehension (Schoenbach, Greenleaf & Murphy, 2012). For a reader to be successful at comprehension, he or she must possess cognitive capacities, the necessary motivation, and sufficient knowledge, for example, of the overall topic of the text. Texts can be difficult or easy, depending largely on the relationship between the content of the text and the abilities and knowledge of the reader. Other contributing factors leading to the successful comprehension of a text are the type of activity which is applicable to that text and appropriate and adequate instruction.

Purpose of the study

This study aimed to address the following research questions:

1. Are the students good or poor readers of the text written in English regarding their use of reading strategies?

2. Is it possible to advance poor readers to good readers through involvement in cognitive and metacognitive reading strategy training in English classes?

METHOD

In this study, both cognitive and metacognitive reading strategies were instructed for eight weeks to enhance students' learning experiences using qualitative method instruments such as diaries and think-aloud protocol (TAP).

The Context of the Study and the Participants

This study was conducted in the context of teaching English as a foreign language to preparatory class students at Inonu University, in 2015-2016 academic year. The participants of the study were 27 evening education students with the age between 18 and 22. Among 27 students, 14 of them were male and 13 of them were female. All the students' mother tongue was Turkish. In order to determine their language proficiency level, the participants were given a placement test at the beginning of the educational year. Therefore, all the students placed in the group were at the same level, beginner.

Research Design

Qualitative method was used in the study. The case was studied using the natural process in a natural setting. The qualitative method relies on the interpretations of data as gathered from observations, interviews and diaries. As taking the advantage of qualitative research method, the order of data collection phases could be changed for the benefit of the study. As Merriam (2002) claims data collecting and data analyzing processes concurrently take place in qualitative research. In other words, a researcher does not need to wait for data collection to be completed for data analysis.

Instruments

Researcher and Learners Diaries

As Bailey (1991) noted both teachers and learners could make use of diaries to keep their experiences, perceptions, and observations. Data gathered from diaries provides deep understanding to the researcher about the learning process. Keeping a diary on a weekly basis enabled awareness to the researcher about the learning process in the classroom, and did not allow overlooking any worthy information that might be crucial for the study (Bailey, 1991).

Learners' diaries are forms of self-report that make students record their reflections on learning process (Oxford, 1990). The participants were asked to monitor and evaluate their process of strategy use while keeping a diary. They were also asked to record whether they were capable of transitioning from one strategy to other when there was a need, furthermore, which strategy they mostly used, and which one better worked.

Think-Aloud Protocol

In this present study, think-aloud protocol (TAP) was conducted to gather verbal data from the participants while they were on task in the fourth week. As O'Malley & Chamot (1990) suggested, a think-aloud protocol was conducted in participants' native language based on the fact that learners can better express their feelings and considerations in their native language. TAP was carried out in the classroom setting to make the students involved in the activity and explore their strategy use, perceptions and feelings about the task on hand. The reading text used for TAP was about Galileo Galilei-the father of modern science, and it was obtained from New Headway Elementary Workbook (Fourth Edition) by Liz and John Soars (2011). Through think-aloud protocol, having reflected their cognitive processes, participants said whatever came to their mind as responding to the questions that were related to the task on hand. Think-aloud strategy enriched the verbal data collected in the natural setting for the study.

Data Analysis

Qualitative data from think-aloud protocol, researcher, and learners' diaries were descriptively analyzed. The perceptions and feelings of the researcher about readers typology and their improvement on strategy use were recorded in the researcher's diary at the end of each week's instruction. The think-aloud protocol data and learners' diaries data were coded, and necessary ones were analyzed. The data from learners' diaries were translated into English at the analysis stage by the researcher.

FINDINGS

Having analysed the data from the researcher's diary to find out the answer to the first research question, it was realized that there were some poor readers among the participants who were not aware of the reading strategies such as skimming, scanning, making use of visuals, using context clues and activating background knowledge to comprehend a text written in English (Kutluturk, 2016). Here is the impression of Week 1 implementation from researcher's diary:

> "My adult learners claimed they were aware of some reading strategies. They must have been instructed some strategies at preparatory schools for University Entrance Exam (UEE) they took

> to study at universities. However, I realized that some of them were not capable of integrating the strategies they already knew in their native language into English. They were happy when I informed them about the strategy training they were going to be exposed (November 30, 2015)."

As can be understood from the following data, all the participants became aware of the strategies they were instructed. Therefore, the learners became able to use various strategies to comprehend a text in English, and this advanced the poor readers to good ones.

> P5DSN: I liked these strategies. From now on, I will use them for all reading tasks. It was easier, faster, and more enjoyable than the other strategies for me to understand the text. I am sure I will not forget the images I created in my mind, so the related information in the text (March 7, 2016).

> P5SRK: I think visualizing strategy works well for me to get an idea of the text before reading it. Also, I could use my background knowledge about tattoos, and it helped me to understand the text. I will always use this strategy when I read a text in English.

As Gagne & White (1978) asserted creating mental imaginary strategies helps to increase the retention of the information for learners. P5DSN claimed that creating mental imaginary strategies helped her to understand the information in the text. P5SRK showed the use of visuals to activate his schema. Learners activate their schema by utilizing their cultural background knowledge to comprehend a written text (Snow, 2002).

> P5EBR: ... mmm, I will study vocabulary to improve my reading skill, because I have difficulties with unknown words. My goal is to be a good reader. As you know, my department requires me to be a good reader in English. Most of the sources about philosophy are in English, and I would like to be skilled on reading those materials.

The aim of Think-aloud Protocol was to gather verbal data from the participants so as to explore whether the instruction helped achieve the goal of the study or not. Anderson (1991) pointed out, "A verbal report or think aloud protocol is produced when a reader verbalizes his or her thought processes while completing a given task" (as cited in Yaylı, 2010, p.236). From this point of view, in the fourth week of the strategy training program the participants, having reflected their cognitive processes, said whatever came to their mind as responding to the questions that were related to the text on hand.

The text was about Galileo Galilei-the father of modern science by Soars & Soars (2011). First, the participants were asked to read the text silently and answer the comprehension questions on their own, and then, they read loud and verbalized their cognitive processes as responding to the instructor's questions. The process was conducted as a whole class activity. The researcher asked them if the picture at the bottom was a reminder to them about his inventions. They answered that they recognized him from the picture at the right top of the page and remembered his discoveries from the picture at the left bottom of the page. Although they were slightly instructed about using visuals with the skimming strategy until then, most of the participants were successful at the use of the strategy as it was the fourth week of the strategy instruction. The next question the researcher asked was their initial thought about the text given, and good readers explained:

> P4FR: umm… there were some comprehension questions to be answered, and so I firstly read the questions. Then, I read the text.

> P4RD: I remember him from physics classes at secondary school, and thought that the text was about his life and inventions.
>
> P4ZN: mm… I skim and scan the text, and realized from sub-headings that it was about Galileo's life and inventions.

The researcher aimed to implicitly activate the participants' background knowledge, and make them use visuals by choosing such a text. Most of the participants said they firstly skimmed and scanned the text to comprehend, but only P4FR claimed that he read the questions as the first activity. As P4RD, some students used their background knowledge.

The participants were also asked what kind of problems they encountered while reading the text, and how they could cope with those problems. The students had the opportunity to monitor their cognitive processes, and interact with each other using think-aloud strategy. They reported the problems they encountered as in the following:

> P4LP: Luckily, I didn't have problems with grammar. I know Galileo was a scientist from the history, and the tense is in simple past. It is easy, but I had difficulties with unknown words. I couldn't guess the meaning of 'prison'.
>
> P4ER: mm… I had difficulties with unknown words, even the word 'prison', but the film I watched last week, 'Prison Break', made me guess the meaning of the word.

From the verbal data, it was obvious that good students were aware of using various strategies as a result of eight-week strategy training, and the interaction among the students gave them the opportunity to be aware of their strengths and weaknesses. Good readers reported the use of some cognitive strategies such as skimming, scanning, making use of visuals, using context clues and activating background knowledge to comprehend the task. Poor readers reported the problems they encountered.

> P4FR: I couldn't guess the meaning of 'blind' before, but as following the strategy my friend used, I remembered from the history of astronomy that Galilei was blind in his last years, so I guessed the meaning.
>
> P4HM: mm… I could answer the question of where Galilei was from by scanning the names of the places.

As the participants were monitoring their cognitive processes, they verbalized that they benefited the words with capital letters, numbers, proper nouns, and the names of the places to answer reading comprehension questions related to the text.

Having analyzed the data from the learners' diaries, the researcher also realized that the participants' goals were to become skilful readers and speakers in English. Since all but one of the participants were compulsory prep school students in English, and they would confront materials in English in their educational life at the university and their professional life in the future, they aimed to be good second language speakers and readers using the reading strategies. They were also aware of their weaknesses, and determined the objectives to study vocabulary and grammar.

DISCUSSION

In order to discuss the answer to the first research question to determine the reader's typology at their current level, it was recorded in researcher's diary that although the students were mostly proficient readers of the texts written in their mother tongue, and were able to apply relevant reading strategies to them, they were not necessarily able to apply those strategies to the texts written in English. As Zhang (2018) claims learners' strategy use determines their language performance. Garner & Alexander (1989) claimed "younger and poorer readers, often rely on a single criterion for textual understanding" (p.145). From this point of view, as the students aged between 18 and 22, they were experienced in their perceptions. As Pearson (2008) noted that "today's new knowledge is tomorrow's background knowledge", the young adult learners of the present study were well off with respect to their life experience to make use of their world knowledge (as cited in Harvey & Goudvis, 2013, p. 437). Another possible explanation for this result might be that the participants were from the departments of Social Sciences at university and had taken instruction on some strategies during preparatory courses for the University Entrance Examination (UEE).

Regarding the second research question, data from think-aloud protocol, researcher's diary, and learners' diaries showed that poor readers could advance to good ones after being involved in cognitive and metacognitive reading strategy training. Therefore, think-aloud strategy allowed the students from all proficiency levels to take part in the lessons so that weaker students were able to indicate the problems they had encountered, and stronger ones could reveal what made them successful (Chamot, 1999). Interaction among the participants gave them the opportunity to be aware of their strengths and weaknesses so that poor readers could follow the good readers.

CONCLUSION

As Weinstein & Mayer (1983) explained 'good teaching' is making the students be aware of the way to learn, remember, think and motivate themselves, and according to them, teachers should have the intention to teach the students what to learn and how to learn. Throughout the study, good readers made use of various strategies to comprehend a text during the reading comprehension process. They received new information through the text and integrated it with their own previous knowledge. In Kendeou, Smith & O'Brien terms, successful reading comprehension "requires the continual integration of incoming information into evolving discourse representation in reader's memory" (2012, p.854). This study has revealed that having explicit metacognitive strategy training made the participants apply different types of strategies to various kinds of texts, and as a result of learning to regulate their thinking, they advanced from poor readers to good readers (Kutluturk & Yumru, 2017).

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From Constructivist Educational Technology to Mobile Constructivism: How mobile learning serves constructivism?

Ümit Yakar [1]
Inonu University

Ayfer Sülü [2]
Inonu University

Mehmet Porgalı [3]
Ministry of National Education

Nuran Çalış [4]
Ministry of National Education

Abstract

Constructivist theory of learning suggests that individuals construct meaning through authentic experiences and social interactions. Thanks to the ample learning experiences and opportunities for unlimited interaction anywhere, anytime, mobile technologies have given birth to a concept called mobile learning. However, there seems a need to ground mobile learning on constructivist learning principles, i.e. define a new scope for constructivism: "mobile constructivism." This paper aimed to explore the relationship between constructivism and mobile learning and how they serve each other. To this end articles, which have based mobile learning activities on constructivist learning principles, were reviewed systematically. Results were synthesized and discussed under four major themes: the expansive potential of constructivist educational technology, integrating different kinds of constructivism in mobile learning, social consequences of mobile learning; and elemental principles of "mobile constructivism".

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[1] Ümit Yakar, Inonu University, School of Foreign Languages, Malatya, Turkey, umit.yakar@inonu.edu.tr
[2] Ayfer Sülü, Inonu University, School of Foreign Languages,Malatya, Turkey ayfer.sulu@inonu.edu.tr
[3] Mehmet Porgalı, Ministry of National Education, Malatya, Turkey, mehmetporgali@gmail.com
[4] Nuran Çalış, Ministry of National Education, Kars, Turkey, nurancalis@gmail.com

INTRODUCTION

Constructivism is a theoretical foundation, which has promises for forming the discussion of technology and its application in social studies (Doolittle & Hicks, 2003). Gilakjani, Lai-Mei, & Ismail (2013) suggest that teachers who use a constructivist approach in instructional procedures are in favour of using mobile learning (mLearning) to achieve their goals. Mobile technologies can have a great impact on learning as they are becoming more ubiquitous, embedded, and networked. They provide users with enhanced capabilities for rich social interactions, context awareness and internet connectivity. From the learning perspective, since learners have the biggest responsibility in knowledge construction in mobile learning, it is thought to be closely related to constructivist approach. Phumeechanya and Wannapiroon (2013) also argue that the right learning theory for ubiquitous learning environment is constructivism, thanks to the use of mobile devices in accessing knowledge sources anytime and anywhere.

With the help of mobile technologies, learners receive feedback from teachers and peers almost instantly, anytime and anywhere. In virtual or online environments created with technologies and guided or controlled by teachers, learners can share their works, successes and doubts, which results in motivation, creating and expanding knowledge (Chai & Fan, 2016; Cobcroft et al., 2006; Cochrane & Bateman, 2010; Fahlman, 2013; Thinley et al., 2014). Learners' engagement in these interactive and collaborative tasks, does not only support social construction of knowledge, it also leads students to be more creative, critical and active in learning (Cobcroft et al., 2006). Scaffolding as one of the important elements of constructivist educational theory, can be performed more frequently and easily with constructivist educational technologies (Cochrane & Bateman, 2010; Fahlman, 2013). Although mobile learning has its roots in constructivism and stands for a favourable approach to perform constructive learning, there seems a need in the literature to ground mobile learning on constructivist learning principles, i.e. define a new scope for constructivism: "mobile constructivism." Thus in the present study we aimed to review the literature to explore the relationship between constructivism and mobile learning and how they serve each other.

Theoretical framework

Constructivism

Constructivist theory has its origins in both psychology and philosophy that go back through many years and many philosophers, such as Kant, Dewey, Hegel, and Vico (Doolittle & Camp, 1999). According to Fosnot (1996, as cited in Doolittle & Camp, 1999), constructivism requires active construction of knowledge and meaning from experiences. It refers to how the material is understood by the learners and how the teachers can teach effectively (Mvududu and Thiel-Burgess, 2012).

Before giving a certain definition for constructivism, it is vital to describe what constructivism is not. Constructivism is not a description of teaching or a process of the knowledge being accumulated and stored in human brain (Fosnot & Perry, 1996; Ertmer & Newby, 2013). It is, on the other hand, a non-positivist (Fosnot & Perry, 1996) theory of learning that suggests individuals' learning process happens through creation of meaning from their experience, perceptions, interactions and interpretations within their social and developmental context (Fosnot & Perry, 1996; Greer et al., 1999; Ertmer & Newby, 2013). Another definition by Fosnot & Perry, (1996) claims that constructivism is a post-structuralist psychological theory that constructs learning as an interpretive, recursive, non-linear building process by active learners interacting with their physical and social world. It is a psychological theory of learning that

describes how structures, language, activity, and meaning-making occur. The term constructivism has often been used as an umbrella term for a wide diversity of views (Duffy & Cunningham, 1996, p.2).

Although the main responsibility of learning in constructivist educational theory is on the student this should not be considered as there is no role for the teacher. In fact, the teacher has a central role that is thought to be more central than in most instructional design frameworks (Duffy & Cunningham, 1996, p.4). The role of the teacher can be resembled to a manager or coach, and many other apprentice frameworks (Duffy & Cunningham, 1996, p.5-6). Rather than the teacher, it is the learner who is responsible for defending, proving, justifying, and communicating their opinions to the classroom environment (Fosnot & Perry, 1996). In constructivist theory teachers should employ modelling, think-alouds and guided practice in the classroom to meet the needs of student achievement (Garner, 2008). Constructivist strategies are especially effective in situations that learners have trouble understanding through reflection-in-action. Tasks that require a high level of processing such as problem solving, personal selection and monitoring of cognitive strategies are frequently best learned with constructivist strategies like situated learning, cognitive apprenticeships, social negotiation (Ertmer & Newby, 2013).

Constructivist theory emphasizes that an external reality may not be understood in the same way by different learners. As individual and social experiences play a crucial role in the process of learning, the focus of social studies is perspective rather than the external truth. This variability in learning is described as having three principal divisions, cognitive constructivism, social constructivism and radical constructivism (Steffe & Gale, 1995 & Moshman, 1982, as cited in Doolittle & Hicks, 2003).

Cognitive Constructivism

Cognitive constructivism is a personal perspective based on the work of Swiss developmental psychologist Jean Piaget. Cognitivist theory has two essentials, "ages and stages" component, which foresees what a child can and cannot perceive at different ages, and a “theory of development” which depicts how cognitive abilities are developed in children (Amineh & Asl, 2015). In cognitive approach the focus is on each individual’s cognitive actions. Cognitive approach emphasizes the constructive activity of individuals as they try to make sense of the world, attempt to resolve the conflict or alternatively construct themselves and their world by accommodating to experiences (Duffy & Cunningham, 1996, p.6). Garner (2008) defines cognitive structures as “basic, interconnected psychological systems”. These structures allow people to process information by “associating it with former knowledge and experience, finding patterns and relationships, identifying rules, and generating abstract principles” (Garner, 2008). Unlike Vygotsky, Piaget ignored social and cultural groups in his research and his tasks underestimated the effect of culture (Blake & Pope, 2008, p.61). Psychologists and educators draw their attention from behavioural methods to complex cognitive processes such as thinking, problem solving, language, concept formation and information processing (Snelbecker, 1983, as cited in Ertmer & Newby, 2013).

From the cognitive constructivist perspective, knowledge is the result of correct internalization and (re)construction of external reality. The results of this internalization process are cognitive processes and structures that correspond exactly to the real world processes and structures (Doolittle & Hicks, 2003). The claim that reality can be known by the individual differentiates cognitive constructivism from both social and radical constructivism (Doolittle & Camp, 1999).

Social Constructivism

An increasing number of constructivist views emphasizes on the cultural integration of learning, employing the methods and framework of cultural anthropology to examine how learning and cognition gain meaning in the environment rather than stored in the head of an individual (Duffy & Cunningham,

1996). Unlike von Glasersfeld and Piaget, sociocultural approach has its focus on the socially and culturally situated context of cognition (Duffy & Cunningham, 1996). This social constructivist approach examines the social origins of cognition, for instance, the effect of an individual's appropriation of language as a mediating tool to construct meaning (Duffy & Cunningham, 1996). In the last decade, terms like "cognitive constructivism" and "social constructivism" have become common in the literature and thus plenty of definitions are available in the literature (Fosnot & Perry, 1996, p.17). We cannot understand an individual's cognitive structure without observing it interacting in a context, within a culture. But, neither can we understand culture as an isolated entity affecting the structure, since all knowledge within the culture is only, to use Cobb's terminology, "taken-as-shared" (as cited in Fosnot & Perry, 1996, p.17). Vygotsky's theory of social constructivism suggests that learner construct knowledge through interaction with other people, especially more knowledgeable others. To Vygotsky the socio-cultural environment is critical for cognitive development (Blake & Pope, 2008). Social interaction plays an important role in student learning. It is through social interaction that students learn from each other, as well as adults (Blake & Pope, 2008, p.61). Garner (2008) posits that students generally come to school without these cognitive instruments as they experience limited interaction with the adults in their families, but more passive exposure to media (Garner, 2008).

Social constructivism can be placed somewhere between the predictable and objective reality of the cognitivists and the construction of individual and consistent reality of the radical constructivists. The truth is socially constructed and it results from "co-participation in cultural practices" (Cobb & Yackel, 1996, p. 37). For social constructivism, "truth is not to be found inside the head of an individual person, it is born between people collectively searching for truth, in the process of their dialogic interaction" (Bakhtin, 1984, as cited in Doolittle & Hicks, 2003, p.80).

Radical Constructivism

Radical constructivism is a way of thinking about knowledge and the act of knowing. The term "radical" was first used for the work of Piaget on genetic epistemology. Radical constructivism is a progressive research programme and it has many strengths. It is an approach to the problems of knowledge and knowing. The main assumption of this approach is that knowledge is in the heads of people, and thinking subject has no alternative but to construct what they know on the basis of their own experience (von Glasersfeld, 1995). The great number of criticism to radical constructivism, when first mentioned in a conference, served it to be more popular and allowed it to be internationally accepted. While he was teaching genetic epistemology, Glasersfeld (1995) wanted to distinguish his studies on constructivism from other versions of it and therefore, he called it 'radical' and laid out two basic principles; "knowledge is not passively received but built up by the cognizing subject and the function of cognition is adaptive and serves the organization of the experiential world, not the discovery of ontological reality" (p.18). Because radical constructivism follows a radical rebuilding of the concepts of knowledge, truth, communication, and understanding, it cannot be seen similar to any traditional epistemology. Based on these, radical constructivism has two principles formulated with the help of Piaget's theory of cognitive development: "1) Knowledge is not passively received either through the senses or by way of communication, knowledge is actively built up by the cognizing subject. 2) The function of cognition is adaptive, in the biological sense of the term, tending towards fit or viability, cognition serves the subject's organization of the experiential world, not the discovery of an objective ontological reality" (von Glasersfeld, 1995, p.51).

Mobile Learning (MLearning)

With an increase in the use of mobile devices, a mobile society has emerged (Boticki & So, 2010; Bozkurt, 2015; Chung et. al., 2015; El-Hussein & Cronje, 2010). In 2011, Franklin (2011) states that 85 billion text messages were sent each month and the use of mobile devices for communication purposes had increased %450 percent in two months. As another evidence for massive use of mobile devices, Gheytasi

et al., (2015) noted individuals use their mobile devices more than two hours a day. With this speed of proliferation, it was inevitable for these mobile devices to be used in the field of education and soon they had taken their places in the classrooms. Being used by almost all of the students and teachers, mobile devices had the potential to become effective learning tools.

Mobile devices can be defined as portable, light electronic devices that enable users to communicate, access and share data through internet connection. Laptops, smartphones, tablet computers, e-readers, portable gaming devices, mp3/4 players, PDAs and cameras are examples of frequently used mobile devices (Simonova, 2016). Being used anywhere, anytime, mobile devices are informal, contextual, portable, continuous, effective, interactive and personal (Aburezaq ve Isthaiwa, 2013; Chen et. al., 2012; Franklin, 2011; Geddes, 2004; Hwang & Chang, 2011; Kukulska-Hulme, 2009). These feasibilities of mobile devices not only provide support to the classroom teaching, they also let individuals learn anything outside the classroom (Alzahrani, 2015; Andujar-vaca & Martinez, 2017; Baran, 2014). As these useful devices become popular (Hashemi et. al., 2011; Muhammed, 2014; Şad & Göktaş, 2014), especially among young people now called "digital natives" (Prensky, 2011), the mobility made its way into education and the term mobile learning emerged.

MLearning is the learning experience that takes place anywhere, anytime through mobile technologies (Bozkurt, 2015; Cavus & Ibrahim, 2009; Gheytasi et. al., 2015; Harris 2001; Traxler, 2005; Trifonova, 2003; as cited in: Bozkurt, 2015). As well as supporting classroom learning, mLearning allows students to access information continuously, create knowledge through online interaction with peers and evaluate their own performances thanks to the online community that provides instant feedback (Alzahrani, 2015; Amry, 2014; Andujar-vaca & Martinez, 2017; Baran, 2015; Looi et. al., 2015). mLearning provides (Chen et. al. 2012; Hashemi et. al., 2011):

- access to documents and sources,
- access to questions and self-evaluation test,
- watching classes and tutorials,
- access to live and archived classes,
- access to audio and video sources,
- access to asynchronous content,
- exhibiting students' work,
- access to virtual learning communities.

These capabilities of mLearning create an individual learning setting for students (Geddes, 2004), lead them to learn by exploring, organizing and saving data (Looi et. al., 2010), provide flexibility in time and space (Andujar-vaca & Martinez, 2017) and allow teachers to give feedback rapidly (Baleghizadeh & Oladrostam, 2010). Consequently, the mobility of learning is not only based on mobile devices, it is also based on the mobility of students, the content and the online audience (Hashemi et. al., 2011).

Mobile Seamless Learning

In seamless learning, learners have the "opportunity to collaborate and interact in new ways with their peers and the physical world, as well as the physical world can be augmented with the use of digital technologies" (Otero, Milrad, & Rogers, 2011, p.18). Seamless learning refers to "a new phase in the evolution of technology-enhanced learning, marked by a continuity of the learning experience across

different environments" thanks to "ubiquitous access to mobile, connected, personal, handhelds." (Chan et al., 2006, p. 6).

While the definition of seamless learning by Chan et al. (2006) represented a rather technology-supported approach to the concept, the term seamless learning was first used by Kuh (1996) about a decade earlier. Kuh (1996) was the first person to coin the term seamless learning, who emphasized "what was once believed to be separate, distinct parts (e.g., in-class and out-of-class, academic and non-academic, curricular and co-curricular, or on-campus and off-campus experiences) are now of one piece, bound together so as to appear whole or continuous" (p.136). Kuh (1996) emphasized the integration of the learning experiences in different contexts, but did not mention about the role of technology. He designed six principles for creating seamless learning environments at universities: 1- Generate enthusiasm for institutional renewal 2- Create a common vision of learning 3- Develop a common language 4- Foster collaboration and cross-functional dialogue 4- Examine the influence of student culture on student learning 5- Focus on systemic change (Kuh, 1996). Today it is apparent that all six principles defined by Kuh (1996) to create seamless learning environments are dominated by mobile technologies. For example Wong and Looi (2011) defined Mobile-assisted seamless learning as a combination of WMUTE (Wireless, Mobile, and Ubiquitous Technologies in Education) and seamless learning. As a result of their review of 54 selected papers on seamless learning they defined the following ten features that characterize the seamlessness of a WMUTE design:

"(1) Encompassing formal and informal learning; (2) Encompassing personalized and social learning; (3) Across time; (4) Across locations; (5) Ubiquitous knowledge access (integrating context-aware learning, augmented reality learning, and ubiquitous Internet access); (6) Encompassing physical and digital worlds; (7) Combined use of multiple device types (including "stable" technologies such as desktop computers, interactive whiteboards with mobile devices); (8) Seamless switching between multiple learning tasks (such as data collection, analysis, presentation and communication). (9) Knowledge synthesis (integrating prior and new knowledge, abstract and concrete knowledge, and multi-disciplinary learning); (10) Encompassing multiple pedagogical or learning activity models." (p.9)

Thus, it is important to take these formal and informal or individual or social learning experiences as a whole. These social networking platforms might provide a potential seamless learning space, which Chan et al. (2006) suggest, have the capacity to extend classroom-based formal learning time into informal learning time so as to embrace opportunities for out-of-school learning. In seamless learning, learners have the "opportunity to collaborate and interact in new ways with their peers and the physical world, as well as the physical world can be augmented with the use of digital technologies" (Otero, Milrad, & Rogers, 2011, p.18)

Seamless learning has the key aspects of continuity and fluidity across physical, virtual or blended the settings or spaces (Keppell, 2014). Seamless learning refers to "a new phase in the evolution of technology-enhanced learning, marked by a continuity of the learning experience across different environments" thanks to "ubiquitous access to mobile, connected, personal, handhelds." (Chan et al., 2006, p. 6). In seamless learning, learning happens continuously bridging the formal and informal learning contexts through different technologies (Milrad et al., 2006). Continuity refers to uninterrupted nature of learning regardless of time and space, while fluidity implies transition from formal to inform, from individual to social learning (Keppell, 2014).

Purpose of the study

Recent increase in the use of mobile technologies in different areas including learning and teaching, created a need to base these new tools on existing learning theories such as constructivism. A wide range of researches (Alzahrani, 2015; Amry, 2014; Andujar-vaca & Martinez, 2017; Baran, 2015; Looi et. al., 2015) evidently show how mobile technologies could serve the the basic elements of constructivism such

as meaning creation and social interactions. Furthermore, constructivism finds its place in mobile learning. Therefore, it is seen significant to gather and synthesize the studies that are aiming at both of these important research areas. The purpose of this paper is to explore the relationship between constructivism and mobile learning and how they serve each other. With this elemental purpose we tried to answer the following research questions:

1. What is the expansive potential of Constructivist Educational Technology?

2. Which different types of constructivism can be integrated in mobile learning?

3. What are the social consequences of mobile learning?

4. How can mobile learning expand our notions of teaching and learning from now on? Is the next term mobile constructivism?

METHOD

Reviews of research are also pieces of research, which aim to review the literature to make it "available in a more digestible form" (Gough, Oliver, & Thomas, 2017, p. 2) and to direct researchers to new research areas (Petticrew & Roberts, 2008). In this qualitative study we aimed to review the literature to explore the relationship between constructivism and mobile learning and how they serve each other. As stated above, this paper tries to gather researches and presents them in a synthesis using systematic review method.

It is recommended that a review study should follow certain steps to be systematic. These steps include "identifying and describing the relevant research, critically appraising research reports in a systematic manner, and bringing together the findings into a coherent statement, known as synthesis" (Gough, et al. 2017, p. 5). To this end, we made more than one searches in databases including Teacher Reference Center, ULAKBİM National Databases, ULAKBIM Turkish National Databases, Social Sciences Citation Index, ScienceDirect, Scopus, SAGE Knowledge, Academic Search Complete, Arts & Humanities Citation Index, DergiPark, Directory of Open Access Journals, ERIC, and Scholar using the keywords or descriptors "mobile learning/mLearning", "ubiquitous learning", "constructivism", "social constructivism", "cognitive constructivism", "radical constructivism". The main aim was to have access to scientific research, which base mobile learning activities used in the research on constructivist learning principles as their theoretical background. Researchers scanned through a large amount of results by reading the titles and abstracts and have reached 20 articles, which have studied mobile learning or ubiquitous learning on the basis of constructivism or constructivist learning principles. In systematic reviews, well defined inclusion and exclusion criteria helps researchers address the research questions more to the point (Petticrew & Roberts, 2006). For this study we defined our inclusion criteria as a connection between mobile learning and constructivism, in a way that they serve each other. Mobile learning studies that did not mention constructivism, and yet still had evidence of constructivism such as "collaborating with peers to learn" were also included.

The studies obtained from this searching process were then carefully studied and coded into excel sheets by researchers. Researchers looked for and coded pieces of information on the title, the year, the purpose, which type of constructivism it was based on, how it created the relationship between constructivism and mobile learning, which technological tools it employed, the method, the samples, the variables it focused on, the evidence of constructivism, results, and implications for each of the studies. Researchers then tried to develop connections between these findings and synthesised them into

research reports. As similar points and ideas related to constructivism and mobile learning accumulated, it formulated a basis for each one of our research findings.

Next, researchers have critically appraised the research reports in a systematic manner seeking answers to such questions as "How does the study theoretically associate mobile learning with constructivism?", "How does the study use mobile technologies in terms of constructivist learning principles?", and "What are the implications of the research findings in terms of mobile constructivism?" etc. Finally, we have brought together, i.e. synthesized the findings under four major themes: the expansive potential of Constructivist Educational Technology, integrating different kinds of constructivism in mobile learning, social consequences of mobile learning; and mobile constructivism.

FINDINGS

What is the expansive potential of Constructivist Educational Technology?

Jonassen, Peck & Wilson (1999, p.12) describe technology as "the designs and environments that engage learners". Hannafin and Hill (2002) explain these learning environments as the contexts in which learners work collaboratively to use various tools and learning materials to pursue the learning goals and problem-solving activities. Although the need for the application of technology in the field of social studies is definite, its integration into that field has not been at a desired level so far. Constructivism is a theoretical foundation, which has promises for forming the discussion of technology and its application in social studies (Doolittle & Hicks, 2003). Constructivist educational technologies are able to turn virtual environments into successful learning settings where learners create knowledge, involve in meaning-making interactions, work collaborative and creatively, reflect on their own or peers' performance. To achieve these goals, Cochrane & Bateman (2010) suggest that it is vital to integrate and employ technologies in learning pedagogically, make use of feedback as formative assessment, chose devices and software appropriately and provide pedagogical and technological support. An effective integration of technology into learning environments creates a stage to perform constructivist theories and instructions (Chai & Fan, 2016; Cobcroft et al., 2006; Gilakjani et. al, 2013;Thinley et al., 2014). Constructivist theory suggests creation of knowledge through experiences, which could easily happen in virtual environments with the help of technology. However not every technology or application serves constructivism (Thinley et al., 2014). Therefore, provided that the ideal technologies, websites or applications are pedagogically engaged, constructivist goals will be achieved (Chai & Fan, 2016; Cochrane & Bateman, 2010).

Gilakjani et al. (2013) emphasize how frequently constructivist teachers use technologies to realize their goals. Educators with constructivist instruction aims eventually end up using mobile technologies since they are quite compatible with constructivist goals. The social interaction, continuous guidance that mobile technologies provide are the important elements constructivism need yet cannot obtain enough in classrooms. For this reason, in social studies, technology is resembled to a "sleeping giant" as most teachers do not benefit from the whole potential of it (Doolittle & Hicks, 2003, p. 3). Song and Kong Siu (2017) made a study on the affordances and constraints of a mobile technology called BYOD (Bring Your Own Device) for teaching and learning. They came to the conclusion that more teachers can benefit from the mobile technology by designing learning activities to achieve intended learning outcomes across different settings; it can also empower teachers to make use of the online learning trails on BYOD to assess students learning process, and identify their learning problems to make pedagogical refinement where it is necessary.

The interaction and collaboration that constructivist educational technologies provide have a huge impact on learning. In virtual or online environments created with technologies and guided or controlled by teachers, learners can share their works, successes and doubts, which results in motivation, creating and

expanding knowledge (Chai & Fan, 2016; Cobcroft et al., 2006; Cochrane & Bateman, 2010;Fahlman, 2013; Thinley et al., 2014). Learners' engagement in these interactive and collaborative tasks, does not only support social construction of knowledge, it also leads students to be more creative, critical and active in learning (Cobcroft et al., 2006).

Scaffolding is an important element of constructivist theory. Thus, receiving feedback from teachers and peers almost instantly, anytime and anywhere shows that scaffolding can be performed more frequently and easily (Cochrane & Bateman, 2010; Fahlman, 2013). Phumeechanya and Wannapiroon (2013) state that the right learning theory for ubiquitous learning environment is constructivism, thanks to the use of mobile devices in accessing knowledge sources anytime and anywhere. Authors suggest that an instructional model based on problem-based learning and scaffolding corresponds to different contexts of ubiquitous learning environment. This constructivist model enables learners to learn anything anywhere and anytime through their mobile devices, and enables instructors to control the class, check out the learning results, and evaluate the learners.

How different kinds of constructivism can be integrated in mobile learning?

Constructivist learning approach encourages students to be active constructors of knowledge and requires teachers to give the students opportunities to participate in the learning process. In this sense, mobile technologies provide a unique opportunity for learners as they provide them with both a supporting tool and a realistic context in which learners can construct meaning personally.

It is the diversity of experiences that leads us to divide constructivism into three different types: social, cognitive and radical. This review study revealed that especially the first two of different kinds of constructivisms can be observed in mobile learning settings. For example, some studies (Barry, Murphy & Drew, 2015; Cochrane & Bateman, 2010; Cobcroft, Towers, Smith, & Bruns, 2006; Fahlman, 2013; Gilakjani, Lai-Mei, & Ismail, 2013; Thinley, Geva & Reye, 2014) have revealed clear connections between social constructivism and mobile learning. Thinley, Geva & Reye (2014) have applied social constructivist pedagogical approaches in their teaching by using mobile technologies as primary means of communication in their researches. According to them, it creates a collaborative learning setting where learners construct knowledge by interaction and sharing. Another research (Barry, Murphy & Drew, 2015) suggests that environment has an effect on learning as learners create different meanings in different learning settings, which is in line with social constructivist approach. Thus, to integrate social constructivist approach in learning, they studied the effects of using mobile information and communication technologies (ICTs) in learning. Cobcroft, Towers, Smith, & Bruns (2006), suggest that social constructivism can be applied through mobile technologies as learners construct and share knowledge not only with their classmates, but with peers from all around the world. Another way how social constructivism was integrated in mobile learning is pointed out by Cochrane & Bateman (2010) who benefitted from key aspects of mobile learning such as connectivity, mobility, personal podcasting and vodcasting while teaching. In a research by Fahlman (2013) that examined nurses' use of mobile devices during the informal learning to gain professional development, it was reported that collaborative functions of mobile learning such as e-mailing, interacting with others through online communities were more frequently used than individual learning functions, which shows the role of social constructivism in mobile learning. Nurses also used their mobile devices individually for meaning making and creation of knowledge purposes to gain professional development and competence, which points out cognitive constructivism as well.

Chai & Fan (2016) employed a constructivism-based model (MIC-Mobile Inverted Constructivism) to let students become the leading actor in their learning experience by using mobile interaction technologies.

Learners involved in cognitive operations to create meaning and learn through social media while their teachers observed and provided feedback. Social media stands as an environment where learners live a virtual life through which they create new knowledge. Similarly, Gilakjani, Lai-Mei, & Ismail (2013) suggest that teachers, with the help of mobile technologies, create constructivist learning environments on which learners involve in dynamic knowledge construction processes. Researchers also state that implementation of constructivism and technologies into learning serve each other as technology-supported environments make great knowledge-building tools.

Lan and Tsai (2011) made a study on mobile memo system and found out that mobile technologies encourage and facilitate student interaction and collaboration through discovering, sharing one's thinking, gathering and discussing. Similarly, authentic and meaningful contexts in which students work collaboratively are emphasized in social constructivist approach.

Habel and Stubbs (2014) explored the effect of student response system (SRS) usage on peer-learning, student preparation and engagement through the use of VotApedia, a form of mobile phone voting, in large first-year law lectures, a discipline that has not previously been used for such implementations. The study is based on social constructivist approach as SRSs support the social construction of learning and understanding. They are used to provide the tools for creating authentic learning environments and enhancing the communication. Moreover, in this study, SRSs were used in a discursive context of divergent questioning, which supports the constructivist pedagogies that are essential to the implementation of SRSs. It was found that as the use of SRSs for group discussion promoted peer learning, it led to a measurable improvement in student performance. Mobile phone voting led to increased student engagement. A clear link between attendance and engagement when SRSs are used to supplement an already interactive lecture style was also found. The students who particularly reported the benefits of the SRS were those who had difficulty learning in the traditional lecture format: those who struggled to remain engaged or devote attention to the material being delivered.

Though limited in number, some mLearning research also referred to the principles of cognitive constructivism, usually together with social constructivism. For example, Song and Kong Siu (2017) examined a mobile teaching and learning process called BYOD (Bring Your Own Device) in higher education. They relate this mobile process to cognitive constructivism as BYOD reveals affordances by creating, editing or drafting documents and also to social constructivism as it helps students share their needs and information, communicate collaboratively in anywhere at anytime and work in a collaborative way. Ogunduyile (2013) made a study on the use of mobile technologies in teaching and learning of the English language and came to the conclusion that mLearning can afford the learners the chance of using authentic English. In this sense, cognitive constructivism is integrated into the mobile learning as mLearning makes it possible for learners to construct their own knowledge. Ogunduyile (2013) implied that mLearning is related to social constructivism as well since teaching through mobile learning helped in increasing interaction and engaged learners and it also facilitated a more friendly teacher and students relationship. Phumeechanya and Wannapiroon (2013) benefited from cognitive constructivist view of learning and used mobile devices with internet access and Context-aware Module to enhance problem-solving skills and context awareness. Another study by Hu (2013) intended to show how mobile devices are being used in vocabulary learning activities. The study suggested that with mobile devices, learners have a unique opportunity to construct knowledge and share it with peers by interacting in a naturalistic context and getting access to supporting tools for their learning. With mobile affordance of the immediate data collection, learners can have opportunities to visualize the idiom-and-context association. Knowledge construction is related to cognitive constructivism while sharing and interacting is related to social constructivism.

What are the social consequences of mobile learning?

In the information age we live in, people are faced with a variety of new information and realities to

learn, which require them to develop lifelong learning skills. Learners use the mobile devices very frequently in and out of schools. They come across plenty of information in social media and other websites. They learn new things through instant messages and sharings by people they met on social networks. Thus formal learning activities conducted within schools according to a certain curriculum cannot be enough for learners to develop lifelong learning skills (Şad & Ebner, 2017). With the use of mobile technologies in education, learning can easily move outside of the classroom, and transform into a seamless part of daily life (Naismith et al., 2004).

The use of mobile technologies uncovers a massive potential as it allows students immediate collaborative tasks, interactions and to learn in contextual situations (Barry, et.al., 2015). It also creates opportunities for teachers to observe, assist and guide learning without being limited to the classroom (Geddes, 2004). In a mobile learning setting where learners engage with knowledge with their social identity, learning experience will be more individual, contextual and effective (Güneş, 2016). Another social consequence of mobile learning is its ability to extend the time and space teachers (who were previously limited by the school and the time spent there) used for scaffolding (Aburezaq & Isthaiwa, 2013; Cochrane & Bateman, 2010).

According to a study carried out by Wong et. al. (2010) creating artefacts and making discussions on their products through mobile devices and online sharing platform make students pay more attention to their surroundings and thus they make better associations with their real-life contexts and the target idioms. Another finding is that students perform better in small-group face-to-face discussions compared to asynchronous online discussions and shared artefacts via Web 2.0 (wiki) technology deepened students' understanding of the idioms. For further studies, the researchers suggest that personalized-to-social learning activities could be used in other school subjects.

Lan and Tsai (2011) made a study on mobile-memo system and found out that there is a significant difference in multimedia choices of female and male students. Males prefer taking photos while females prefer voice recording. Students regard mobile memo system as helpful and convenient for mobile learning. The researchers came to the conclusion that handheld devices contribute to the pedagogic theory, encourage students' learning, satisfaction and enthusiasm. Students welcomed critiques of peers, which was not usually observed in a classroom setting (Richards, 2012).

Wang (2014) carried out a study, which aims to improve learning quality by fostering collaboration among students and between students and instructors through interactive mobile assisted social e-learning (iMASE) module in a speech and debate course. The results indicated that the quality of students' learning experiences could be predicted by the quality of feedback students gave and received. This finding is consistent with social constructivism, which suggests that feedback should be given frequently. Learning is a social activity the Web 3.0 has afforded individuals the opportunity to connect and communicate at almost no cost at anywhere and anytime. Results suggest that e-cooperative learning with mobile networking apps promoted a social constructivist learning environment. The participants improved their learning achievement through a high frequency of communication with peers and instructor in an iMASE module. Students' sense of community and connectedness in the learning environments enhanced their learning. The technology-based learning environment played an important role in supporting social skills. In a web social setting, students' abilities can be recognized and their beliefs about their self-worth can be promoted. The Web 3.0 gave individuals the opportunity to connect and communicate at almost no cost at anywhere and anytime and lastly, e-cooperative learning with mobile networking apps promoted a social constructivist learning environment.

How can mobile learning expand our notions of teaching and learning from now on? Is the next term mobile

constructivism?

Constructivism and mLearning are closely related to each other as they both aim to provide students with student centered, context-rich, authentic and constructive learning environments (Jonassen, 1991; Naismith et al., 2004). mLearning requires learners to take the most responsibility for constructing knowledge. With the opportunities for discussion and feedback, and scaffolding knowledge, mLearning facilitates attaining a 'certain knowledge' by the learners and the community (Stefani, Mason & Pegler, 2007). In this sense, Walker and Logan (2008) and Jones and Issroff (2007) mention 'learner engagement' which they explain as the positive effects of mLearning on learning ownership and self-esteem. Mobile learning also allows learners to be active, critical and creative (Cobcroft et al., 2006; Cochrane & Bateman, 2010; Liu & Chen, 2015). In their research Chai & Fan (2016), have found that students are more creative while using mobile technologies in learning as active participants.

In several constructivist frameworks, emphasis is given on formative assessment and authentic tasks. In Richards' study (2012), in which he aims to explore the impact of formative assessment through oral responses captured by mobile phones on 8th grade students' understanding of algebraic inequalities, mobile learning serves as a part of formative assessment and provides authentic tasks. The study is grounded on cognitive and social constructivism. In Richard's study (2012), most students agreed that receiving feedback on computers from teacher and peers in the form of voicemail on mobile phones was helpful in understanding the subject and that the creation of multimedia artefact was a good way of showing their understanding of a topic. Instead of receiving information passively, students became active content producers as they created representations of their understanding using devices. Such an application with several disciplines may inform educators about the ways a mediated dialogue may strengthen meaningful learning and formative assessment for students.

Learning activities powered with mobile technology can be labelled as constructivist since they are student-centred, problem-based, and collaborative. Students are active in acquiring knowledge, solving problems, conducting experiments and in producing common artefacts (Palmárová & Lovászová, 2012). In their study, Palmárová and Lovászová (2012) designed and examined an engaging outdoor activity (inspired by a treasure hunt game i.e. Geocaching) based on student collaboration and active use of mobile technology for an informatics education course. Pupils collaborated constructively and the adventurous and competitive nature of the learning activity resulted in high intrinsic motivation to learn. The study is an example of a well-designed constructivist/ constructionist learning activity and can be easily adapted for using in any other school subject or some after-school context as well.

In Song and Kong Siu's study (2017), 17 higher education teachers from different departments used mobile devices, apps and other BYOD (Bring Your Own Device) websites and apps like moodle, edmodo etc. during teaching and learning process for enabling students to share information, work collaboratively and communicate. The study developed the framework of seven affordances, which are resource access, communication, resource collection, resource submission, construction, resource sharing, and representation, and three main constraints, which are technical, social and personal constraints in BYOD-supported learning environment. These findings could be used for pedagogical practices.

In an experimental study carried out by Ogunduyile (2013), the researcher examined the integration of mobile technologies in English language learning process. A mobile chat app to enable the learners to use the target language outside the classroom, a blog for posting assignments and a group on Facebook for accessing questions and instructions are used in language teaching in this study. The students did the assignments via these mobile and digital media tools. The study concludes that as mLearning is cooperative, collaborative and learner centred, It enhances active involvement of the students in the acquisition of linguistic knowledge. The integration of mLearning in the teaching of English in secondary schools would afford learners the opportunity of having a method that is 21st century compliant and availing the learners the digital age benefits. However, to fully enjoy the benefits offered by this

innovation, the schools must be given some infrastructural face lifts in terms of good network connection and stable electricity.

Phumeechanya and Wannapiroon (2013) used mobile devices with internet access and Context-aware Module to develop a ubiquitous scaffold learning environment using problem-based learning model to enhance problem-solving skills and context awareness. During the learning process, the system notified the learners via their mobile devices about the upcoming activity. The learners received assistance automatically from Learner' Context-aware Module and they could communicate with their friends and instructors all the time. Both learners and teachers benefited from the mobile learning process as learners were able to study anything anywhere and anytime through their mobile devices, and instructors managed the learning in an efficient manner anywhere and anytime. However, preparing the infrastructure, learners and instructors is a prerequisite for any education institute that aims to apply this instructional model. All the users must have mobile devices with internet and it is the limitation of using this model.

Hu (2013) states that the blended use of Web 2.0 technologies and mobile phones give the learners the chance to share learner-created content in authentic environments. In Hu's study, learners aimed to learn idioms by creating their own artifacts or collecting them via mobile phones and they made online discussions to achieve a profound understanding of the idiom. Mobile phones and Web 2.0 technologies provided learners with an authentic and social learning environment.

Mobile Learning, which is considered to promote deep learning and reflection, is regarded as a social constructivist model of learning by various commentators (eg. Charitonos, Blake, Scanlon, & Jones, 2012b; Sharples et al., 2009, as cited in Scanlon, 2014). However, in addition to the social side of learning, mobile learning enhances complex cognitive skills such as problem-solving, context awareness and information processing regardless of time and space. Strong relationship between constructivism and mobile learning is shown clearly in this study. Detailed descriptions of how they serve each other and how they benefit each others' feasibilities are given as well. Since constructivism and mobile learning are quite compatible with each other and they are often being used together, could "mobile constructivism" be a new method in learning and have certain principles as mobile learning and constructivism has? If so, what would be the framework for mobile constructivism? Deep research and analysis on both constructivism and mobile learning have shown that the essential aspects of each could represent the principles of "mobile constructivism". These principles are;

a) Ubiquitous Interaction

b) Dynamic learning network

c) Informal learning settings

a. Ubiquitous Interaction

Learning through authentic interaction is a key aspect of social constructivism (Blake & Pope, 2008) and it can be achieved through mobile learning easily (Andujar-vaca & Martinez, 2017). Thanks to the internet and mobile devices, people and groups can interact beyond time and space (Doolittle & Hicks, 2003). Just like in social constructivism, mobile constructivism also focuses on collaboration and creates learning settings, which encourage collaboration through interaction and sharing. Learners interact not only with the physical and social world around them, they also interact with the social world virtually. Learners can interact with the technology, the teacher and each other anytime, anywhere in all circumstances. Mobile technologies encourage interaction and collaboration through discovering, sharing, gathering and

discussing (Lan & Tsai, 2011; Ogunduyile, 2013). Research related to mobile learning and constructivism has clearly shown that interaction has many functions. When used correctly interactions between students and teachers provide (Barry, Murphy & Drew, 2015; Cochrane & Bateman, 2010; Fahlman, 2013; Gilakjani, Lai-Mei, & Ismail, 2013; Thinley, Geva & Reye, 2014):

- flexibility in both formative and summative assessment through feedback
- motivation as a result of sharing successful learning outcomes
- critical thinking by reflecting on their own and peers' work
- scaffolding opportunities for teachers

b. Dynamic learning network

An emphasis on a social, online/virtual environment is visible in almost all studies concerning social constructivism and mobile learning. This environment is a dynamic network of information, where individuals can learn something new, expand existing knowledge and achieve deep learning by means of asking questions in online communities, texting with peers or teachers, searching, listening or watching different sources (Looi et. al., 2015). This learning network is dynamic since the devices used to access it, the information and the residents are constantly changing (Chen et al., 2019). This environment is also a setting for students to exhibit their learning outcomes (Chai & Fan, 2016).

In constructivism, learners construct knowledge either by themselves (Duffy & Cunningham, 1996) or by interacting with other individuals (Blake & Pope, 2008). Mobile constructivism encompasses personal and social learning and creates a virtual learning environment in which learners can carry out learning activities themselves or by interacting with peers and teachers. Mobile learning makes use of e-cooperative learning settings in which participants connect and communicate whenever and wherever they want. It helps them to have a sense of community and connectedness in the learning environment and thus make them more motivated and engaged in learning (Wang, 2014). This e-cooperative learning community is dynamic in that the participants can connect to each other anytime and anywhere to ask, answer, give and receive feedback, discuss, or share etc. Being a part of a community, which is active all the time, motivates the learners and makes the learning process more enjoyable.

Mobile learning naturally provides dynamic formative assessment opportunities as it forms a virtual learning atmosphere where an intensive feedback exchange take place between students and teachers (Andujar-vaca & Martinez, 2017; Cochrane & Bateman, 2010). Instant social media comments, continuous text message exchanges, lots of likes and reviews all become effective assessment tools with mobile learning (Baleghizadeh and Oladrostam, 2010; Fahlman, 2013; Ozdamli, 2013). In a learning experience without mobile learning, the evaluation and assessment is limited by teachers. Mobile learning with its social interaction capability eliminates this limit and lets the society learners live in, become the judge. These feedbacks are not always result in evaluation of learning outcomes. Chai & Fan (2016) state that when students share their success, they feel more motivated.

c. Informal learning settings

Using mobile devices to design learning activities, which learners can access in different settings results in learning in informal settings. Learning takes place continuously with the help of different mobile technologies (Milrad et al., 2013). Considering that learners spend much of their time outside the formal learning settings and mobile devices are commonly used among learners, we can say that learning is taking place more in informal settings. According to the constructivist view of learning and teaching, feedback should be given frequently. As mobile devices enable learners to communicate with peers and teachers outside the classroom, learners can give or receive feedback more frequently than in traditional settings. Giving or receiving feedback in informal settings is found to be better as learners welcome

online critiques more than the critiques in classroom (Richards, 2012).

Learning in informal settings deepens learning as it uncovers the learner's real potential. In a classroom setting, many possible problems such as anxiety, limited time, distracting students, overly dependent students and unpreparedness may prevent the learners from using their whole potential. However, informal learning settings eliminate all these problems and reveal the learner's real potential.

DISCUSSION & CONCLUSION

Constructivist theory of learning suggests individuals learn through creation of meaning from their experience, perceptions, interactions and interpretations within authentic experiences and social interactions (Ertmer & Newby, 2013; Fosnot & Perry, 1996). While cognitive constructivism emphasizes knowledge construction of learners through their experiences and attempts to solve a problem, social constructivism focuses on how individuals create meanings across different social environments depending on their cultural background or role in society (Duffy & Cunningham, 1996). Educators who have adopted constructivist instruction approach could benefit greatly from mobile seamless learning since it provides ample learning experiences and unlimited interactions anywhere, anytime because of its capabilities such as being informal, continuous, interactive and personal (Chen et. al., 2019; Geddes, 2004; Hwang & Tsai, 2011; Kukulska-Hulme, 2009).

Regarding the expansive potential of Constructivist Educational Technology, it can be concluded that it is still in its infancy stages and promises a lot as far as pedagogically integrated and used effectively. Effective use of these technologies depends largely on unlimited access to mobile sources. The importance of unlimited access to mobile sources comes from the fact that mobile technologies provide students with immediate collaborative tasks, interactions and learning in different contextual settings. Interactive and collaborative tasks contribute to the quality of learning by adding up to students' creativity and collaboration ability. Another benefit of constructive mobile technologies is about the natural feedback mechanism they provide. Through communicating, interacting and sharing on mobile devices, students produce meaningful output which can serve as an assessment tool for teachers later on. What makes that assessment tool precious is that teachers can evaluate the learners without being limited by time and place. Constructivist educational technology has contributed a lot to the teaching and learning processes with its unlimited virtual sources and learning environments and social platforms, which connect people beyond time and space. This technology empowers teachers, as it is easier to follow learner progress and identify their learning problems and assign tasks according to the level of understanding. However, constructivist educational technology has not been used in its full potential yet and thus it is described by some scholars as 'sleeping giant' (Doolittle & Hicks, 2003). One of the biggest constraints, which prevent the users from fully enjoying this innovation is that not all learners have mobile devices with the internet and both teachers and learners need some training on using educational technologies.

When it comes to the different types of constructivism which can be integrated in mobile learning, it can be concluded that cognitive and social constructivism can form the basis for mobile learning. Constructivism requires active construction of knowledge through experiences and interactions. Cognitive constructivism emphasizes individual construction of knowledge and social constructivism focuses on how individuals create meanings across different social environments (Duffy & Cunningham, 1996). In that sense, mobile technologies provide different and authentic learning experiences and a virtual environment where learners can take the lead and create new knowledge or different meanings in

different online settings, which serves cognitive and social constructivism. Cochrane & Bateman (2010) suggest that the key aspects of mobile learning such as connectivity, mobility and personal podcasting corresponds with social constructivism. The use of mobile technologies for communication purposes serves social constructivist pedagogical approaches as it makes it possible for students to share and teachers to guide (Thinley, Geva & Reye, 2014). Sharing ideas and learning outcomes with peers from all around the world in different learning settings is a goal of social constructivist theory and it can be easily performed through mobile learning (Barry, Murphy & Drew, 2015; Cobcroft et. al., 2006). Mobile learning happens via personal mobile devices, and every individual becomes the leading actor in their learning experience, which points out the cognitive constructivist side of mobile learning. It can be concluded that constructivism and mobile learning are interconnected as the former's aim is successfully achieved by the latter's functions.

The research explains how mobile technologies are integrated in learning and how they help learners and educators with the key aspects of constructivism such as interaction, collaboration and authentic experience. These create an informal atmosphere where social and cognitive constructivism can easily be implemented and contribute to formal lessons. When the potential of mobile learning is effectively employed, students engage with knowledge with their social identity and are involved in individual, contextual and effective learning experiences. Having described a strong relationship between constructivism and mobile learning, it can be concluded that the key aspects of constructivism are associated with mobile learning from a "mobile constructivism" perspective. Since constructivism and mobile learning target a student-centered, context-rich, authentic and constructive learning environment, "mobile constructivism" can be a new method that has principles covering the key aspects of both constructivism and mobile learning. In such a case, the first principle of mobile constructivism would be "Ubiquitous Interaction" which moves the key aspect of social constructivism- interaction with social environment- to a seamless context, the main proponent of which is mobile devices. The second principle would be "Dynamic Learning Network" which describes how learners are involved in knowledge construction, evaluation and deep learning through a constantly changing online and virtual brain like environment (Looi et. al., 2013). The last principle would be "Informal Learning Settings" which emphasizes what learners can learn by accessing mobile devices in informal settings rather than formal settings such as schools. Using these devices for learning purposes does not necessarily mean bringing these devices into formal learning environments, but it does mean learning and feedback are moved towards informal settings.

Learning which is moving towards a more mobile and informal context is expected to have some prerequisites and consequences. Before adapting a mobile constructivist educational view, all users must have mobile devices with seamless internet connection, which could be regarded as a limitation of using this model. Another prerequisite is that all users must be given training on how to use their mobile devices for learning, teaching, and assessing. As for the consequences, it can be concluded that users are able to access information anytime, anywhere; communication, interaction, learning and assessing in formal classroom setting continues outside the classroom, in informal settings as well, which promotes learning; informal learning settings lower the affective filter level of students and thus promotes learning; informal assessment gives a better chance for formative assessment and provides teachers with a process-based type of an assessment rather than product-based. Rapidly-changing word around us seems to be making way for a more mobile world and it seems inevitable in near future for all people to be a part of this seamless communication world.

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EMI or TMI?
A Case Study on the Effect of English Medium Instruction on Prep-school Students' Success and Motivation

Ayse Yilmaz Virlan[1]
Marmara University, Istanbul, Turkey

Dilara Demirbulak[2]
Medipol University, Istanbul, Turkey

Abstract

English-medium instruction (EMI) has become a widely adopted approach, especially in higher education institutions not only in Europe but also in Turkey. Students may go for departments with 100% English medium instruction as well as departments with 30% EMI, which are offered by many universities in Turkey. However, depending on the medium of instruction in their future departments, students may show different performance and attitude even when they are at prep schools. A quantitative case study was conducted to see if there is a relationship between the perceptions and the motivation as well as the success of EMI students at prep school. Attitude/Motivation Test Battery (AMTB) developed by Gardner in 1985 was utilized as the main data collection tool. The data includes responses of prep school students in a public university who were randomly chosen from the full EMI departments as well as 30% EMI departments. Considering the success of the students, the results showed that there is a decrease in the achievement of the 100% EMI students while there is an increase in the performance of 30% EMI students. Furthermore, no significant relationship was found between the test scores and the motivation level of the students. The study adds to our understanding of how different the students might perceive learning English for further academic instruction while they are receiving English courses at prep school lighting up the pathway for curriculum design studies of prep school programs.

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[1]Dr, Marmara University, Istanbul, Turkey, ayseyilmazvirlan@gmail.com
[2]Assoc. Prof. Dr., Medipol University, Istanbul, Turkey, ddemirbulak@hotmail.com

INTRODUCTION

There is a striking tendency towards adopting English as the medium of instruction (EMI) for academic studies in many universities in non-English-speaking countries (Hue & Lei, 2014). Several driving forces can be found behind the reason why adoption of EMI is preferred that much. To start with, Kirkpatrick (2014) claims that the Bologna Process is the most important motivation since it aims to standardize university degrees and allows staff and student mobility across Europe. As for Coleman (2006), financial concerns such as the marketization of university education play the biggest role in EMI adoption. Moreover, Dalton-Puffer (2011, p.185) suggests that "the perceived weakness of traditional foreign language teaching" makes it more important for universities to employ EMI in their degree programs. Finally, Hu and Lei (2014, p.552) consider EMI as an advantage to have "disciplinary learning and English proficiency" in higher education systems. Therefore, it is not surprising to observe an increase in the EMI programs at universities in the internationalization process the world is going through.

On the contrary, recent studies indicate that EMI instruction might negatively affect academic studies in higher education institutions. In one of their studies, Hu and Lei (2014) emphasize the fact that there are mixed or contradictory findings of EMI when the latest studies are examined. It is mostly observed in such research that students who were being forced to use a language different from their mother tongue had more problems than the students who could use their mother tongue in their academic studies. As to Hu & Lei (2014) this, in turn, resulted in "a lower performance of the students on academic studies" owing to the difficulty students had while producing requested proficiency level in the target language. Additionally, UNESCO education policy also emphasizes the importance of first language usage that helps learning during instruction (Kirkpatrick, 2014). As it was also pointed out by Behan, et.al (1997), when the students did the appointed tasks using their native languages, the results showed higher quality when compared to the studies where students used a second language. For this very reason, when the role of the universities in that sense is reconsidered, it becomes crucially important to better understand the departmental courses through the language that is provided by the instructors. For this reason, the emphasis put on the medium of instruction that is examined by previous research emphasizes the significance of native-language instruction at the university level (Littlewood & Yu, 2011; Benson, 2008; Kirkpatrick, 2014).

This being the case, it becomes even more necessary to find out what is considered attractive for students to choose an English-medium education in their academic studies (Kırkgöz, 2014). It is known that universities well-advertise themselves by offering a "British-style education" to appeal to the students (Kirkpatrick, 2014). Students are also offered prep school or support courses during their actual study. In short, EMI universities try to ensure that they provide their students with sufficient English education along with their degree courses (Kirkpatrick, 2014). Yet, when the students face with reality in their departments and prep schools of universities, things may differ.

One explanation made by Spolsky (2004) is that the language policy each student employs is a different mechanism. This mechanism consists of personal language practice and management with different beliefs and interactions during the implementation of the language within the course studies (Spolsky, 2004). Thus, what students perceive and perform in an EMI course might be quite different from what universities or program developers may foresee in their language policies. With these in mind, it is not difficult to encounter a lot of debate on whether academic studies should be conducted in the first language or following EMI policies. At this point, it becomes even more important to shed light on student perceptions of the second language in higher education. Hence, we first need to identify how students perceive EMI even when they start prep school to get a good command of English.

Considering the factors affecting the choice of EMI, it seems that on the one hand, there are universities which try to accredit themselves with the international schools to get a higher ranking in terms of their quality. In addition to universities, there are parents who are eager to provide their children with an education that will fulfill their career goals, mostly with an EMI education (Kirkpatrick, 2014). On the other hand, there are the students, who learn best in their first language and even produce better scores (Benson, 2008).

Not very different from the rest of the non-English speaking countries, Turkey also experiences such complexities after having launched the EMI in most of its universities. With the desire to cope with the internationalization of higher education, and "to operate with other countries to foster close relations" (Demirel, 1990), universities in Turkey have started to employ EMI in their degree programs. For example, in the university that this study will take place, there are departments such as medicine and engineering, which offer English-only classes in their degree programs. On the other hand, there are also some departments such as jewelry design, which offer EMI only in a few of their courses. The rest of the courses in these departments are lectured only in the Turkish Medium of Instruction (TMI). English prep school is provided to all students at such universities if they cannot pass the proficiency test of the university. It does not matter how many of their degree courses are in English or Turkish; the students have to reach a proficiency level to follow the courses in English. In other words, because even one academic course with EMI requires a high level of competency in English, students are obliged to prove that their language level is sufficient to ensure successful study regardless of their discipline.

Under such circumstances, it is crucial to understand the students' perceptions of the EMI in their academic studies. Nevertheless, limited number of research has been conducted about what the students might think of English and what factors shape their attitudes towards it when they start prep schools (Kırkgöz, 2005). Hergüner (1990), Ciğdem (1994), Kırkgöz (2005) are some of the studies on the field, reporting students' problems when they receive EMI at universities (Kırkgöz, 2005). In addition to their studies, Sert (2008) investigated the effectiveness of EMI concerning instructor perceptions as well as student perceptions. It was reported that although EMI at the university level was effective as a part of language skill development, it was unsuccessful in conveying academic content in an efficient way (Sert, 2008). In another study, Collins (2010), reports that students feel disadvantaged during their university years, as they perceived their language proficiency as very low. To enhance student performance, then, it should be a must to provide students "a middle ground" in the departments that offer EMI (Collins, 2010).

Seen in this light, this research aims to fill the gap in identifying the perceptions of prep school students of EMI before they start their degree programs. It is aimed to see if the amount of English in the department courses plays an important role in students' decision about selecting their department at university. Besides, the study also tries to investigate if the English medium of instruction affects students' attitude towards language learning motivation, thereby affecting their success at prep school.

Purpose of the study

This study grounds its basis on the fact that students of full EMI departments of a university in Istanbul keep their performance around the same average in prep school, while students of half EMI seem to have a lower average according to the proficiency tests. Although the instructions, objectives of the program, course books and materials are the same, students of the departments which offer most of the courses in Turkish seem to be less successful. Thus, it is necessary to investigate the student perception and motivation underlying the success of the prep school programs. In this research study, it was aimed to better understand whether or not the prep-school students show any different attitude and performance

depending on the amount of English, namely, as 100% EMI intensive or 30% EMI intensive as the medium of instruction in their future departments. Likewise, it is also essential to investigate how students perceive EMI offered at their appointed departments at the faculty. In that way, any possible changes related to curriculum and/or instructional strategies could be identified as an outcome of the study.

Research Hypothesis

Since the objective of this case study is to identify how prep-school students perceive English medium instruction at the university level, the research hypotheses were suggested as follows: "There is a difference between the 100% and 30% EMI students' academic performances in terms of prep-school studies. There is a positive relationship between students' academic performance and motivation". Thus, research questions listed below were formulated accordingly as:

1. Is there a difference between 100% EMI and 30% EMI students' performances?

2. Is there a relationship between the students' performance and motivation?

METHOD

Research Sample

The sample group of the study consisted of 39 participants who were students at the English Prep Department at the School of Foreign Languages of a public university in Istanbul. Subjects were selected through convenience sampling method from the B1 level students, which implies that these students could not pass the proficiency test but received the highest scores in the placement test among all the other students. In so doing, any failure in their performance would be observed clearly when compared to the students in the lower levels. The classes which had 60 students in total were randomly appointed by the administration to conduct the study. These classes consisted of students of both 100% EMI and 30% EMI students. Out of 60 students, 39 students participated in the research study. There were 21 students from the 100 % EMI departments, and 18 students from the 30% EMI departments participating in the study. The participants were aged between 18 and 21. They were students of different departments such as Dentistry, Engineering, Medicine as the 100% EMI departments, and Jewelry Design, Public Relations, and Journalism as the 30% EMI departments. However, the subjects were studying English in the preparatory program of the university during the study.

Research Instrument and Procedure

As the data collection tool, Gardner's Attitude/Motivation Test Battery (referred to as AMTB hereafter) developed in 1985 was utilized in this study. In the very beginning, the technical report of the AMTB was downloaded from http://publish.uwo. ca/~gardner/docs/AMTBmanual.pdf) to be further examined and adapted to this study. Out of 104 items in the test battery, 30 items were selected according to the main research focus. Items that were reported to have *no effect* on the reliability of the test were excluded for practical reasons. The categories related to attitude and motivation were used as the survey part of the questionnaire. The selected items of the test battery were also translated into Turkish to avoid any language-related problems.

The second data collection tool utilized was a placement test administered as an achievement test of the current research. The test had been developed by the testing office of the School of Foreign Languages and its reliability and validity were ensured by the test office before administration and conducted by the instructors of the prep-school immediately after the academic year started in September. Students had been already ranked depending on the results of this test, and placed into relevant B1 level classes when the study started. In December, the placement test was permitted to be used as the achievement test.

The sections as well as the items of the test were shuffled to avoid any drawbacks that might stem from the memorization of the answers when used as the achievement test. Added to these, any possible extraneous variables such as instructors, materials and method of instruction were eliminated by applying the same procedures as of the placement test administration.

The placement test was used as the achievement test of this study to be able to investigate any changes in the academic performance of the students when pre-post test results are compared. After the students sat for the test, they were distributed the attitude and motivation questionnaire during their normal class sessions. All students were asked for their consent and acknowledged the process before the study was started for ethical considerations

Data analysis

To analyze the academic performance of the students, results that were obtained from the achievement test were compared through paired sample t-test analysis. The scores received from the tests were compared with the results obtained from the questionnaire through correlation analysis. It was aimed to find out whether or not there is a statistically significant relationship between the academic performances of the participants and their motivation with regards to EMI.

FINDINGS

Performance

To analyze any differences in the performance score of the subjects a paired sample t-test was computed. In that sense, the first table (Table 1) presents the mean differences of the achievement test scores of 100% EMI and 30% EMI students. The difference in the performance of 100% EMI students in pre and post-tests is named “gain_100” and the difference in the performance of 30% EMI students in these tests is named “gain_30” in the table.

Table 1: *Mean Differences of Paired Samples*

		N	Mean	Std. Deviation
Pair 1	gain_100	39	-2,12	4,64
	gain_30	39	10,35	4,38

According to the findings, the gain score of 100% EMI students is M= -2.12, SD=4.64. This means that the performance of 100% EMI students decreased as the mean is in the negative direction. As for the 30% EMI students, it is observed that the mean difference is M=10.35, SD=4.38, which means that there was a considerable increase in the performance of the 30% EMI students. However, to understand if the differences between the groups are statistically significant, a paired sample t-test was conducted as can be seen in Table 2.

Table 2: *Results of Paired samples t-test*

		Mean difference	Std. Deviation	t	df	p
Pair 1	gain_100 gain_30	-12,47	6,53	-7,87	16	0.000

According to the figures in Table 2, there was a significant difference in the scores for the 100% students (M= -2.12, SD=4.64) and 30% students (M=10.35, SD=4.38) according to the pre and post-test results (t (16)= -7.87, p= 0.000). These results show that 30% EMI students gained more than 100% EMI students during the course. That is, 100% EMI students did not learn much probably because the materials were easy for them and they knew it before taking the course.

Motivation

A correlational analysis was computed to figure out any significant relationship between the success and the motivation of the 100% and 30% EMI students. The results shown in Table 3 revealed that there is no significant correlation between the achievement of the 100% EMI students and their motivation level (r19) = -.041, p=.0, p<.0). Besides, the correlation is negative, which means that the students' motivation was low while their scores in the pre-test were high. When we look at the relationship between the post-test scores of the 100% EMI students and their motivation, again we do not see a significant correlation (r19) = .031, p=.0, p<.0). However, this time the correlation is a positive one which means that the students' achievement also decreased while their motivation also decreased. The correlation matrix also reveals that there is a negative correlation which is not significant between pre-post test scores of participants (r(19)= - .084. This means that there is a decrease in the achievement of the students as the pre-test scores were higher while the post-test scores were lower as shown in Table 3. Obviously, 100 % EMI students were not motivated as expected while they were receiving instruction in the prep school.

Table 3: *Results of Correlations for the 100% English department*

	Pre_test	Post_test	Motivation100
Pre_test	1		
Post_test	-0,084	1	
Motivation100	-0,041	0,031	1

A second correlational analysis was administered to investigate the relationship between achievement and motivation of 30% EMI students. According to the figures in Table 4, the correlation between the pre and post-test scores of these students and their motivation is not statistically significant (r(16)= -,213). This might mean that 30% EMI students were not motivated at all when they were to start prep school. However, although the correlation between the post-test scores and motivation is not significant, either (r(16)=.148), the direction of the correlation changes from negative to positive when the students took the achievement test. As can be seen, the motivation of these students increased after they started learning English in prep school. Finally, the correlation between the pre and post-test is not a significant one (r(16)=.027). The direction of the correlation shows that both the pre-post test results of the students increased.

Table 4: *Results of Correlations for the 30% English department*

	Pre_test	Post_test	Motivation30
Pre_test	1		
Post_test	0,027	1	
Motivation30	-0,213	0,148	1

In short, the results indicate that neither the performance nor the achievement scores of the students of 100% EMI departments change in a positive direction. On the other hand, the results of students of 30% EMI departments increase not only in terms of motivation but also in terms of achievement. In other words, the only positive change could be observed in the results of students who would be studying in departments with 30% English instruction.

DISCUSSION & CONCLUSION

One of the aims of the study was to find out if there was a difference between the 100% EMI and 30% EMI students' achievement. The study also tried to identify if there is a relationship between the students' achievement and motivation regarding their departments.

When we look at the results, we fail the reject our first hypothesis which was about the difference between the students' performances. As the results imply, we can observe a decrease in the achievement of 100% EMI department students while there is an increase in the performance of students who are from 30% EMI departments. In parallel with this study, it was suggested by Hue and Lei (2014) that there could be some contradictory results in the EMI studies which reveal that students may respond differently to English medium instruction. In our study, too, students in both groups receive the same instructions; nevertheless, their performance is not the same. Hue and Lei (2014) explains this as "the force to use a language which is not the mother tongue of the students which leads to a lower performance of the students" (Hue and Lei, 2014). One explanation of the results obtained in the study could be that students who would be studying at 100% EMI departments after prep school might have felt under pressure resulting in their lower performance. Added to that, Collins (2010) also reports in his study that students may feel disadvantaged when they are exposed to a lot of foreign language instruction in their academic studies at the university level. This might also explain why students of 30% EMI departments had an upturn in terms of motivation after receiving instruction at the prep school.

Another analysis was conducted to test the second hypothesis of the study which tried to investigate whether there was a relationship between the students' performance and motivation. The students of 100% EMI department obviously showed lower performance in the achievement test. Thus, in the second step of the study, an adaptation of Gardner's attitude and motivation test battery (developed in 1985) was utilized in order to examine the factors which might lead to lower performance. According to the results, however, there was no statistically significant relationship between the test scores and motivation levels of the students who would be imposed on a different amount of English instruction at their departments. Under such conditions we had to reject our second hypothesis about any possible relationship between the students' performance and achievement.

Recommendations

The results show that there is a decrease in the achievement of the 100% EMI students while there is an increase in the achievement of 30% EMI students which provides us with the overall academic performance of the students. So, the first hypothesis about the difference between 100% and 30% EMI students' performances is rejected. Furthermore, no significant relationship was found considering the achievement test scores and motivation level of the participants. Nevertheless, the findings of the study also show that students of 30% EMI departments have a higher motivation level when compared to the students of 100% EMI departments.

One of the implications of the study could be that not all the time can we expect an increase in the performance of the students when instruction is given in English, even though the students elect the EMI departments on their wish. Besides, students with higher scores in the placement test may show lower performance later while students with lower scores may perform better during the prep class instruction regardless of their choice of medium instruction. In other words, we cannot claim that students who prefer 100% EMI departments are more motivated to learn English in prep school than the students who prefer 30% EMI departments. There could be different motives behind the differences in the academic performance of the students in the prep school, however, in the study, such factors were tried to be eliminated by applying the same procedures simultaneously for each class. Therefore, the only differences between these two groups of students were their department and the amount of EMI in their departments, and the passing grade of the proficiency exam in the prep school. Hence, motivation level and exam stress could be considered as the main factors however, as the findings of the study imply, motivation doesn't play an important role as in the case of these students.

As a result, it can be suggested to conduct another study to see if exam stress is an important factor that leads to lower performance of students with higher scores students and better performance of students with lower scores. Additionally, a follow-up study could be conducted to see if there is a difference in students' attitudes towards learning English after they finish their first year in their department. Another study can be conducted with the other levels of the students as well, to find out if having to receive 100% EMI in the degree programs creates stress or pressure on prep students. The researchers could further study if knowing in the prep school that there are less EMI courses in the degree programs (as 30% EMI students) affects their learning and performance. Such studies would also allow administrators to prepare their curriculum including the factors that affect the motivation levels and related performance of the students, as well. Also, as suggested by Kirkpatrick (2014) faculty departments at universities could be offered professional guidance on "how to decide which language a course should be delivered in" in light of such study if they can employ action research as part of their implementation of the instructions. In addition, instructors at prep school could be acknowledged that it does not always necessarily mean that when the students select a 100% EMI department they are highly motivated, or students of 30% EMI departments are to be less motivated. For students, this may be the other way around. That is, a student might have preferred a 30%EMI department and be quite motivated to learn the language at prep-school while another student might felt pressurized as he would be receiving all his undergraduate courses in a second language. For this reason, the instructors should not take it for granted that all the students who choose to study in a full-English program are so eager to learn English in the prep-school.

As a consequence, it is obvious from the study that the need for universities to take into account today's linguistic trends as well as realities and to re-evaluate their language policies should not be disregarded if academically high standards are to be sought for.

Notes:

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*Preservice Science Teachers' Perceptions towards Scientists**

Merve Lütfiye ŞENTÜRK[1]
Süleyman Demirel University, Department of Educational Sciences, Isparta, Turkey

Abstract

The aim of the research is to determine the perceptions of preservice science teachers who attended the course History and Nature of Science taught according to explicit-reflective approach, towards scientists. It is also to reveal the participants' expectations from the scientists in the context of social contribution. Thus the study was planned based on qualitative phenomenological research design. Participants of the study consisted of 32 third grade preservice science teachers. Participants were provided with the necessary prerequisite knowledge through video demonstrations, questioning and answering methods, article review studies, activities related to the nature of science and sharing reflections about the activities. Data were collected using drawing technique, "A New Society" activity questions and a structured interview form. Content analysis technique was used in the analysis of the data obtained in the study. As a result of the analysis of the data, preservice teachers' perceptions about scientists were found to be compatible with the literature in terms of physical and personal characteristics, study areas, working environments and social contribution of scientists. However, contrary to the findings in the literature suggesting that the scientists are male, approximately half of the participants in this study stated that they perceived the scientists as women.

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[1] Asst. Prof. Dr., Suleyman Demirel University, Department of Educational Sciences, Isparta, Turkey, mrvesenturk@gmail.com

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INTRODUCTION

The better we know science, the better we can use it to achieve our goals determined in a systematic completeness. This process can be achieved more easily by understanding the definition of science and the characteristics of a scientist. The term "Science", which first appeared in the Middle Ages and derived from the Latin word *scientica*, means knowledge in its broadest sense, but the emergence of the term "Scientist" does not have an old history, it dates back to the nineteenth century (Angın & Özenoğlu, 2019). Science is much more complex than standard definitions. Although various explanations related to science are made, opinions regarding the lack of a clear definition of science predominate. Scientists working in different fields from many parts of the world define science in different ways on the basis of their purpose and scope (Godin, 2007). For example, for a scientist working in basic sciences, science is expressed as organizing data according to the most general and fundamental laws or qualified and stable findings (Palya, 2000). However, for a scientist from the field of social sciences, it refers to concepts and processes involved education and research processes and are patterned with scientific and technological activities (Godin, 2007). Labs, chemical reactions, physical phenomena, microscopes, telescopes, science centers, even textbooks and similar images all reflect an aspect of science, but none of them can present a complete picture in relation to science. However, in recent years, the importance of students' understanding of contemporary science has been emphasized in the reforms made in the field of science education in many countries (Lederman & Lederman, 2004). The perceptions of science and scientist develop at an early age. Thus, children's acquaintance with science at an early age affects their perspective towards science in the later years of their lives (Bartan, 2019). According to Ayvacı, Atik, and Ürey (2016), it is important to reveal how children perceive scientists in order to find out their understanding of science. Whether children will continue scientific studies in the future will be shaped as a result of these positive or negative perceptions on scientists (Finson, 2002). Children's negative perceptions about scientists and science play an important role in negatively shaping their thoughts and attitudes about scientific activities (Ayvacı, Atik & Ürey, 2016). Thus, students' positive images of the scientist is seen important (Finson, Beaver & Cramond, 1995).

Students' images of scientists are influenced by their teachers' behaviors in the teaching process (Buldu, 2006) and their expressions about scientists (Buldu, 2006; Türkmen, 2008). Therefore, the teacher's physical characteristics and behaviors in the classroom will affect the students' values and attitudes towards both science and scientists and shape the images about the scientist (Yontar Toğrol, 2013). In this direction, in order for students to have a realistic and positive image towards science and scientists, they need teachers who can provide them with accurate information and put their scientist image on a realistic basis (Çermik, 2013). Science Course Curriculum (MEB, 2017) aims to educate all individuals as science literate. To achieve this aim, helping to understand how scientists create scientific knowledge and how it is used in researches is among the objectives of the curriculum. This goal can be seen basis for formation of students' perceptions towards the scientist. Therefore, for an effective science education, it is very important to reveal how teachers perceive scientific knowledge and to gain an understanding and view of science that is valid with today's thinking (Çakıcı, 2009). In this respect, the perception of the scientist preservice teachers will develop within the scope of their education is important during the undergraduate education period when professional development is gained (Ürey, Karaçöp, Göksu & Çolak, 2017).

Learning the nature of science plays an important role in shaping preservice teachers' perception of scientists. According to Abd-El-Khalick and Lederman (2000), the approaches used in teaching the nature of science are divided into two groups as implicit and explicit-reflective direct the teaching methods and practices they use in their classes (Brickhouse, 1990). In the implicit approach, it is assumed that students can understand the nature of science by experiencing the scientific process, while in the explicit-reflective approach, students are given opportunities to question their experiences and make inferences in terms of the nature of science. The main difference between the two approaches is whether students are given the opportunity to think about the nature of science on their activities or not (Yeşiloğlu, Demirdöğen &

Köseoğlu, 2010). Khishfe and Abd-El-Khalick (2002) stated that students understand better and become more successful in teaching the nature of science on the basis of explicit-reflective approach. There are studies suggesting that methods such as conducting research and activities, giving examples, and questioning students' views on science components are more useful and effective in the process of learning the nature of science (Abd-El-Khalick, 2005; Abd-El-Khalick & Lederman 2000). For this reason, in most of the studies on the nature of science, an explicit-reflective approach has been taken as a teaching strategy (Çetinkaya, 2019).

There are many researches conducted to determine how the concept of scientist is perceived (e.g. Akçay, 2011; Ağgül Yalçın, 2012; Bilir, Eyceyurt Türk & Tüzün, 2020; Buldu, 2006; Camcı Erdoğan; 2018; Chambers, 1983; Çermik, 2013; Eyceyurt Türk & Tüzün, 2017; Fung, 2002; Huber & Burton, 1995; Kaya, Doğan & Öcal, 2008; Korkmaz & Kavak, 2010; Küçük & Bağ; 2011; Mead & Metraux, 1957; Nuhoğlu & Afacan, 2011; Özgelen, 2012; Özsoy & Ahi, 2014; Palmer, 1997; She, 1998; Song & Kim, 1999; Şenel & Aslan, 2014; Ünver, 2010; Yontar Toğrol, 2013). When these studies were examined, it was seen that before the process of determining the perceptions of students at different levels or preservice teachers, no activity or training related to the explicit-reflective approach was mentioned. Therefore, it has been inferred that many of them are based on the implicit approach of scientist perception's formation. In science education research, it is considered important to improve the conceptual perception by using appropriate methods and techniques in the teaching of scientists and the work of scientists, to facilitate students' understanding and learning of science (Schibeci, 2006; Symington & Spurling, 1990). When looking from this point of view, it is very important for science teachers to grasp the nature of science and scientific knowledge well and to transfer these concepts to their students with appropriate activities (Doğan, Çakıroğlu, Çavuş, Bilican & Arslan, 2011). In this way, it is important to ensure that preservice science teachers gain awareness by revealing their thoughts about scientists, how they perceive them, with appropriate methods and approaches. Because their perception of scientists' characteristics, which might be thought as a reflection of the components of the nature of science, is a prerequisite for the perception of the students they will train. Thus, in this study, firstly preservice science teachers were enabled to have information about scientists and to think like scientists in activities developed on the basis of an explicit-reflective approach. Then, their perceptions towards the scientist were tried to be determined.

Purpose of the study

As explained in detail in the introduction, teachers affect the perception of children about scientists. Therefore, it is important to reveal how prospective science teachers perceive scientists with appropriate methods and approaches, and if they have misperceptions about scientists, identify possible reasons for this and ensure that they gain awareness. For this reason, in this study, unlike many studies in the literature, the research was carried out after the eight-week course named the history and nature of science, taught with explicit-reflective approach. Thus the perceptions of the participants will be determined at the end of a process in which they act like scientists through questioning and research, not based on their supposed existing experiences they have.

In this regard the purpose of the research is to determine the perceptions of preservice science teachers, who attended the course *History and Nature of Science* taught with explicit-reflective approach, towards scientists. It was also aimed to reveal the expectations of participants from the scientists in the context of social contribution. *(The effect of teaching method was not investigated in the study. Only pre-service science teachers' perception of scientists was determined).*

For this purpose, the problem statement determined within the scope of the research is as follows:
What are the perceptions of preservice science teachers towards scientists?

METHOD

This qualitative research was planned based on phenomenological design. Phenomenological design aims to reveal the meanings that individuals attribute to a phenomenon about which they have knowledge and experience. For this reason, it is tried to reach the essence of the experience by questioning individuals about the phenomenon (Yıldırım & Şimşek, 2006).

Participants, Data Collection Tools and Analysis

The participants of the study consisted of 32 preservice science teachers, 2 males and 30 females, studying at the 3rd grade. In order to provide preservice teachers to have the necessary precondition knowledge for the study participating preservice teachers attended the course called History and Nature of Science, which was delivered according to explicit-reflective approach. Main components and some information on the teaching process of course named given below:

1. Lecturing, question & answer method,
2. Article review tasks,
3. Video screenings on the lives of world-renowned scientists (Einstein, Marie Cruie, Stephen Hawking, Aziz Sancar, Rosalind Franklin) and sharing of views on videos in the classroom,
4. "A New Society" activity, developed by Cavallo (2008) and used also by Yeşiloğlu, Demirdöğen & Köseoğlu's (2010) research.

5. Reflecting of opinions about the activity (Detailed information about the activity is given below).

"A New Society Activity": The activity was used in order to reveal the opinions of the participants about the characteristics of the scientist in line with their experiences. It was applied with slight changes on the basis of the characteristics of the research group. The activity involves the process of discovering by scientists a society that has its own rules and lives according to these rules. However, according to the application necessaries of the activity, scientists obtain information about the society without knowing these specific rules of the society. The rules of society are as follows:

Rule 1: Community members speak only a language made up of the words "yes" and "no".

Rule 2: If the scientist asks a question with a smile to a member of the community, whatever the question is, the answer will always be "yes", if he asks without smiling the answer will always be "no".

Rule 3: Members of the community will only answer questions posed by scientists of different sex and questions posed by scientists of their own sex only in the second round. Thus, the following steps were followed in this research:

- ✓ First, four people from among the participants were selected to form the scientist team, and they were kept outside the classroom.
- ✓ While choosing the scientist team, taking into account the rules of the society, the team was made up of scientists of different genders, smiling and sullen faces.
- ✓ The rules of the new society, which will be discovered to the participants who stayed in the classroom, were explained to them.

"Drawing", "A New Society" activity questions and "Structured Interview Form" were used as data collection tools. Activity questions were asked to the participants right after the event. The drawing and interview form were applied one week later and together. Drawing process and answers given interview questions were completed within 40 minutes.

Content analysis technique was used in the analysis of the data obtained in the study. Content analysis is a method mainly used for analyzing written and visual data (Özdemir, 2010). The main purpose of content

analysis is to reach concepts and relationships that can explain the collected data. In the analysis of the data, the themes in the literature were examined in detail, and firstly, categories related to the research subject were created, and then in the analyzed data, the frequencies of the data included in these categories were calculated. Purposeful sampling, data diversification, participant confirmation and detailed description methods were used to ensure the validity and reliability of the study.

FINDINGS

Data obtained from all data sources in the study were analyzed on the basis of the following categories:

1. Study Field of the Scientist
2. Personal Characteristics of the Scientist
3. Physical Characteristics of the Scientist
4. Gender of the Scientist
5. Working Environment of the Scientist
6. The Contribution of Scientists to Society

Findings in each category were handled separately. Participants expressed more than one opinion for each category. All of these views were reflected in the codes. For this reason, the numbers of code differ from the numbers of participants. Direct quote expressions and drawing images that support the findings in the relevant categories are as follows:

1. The Perceptions of Preservice Science Teachers about Study Fields of the Scientists

Table 1. *Study Fields of the Scientists in the Minds of Preservice Science Teachers*

Categories	Code	f
Study Field of the Scientist	Medicine	18
	Physics	11
	Biology	7
	Chemistry	5
	Astronomy	3
	Molecular Biology	1
	Pharmacology	1

According to Table 1, preservice science teachers perceive study field of scientists in seven different disciplines: "medicine, physics, biology, chemistry, astronomy, molecular biology and pharmacology". In addition, the most preferred branch of science for the field of study of the scientist was determined by the preservice teachers as medicine (f = 18) and the least preferred branches of science were molecular biology (f = 1) and pharmacology (f = 1). Example participant expressions (most and least) and visual in this category are as follows:

"My dream was to study science in the field of medicine, I wanted to include my dreams here. Because the first thing that comes to mind when I talk about the field of science is medicine…" (PT9)
"I think it includes all the sciences in medicine, for example, the working principle of the devices used in the detection of diseases such as physics, chemicals used in treatment ... Therefore, if I made a single choice as a field of study of my scientist, I would say medicine, so my scientist works in the field of medicine ..." (PT18)
"My scientist is a pharmacologist who steals more than other scientists and finds cures for all diseases ..." (PT2)

Figure 1. Example of drawing (PT2)

When the statements of the preservice teacher and the sample visual are examined, it can be inferred that they have chosen the study field that they think is respect and hard to reach.

2. The Perceptions of Preservice Science Teachers about Personal Characteristics of the Scientist

Table 2. *Personal Characteristics of the Scientist in the Minds of Preservice Science Teachers*

Categories	Code	f
Personal Characteristics of the Scientist	Patient	27
	Punctual	25
	Objective	21
	Researcher	18
	Hardworking	18
	Curious	15
	Observer	13
	Determined	10
	Interrogator	8
	Intelligent	7
	Stubborn	5
	Disciplined	4
	Intellectual	4
	Sociable	3
	Altruistic	3
	Willing to learn	3
	Tidy	3
	Open to change	3
	Helpful	2
	Sparing time for family	1

According to Table 2, preservice teachers identified twenty different personal characteristics of scientists: "patient, punctual, objective, researcher, hardworking, curious, observer, determined, interrogator, intelligent, stubborn, disciplined, intellectual, sociable, altruistic, willing to learn, tidy, open to change, helpful, sparing time for family". While the most preferred characteristics by the participants regarding the personal characteristics of the scientist are patient (f = 27), punctual (f = 25) and objective (f = 21), the least

preferred characteristics are those that allocate time for their family (f = 1) and helpful (f = 2). Example participant expressions (most and least) and visuals in this category are as follows:

"I think a scientist should be patient, just like the scientists whose life stories we see, should not be daunted by unsuccess ..." (PT5)
"If a scientist wants to be successful in his job, he must also be someone who devotes time to his family. I think this is the most important feature…" (PT17)

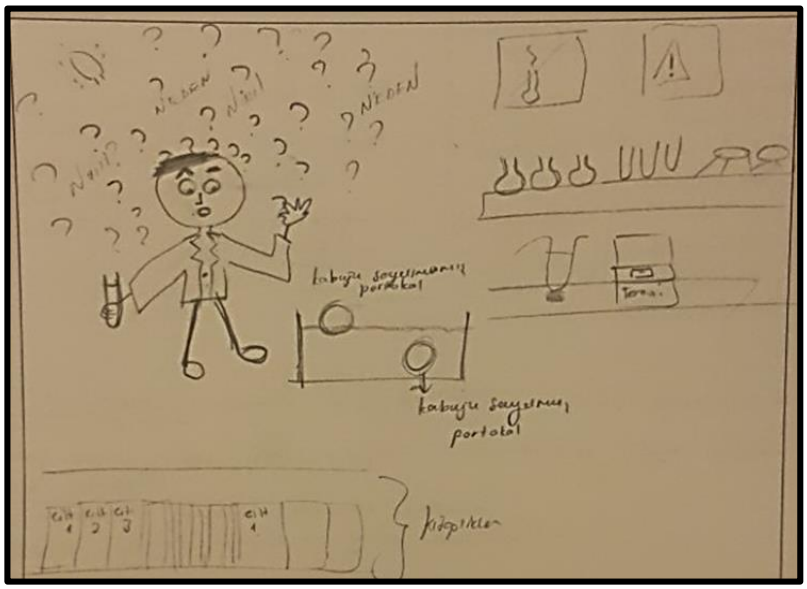

Figure 2. Example of drawing (PT5)

When the statements of the preservice teacher and the sample visual are examined, it can be stated that preservice teachers' perceptions of scientists' personal characteristics are affected by both their perspective on life and the activities in the teaching process.

3. The Perceptions of Preservice Science Teachers about Physical Characteristics of the Scientist

Table 3. *Physical Characteristics of the Scientist in the Minds of Preservice Science Teachers*

Categories	Code	f
Personal Characteristics of the Scientist	Wearing glasses	28
	Wearing apron	25
	Messy	19
	Neglected	16
	Unkempt hair	14
	Beautiful	5
	Well-groomed	4
	Bald	2
	Weak	1

According to Table 3, preservice teachers determined the characteristics of "wearing glasses, wearing apron, messy, neglected, unkempt hair, beautiful, well-groomed, bald, weak" in relation to the theme of the physical characteristics of the scientist. The most preferred features by the participants regarding the physical characteristics of the scientist were wearing glasses (f = 28) and apron (f = 25), while the least

preferred features were bald (f = 2) and weak (f = 1). Sample participant expressions (most and least) in this category are as follows:

"I cannot think of a scientist without glasses ..." (PT11)
"My scientist works so hard that he cannot even find time to eat ..." (PT19)

When the statements are examined, it can be stated that preservice teachers generally perceive that scientists wear glasses and aprons and have a messy appearance.

4. The Perceptions of Preservice Science Teachers about Gender of the Scientist

Table 4. *Gender of the Scientist in the Minds of Preservice Science Teachers*

Categories	Code	f
Gender of the Scientist	Female	16
	Male	15
	Female and Male	1

According to Table 4, it was determined that 16 of the preservice teachers were female, 15 were male and 1 had both a female and male scientist perception in relation to the gender category of the scientist. As a result of examining the data in the explanation step, it was determined that the majority of the female participants (f = 11) who drew a male scientist avoided expressing this in writing. Sample participant expressions (most and least) in this category are as follows:

"I prefer men because men are more punctual and patient ..." (PT3)
"I can say a groundbreaking woman ..." (PT23)

5. The Perceptions of Preservice Science Teachers about Working Environment of the Scientist

Table 5. *Working Environment of the Scientist in the Minds of Preservice Science Teachers*

Categories	Code	f
Working Environment of the Scientist	Equipped laboratory	22
	Library	10
	Study room	7
	Home	3
	Sky	1

According to Table 5, preservice teachers determined the environments of "equipped laboratory, library, study room, home and sky" in relation to the theme of the scientist's working environment. The most preferred place for the scientist's working environment by the participants was the equipped laboratory (f = 22), while the least preferred was the sky (f = 1). Example participant expressions (most and least) and visuals in this category are as follows:

"He is trying to find the invisibility potion in a laboratory that has everything he will need ..." (PT7)
"The home with all my experimental equipment is the best workplace. It is where scientific ideas come to mind first ..." (PT10)
"The place of scientists is the sky ..." (PT31)

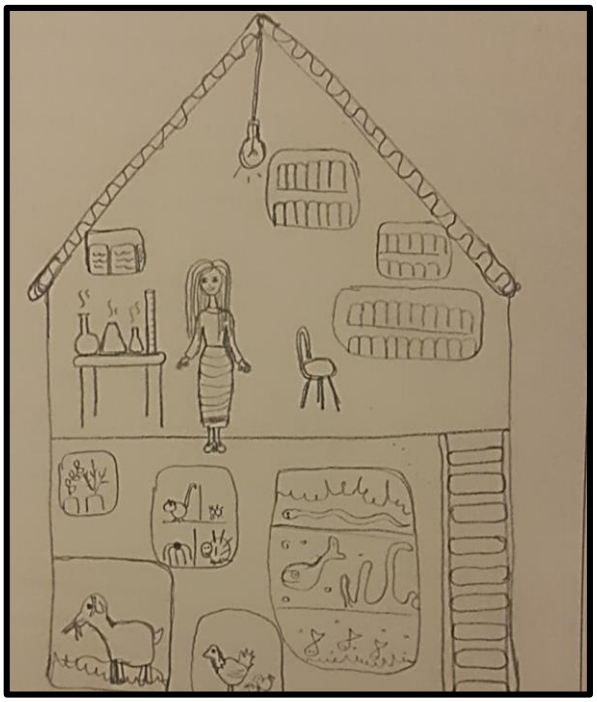

Figure 3. Example of drawing (PT10)

When the statements and the sample visual are examined, it can be stated that preservice teachers generally perceive that scientists' working environment is well equipped laboratory because of their emphasis on experimental activities.

6. The Perceptions of Preservice Science Teachers about Working Environment of the Scientist

Table 6. *Working Environment of the Scientist in the Minds of Preservice Science Teachers*

Categories	Code	f
The Contribution of Scientists to Society	Cure for cancer	23
	Cure for diseases	20
	Medicine production	16
	The invention of time machine	11
	Healthy food production	11
	Making it possible to travel to the planets	9
	The invention of the mind reading mechanism	5
	Finding the potion of invisibility	5
	Finding the energy source of black holes	4
	Improving the education system	4
	Obesity treatment	2
	Epilepsy treatment	1
	Developing tools to facilitate the life of visually impaired people	1

According to Table 6, preservice teachers stated thirteen different contribution made by the scientist to the society: "cure for cancer, cure for diseases, medicine production, invention of time machine, healthy food production, making it possible to travel to planets, invention of mind reading mechanism, Finding the

potion of invisibility, finding the energy source of black holes, improving the education system, obesity treatment, epilepsy treatment, developing tools to facilitate the lives of visually impaired people". Among these ideas, the most preferred by the participants were the cure for cancer (f = 23) and cure for diseases (f = 20), while the least preferred were epilepsy treatment (f = 1), developing a tool to facilitate the life of the visually impaired (f = 1) Obesity treatment (f = 2) was found to be. Example participant expressions and visuals in this category are as follows:

"Everyone's fearful dream is working resolutely to find a cure for cancer …" (PT25)
"My visually impaired relative came to my mind, my scientist is trying to develop a vehicle that will keep him alive under equal conditions with other people ..." (PT4)

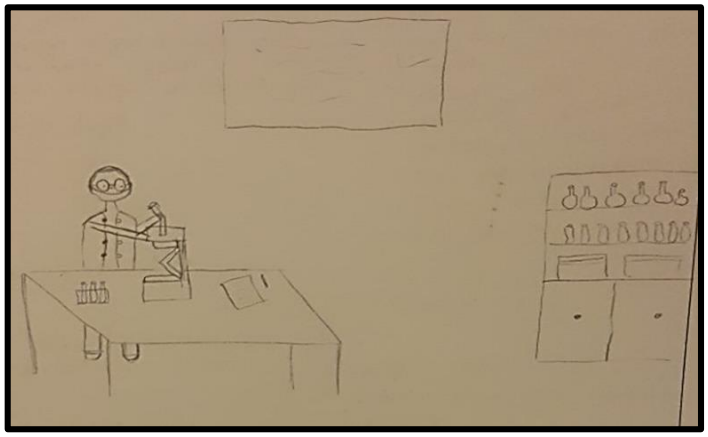

Figure 4. Example of drawing (PT25)

When the statements and the sample visual are examined, it can be stated that preservice teachers generally perceive that scientists' contribution to society is relate with diseased and they have high expectations from scientists.

DISCUSSION & CONCLUSION

As a result, it has been determined that preservice teachers perceive that scientists have better equipped, qualified and superior abilities than both themselves and many people in the society. Similar to this finding, in the literature there is the view that different perceptions about the scientist cause some student groups (such as students who think they are not very intelligent) to stay away from science and subjects related to science (Yeşiloğlu, Demirdöğen & Köseoğlu, 2010). In addition, the view that students think that they need to be very intelligent to become scientists also supports this finding (Greenfield, 1997). Preservice teachers have high expectations from scientists. This might be stem from due to their view of science as a difficult pursuit (Logan & Skamp 2005). Relating to the contributions of scientists, preservice teachers mostly put forward the views of finding cure for diseases. This finding of the research was found to be compatible with the perception that scientists identified in Şenel and Aslan's (2014) study are beneficial to society. However, there are also those who put forward ideas such as invention of some machine. This finding is similar to the tool development result in the drawings of some of the participants in research of Turgut, Öztürk and Eş (2017).

In the literature, in relation to the physical characteristics of the scientist, it is one of the features that often wearing apron, neglected, and wearing glasses. In this study, although findings of physical characteristics compatible with the literature (For example; Bartoszeck, & Bartoszeck, 2017; Bilir; Eyceyurt Türk & Tüzün, 2020; Demirbaş, 2009; Küçük & Bağ, 2011; Song & Kim, 1999; Türkmen, 2008) were reached, on the contrary, there were participants who emphasized that the scientists were well-groomed. In addition,

scientists' perceptions of their gender have been distributed in a balanced way as women and men, contrary to many previous studies in the literature (For example; Angın & Özenoğlu, 2019; Camcı Erdoğan, 2019; Çermik, 2013; Gülhan & Şahin, 2018; Mead & Metraux, 1957; Özgelen, 2012; Özsoy & Ahi, 2014; Ünver, 2010). One of the reasons for this result may be the activities that enabled the study group, 30 women, to question the characteristics of scientists in the course named history and nature of science. Similarly to this result, Deniş Çeliker and Erduran Avcı (2015) found that there is a change in favor of women in gender of scientists' perception the students who participate in activities-based science activities as a finding of their research. Consistent with the results of the research, Mason, Kahte and Gardner (1991) stated that such interventions could cause changes in students' perceptions of scientists about their gender. Since they are made to think of themselves as scientists in the activity, they may think that scientists may have the same gender as them. Therefore, it is concluded some participants have positive discrimination for the gender. Here is an expression presented within the scope of the research, in which the participants have positive discrimination, were determined in the direction of *"… I cannot say otherwise because I am a woman…", "…I think it is always a woman who solves the problem in all studies. For example, girls helped to find the characteristics of the society in our activity, so I chose a female scientist."*

One of the most common misconceptions about the nature of science in the literature, the misconception related to the objectivity of the scientist, was also detected in this study. The participants mostly defined the scientist as objective and free from prejudice. At the participant confirmation stage, it was determined that this misconception was related to determining the area for the scientist. Because they mainly associated scientists' fields of study compatible with experimental research. According to the participants systematic experimentation is important to contribute to science. Thus scientists should be objective as a requirement of this systematicity. This finding is similar to Abd-El-Khalick and Boujaoude's (1997) research results that teachers do not believe much in the creative and fanciful nature of scientific studies. Similarly, in their study Şenel and Aslan (2010) also stated that preservice teachers' perceptions of scientists' characteristics such as creativity and imagination are insufficient. As a result, the data collected after the history and nature of science course taught on the basis of an explicit-reflective teaching approach are compatible with the literature, Lederman, Abd-El-Khalick, Bell and Schwartz (2002) confirm the view that the understanding of the nature of science that the student acquired at school is in consistency with the understanding of the nature of science today. In addition, the suggestion that all students from pre-school to the end of secondary education, teacher candidates and teachers should have a consistent understanding of science can be customized also for scientist perception studies. In order to improve the perception of the scientist, it is important to understand the scientist, put himself in the place of the scientist and to think about the scientist in detail. Therefore, in order to develop positive perception, it is important to create an activity-oriented environment in which students can make inferences about these activities in teaching the nature of science. It is recommended to take this into consideration in the classroom activities.

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