EURASIAN JOURNAL OF EDUCATIONAL RESEARCH

Bimontly Peer-Reviewed Journal, Year: 17 Issue: 72 / 2017
İki Ayda Bir Yayımlanan Hakemli Dergi, Yıl: 17 Sayı: 72 / 2017

EURASIAN JOURNAL OF EDUCATIONAL RESEARCH

Bimontly Peer-Reviewed Journal, Year: 17 Issue: 72 / 2017
İki Ayda Bir Yayımlanan Hakemli Dergi, Yıl: 17 Sayı: 72 / 2017

SAHİBİ VE YAZI İŞLERİ MÜDÜRÜ / Publishing manager
Özer Daşcan

EDITORIAL OFFICE / Yayın Yönetim
Dilek Ertuğrul

Anı Yayıncılık, Kızılırmak Sokak 10/A
06640 Bakanlıklar Ankara, TURKEY
ejer.editor@gmail.com
Tel: +90 312 425 81 50 pbx Fax: +90 312 425 81 11

Printing Date / Basım Tarihi: 20.11.2017
Printing Address / Matbaa Adresi: Step Dijital Vadi Grafik Ltd. Şti. İvedik Organize Sanayi Sitesi 770. Sokak No: 101 Yenimahalle-Ankara
Yayın Türü: Yaygın Süreli
Cover Design / Kapak Tasarımı: Anı Yayıncılık
Typography / Dizgi: Göksel ÇAKIR

Eurasian Journal of Educational Research (ISSN 1302-597X) is a bimonthly (6 issues per year) peer-reviewed journal published by Anı Yayıncılık (ISSN 1302-597X) Anı Yayıncılık tarafından yılda altı kez yayımlanan hakemli bir dergidir.

Eurasian Journal of Educational Research **(EJER)** is abstracted and indexed in;
Emerging Sources Citation Index **(ESCI)**
The Education Resources Information Center (**ERIC**)
Social Scisearch,
Journal Citation Reports / Social Sciences Editon,
Higher Education Research Data Collection **(HERDC)**,
Educational Research Abstracts **(ERA),**
SCOPUS database,
EBSCO Host database,
ULAKBİM national index.

CONTENTS
İçindekiler

REVIEWERS of the 72nd ISSUE
72. Sayı Hakemleri

Murat Balkıs
Daniel E. Gustavson
Andres Mendiburo-Seguel
Senel Poyrazli
Bahadir Namdar
Sedef Canbazoglu Bilici
Aysegul Karabay
Berna Aslan
Senar Temel
Ismail Kinay
Dilek Celikler
Sabahattin Deniz
Tuncay Tunc
Murat Demirbas
Serkan Timur
Hatice Kumandas
Alper Kose
Irmak Hurmeric-Altunsoz
Jale Cakiroglu
Gokce Becit Isciturk
Beril Ceylan
Zekeriye Cam
Bayram Tay
Natividad Crespo
Erdinc Duru
Tugba Hosgorur
Tu, Ya-Ling
Ruhan Karadağ
Hüseyin Anılan
Demet Sever
Şngül S. Anagün
Özcan Özgür Dursun
Muhammet Baştuğ
Burçin Türkcan
İbrahim Coşkun
Şerife Dilek Belet Boyacı
Alper Başbay
Mediha Sarı
Beste Dinçer

Eurasian Journal of Educational Research 72 (2017) 1-22

Eurasian Journal of Educational Research
www.ejer.com.tr

Investigating Relationships between Undergraduate Students' Flow Experience, Academic Procrastination Behavior, and Calculus Course Achievement

Aysenur ALP[1] Semra SUNGUR[2]

ARTICLE INFO

Article History:
Received: 16 Aug. 2017
Received in revised form: 27 Oct. 2017
Accepted: 21 Nov. 2017
DOI: 10.14689/ejer.2017.72.1

Keywords
Flow, procrastination, achievement, Calculus course

ABSTRACT

Purpose: Calculus is generally offered as a freshman-year course and is a prerequisite for some advanced STEM-related courses in some undergraduate programs. However, some students experience difficulties in Calculus courses, leading to lower levels of achievement. Thus, there is a need to examine the factors which may be related to students' achievement in Calculus courses. According to relevant literature, procrastination can diminish students' achievement. Additionally, flow emerges as an important factor that may be related to students' achievement and procrastination, but these relationships have not been studied in the context of Calculus courses. The purpose of this study was twofold. Firstly, undergraduate students' academic procrastination was examined in relation to dimensions of flow experiences in a Calculus-I course. Secondly, undergraduate students' academic achievement in Calculus-I course was explored in relation to their academic procrastination and dimensions of flow experiences. **Research Methods:** A total of 117 undergraduate students (54% female and 46% male, M_{age}=23.00) from various departments participated in an online survey. **Findings:** Multiple regression analysis showed that among flow-experience dimensions, "concentration on the task at hand" was negatively related to procrastination. In addition, two-step hierarchical regression analysis indicated that procrastination negatively predicted achievement in the first step. However, in the second step, only the "challenge-skills balance" dimension of flow positively predicted achievement. **Implications for Research and Practice**: In Calculus courses, if students are given tasks that foster their focus, their procrastination behavior can be diminished. In addition, if they are given tasks that are appropriate to their level and skills, their academic achievement can be predictably higher. In this context, real-life applications should relate to students' own interests and skills. Therefore, their academic achievement can be higher.

[1] Corresponding Author: Middle East Technical University, TURKEY, aysenur.alp@metu.edu.tr
ORCID: https://orcid.org/0000-0002-9291-5157
[2] Middle East Technical University, TURKEY, ssungur@metu.edu.tr
ORCID: https://orcid.org/0000-0002-3372-6495

Introduction

When people are engaged in an activity that involves high concentration, high enjoyment, and losing track of time, they are said to be at the state of optimal experience, which is called *flow* (Csikszentmihalyi, 1975; 1997). In a flow state, individuals perceive themselves as successful regarding their performance, and this perception gives them pleasure. Individuals do the activity for its own sake, and there is no other further goal (Nakamura & Csikszentmihalyi, 2002). Csikszentmihalyi (1975) initially identified four elements related to flow state: control, attention, curiosity, and interest. These four elements were later elaborated, and nine elements of flow state were defined (Csikszentmihalyi, 1996): (1) There are clear goals for every step of the way (i.e. in flow, individuals know what should be done and in what order). (2) There is immediate feedback for one's actions (i.e. in flow, individuals know how well they are doing and they are aware of their performance). (3) There is a balance between challenges and skills (i.e. individuals feel that their abilities are well matched to the opportunities for action). (4) Action and awareness are merged (i.e. in flow, individuals are aware of what is here and now). (5) Distractions are excluded from consciousness (i.e. in flow, individuals' concentration is focused on what they are doing; they are not thinking about anything else). (6) There is no worry of failure (i.e. in flow, individuals are not afraid of what they are doing because they don't have full control of their actions; the action is done automatically). (7) Self-consciousness disappears (i.e. in flow, individuals are too involved in what they are doing). (8) The sense of time becomes distorted (i.e. in flow, individuals forget time, and hours may pass by in what seem like a few minutes). (9) The activity becomes autotelic (i.e. in flow, everything that individuals do is worth doing for its own sake) (Csikszentmihalyi, 1996).

Flow has been found to be related to adaptive outcomes such as satisfaction with life, hedonic balance, and psychological well-being (Bassi, Steca, Monzani, Greco, & Delle Fave, 2014; Collins, Sarkisian, & Winner, 2009). Research has also demonstrated that flow experiences improve students' academic satisfaction and achievement (Carli, Delle Fave, & Massimini, 1988; Heine, 1996; Joo, Joung, & Sim, 2011; Nakamura, 1988). For example, in a study with undergraduate students, Seo (2011) reported that flow is positively related to academic achievement. Mendelson (2007) also found a positive relationship between flow and exam scores, as indicated by both exam scores and GPA. Moreover, undergraduate students' flow was found to have a direct effect on achievement in an Application of Computers course (Joo, Oh, & Kim, 2015). Additionally, considering the nine elements of flow state, Shernoff, Csikszentmihalyi, Shneider and Shernoff (2003) showed that when students (a) experience challenging tasks, (b) feel that their skills are balanced with the challenge, and (c) control their climate, they are highly engaged in the learning environment. Moreover, Kim and Seo (2013) found that action-awareness merging, autotelic experience, and transformation of time were significant positive predictors of achievement behaviors. The latter two studies revealed that relationships between flow and academic outcomes can differ across different dimensions of flow. Thus, it appears that research on flow should focus on its specific dimensions rather than

examining flow as a single construct. Accordingly, in the current study, students' flow experiences were examined in terms of the dimensions. In addition, flow experiences were examined specifically for a Calculus course. Accordingly, the findings here can shed light on whether other findings in the relevant literature can be generalized across different domains, such as art, sport, and mathematics.

With regard to flow studies in mathematics education, Seifert, Radu, and Doyle (2009) reported that flow is a deep cognitive experience for mathematics students. Moreover, a combination of challenge, concentration, and competence is important for experiencing flow. Mathematics students mostly experience flow alone and in an environment over which they have control. However, they also may experience flow while the mathematics instructor is working on a problem and they are concentrated on the instructor's explanations (Seifert et al., 2009). Additionally, according to Radu and Seifert (2011), flow experiences in mathematics include clear goals, challenge-skill balance, and intense concentration. In particular, engagement in mathematics requires a challenge-skill balance. Moreover, becoming engaged in solving math problems requires a clear goal of solving the problem, which furthermore assumes a certain degree of concentration. Overall, the aforementioned literature has suggested that among flow dimensions, the positive predictors of achievement behaviors are challenge-skills balance, clear goals, high control, and high concentration.

Apart from flow, several studies have been conducted regarding academic procrastination, which is one of the maladaptive behaviors of students. According to Lay (1986), procrastination is a failure to finish what has to be done to attain goals. In other words, when individuals continue to fail to do what they should be doing to attain certain desirable goals, then procrastination behavior occurs. Moreover, Solomon and Rothblum (1984) defined procrastination as "the act of needlessly delaying tasks past the point of discomfort" (p. 503). Accordingly, academic procrastination involves delaying study-related activities, such as studying for an examination or writing a term paper (Klingsieck, Grund, Schmid, & Fries, 2013). Procrastination has been related to maladaptive outcomes in high school students, such as anxiety and low self-esteem (Besinck, Rothblum, & Mann, 1986), low examination grades and poor academic achievement (Beck, Koons, & Milgrim, 2000; Popoola, 2005; Tice & Baummestier, 1997), and amotivation (Lee, 2005). However, Seo (2011) found that procrastination (with its dimensions) was not a significant predictor of achievement for university students. Regarding the reasons for student procrastination, these behaviors are caused by low self-efficacy (Ferrari & Emmons, 1995), perfectionism (Onwuegbuzie, 2000), fear of failure (Rothblum, 1990), unclear directions (Schraw, Wadkins, & Olafson, 2007), and lack of time management and inability to concentrate (Noran, 2007). However, situational interest (Corkin et al., 2014), intrinsic motivation (Desrosiers, 2016), effort regulation (Rakes & Dunn, 2010), and conscientiousness (Ozer, 2012) were negatively related to academic procrastination.

At this point, it is important to note that because study behaviors can change across domains, examination of procrastination in a specific domain—such as mathematics—can have high predictive value (Choi 2005). According to Asikhia

(2010), many students, especially those in mathematics courses, do not study hard until the examination period, because mathematics is a demanding subject in terms of mathematical reasoning and problem solving. Akinsola, Tella, and Tella (2007) showed that many students perceive mathematics as high-demanding and difficult, and procrastination often occurs when a task is perceived as difficult or unpleasant. Mathematics also involves cognition effects and does not seem easy to anyone (Sutton, 1997). Moreover, some students often dislike mathematics as a subject, since it is often related to pain and frustration, and thus many students procrastinate in studying mathematics (Asikhia, 2010; Hopper, 2005). Considering this available literature, in the present study, students' procrastination and its relation with achievement were examined specifically for a Calculus course. The results have the potential to lead to specific implications for higher-education practices in Calculus courses.

Many researchers have also studied the relationship between flow and procrastination. In a study examining the relationship between students' flow, motivation, and procrastination, Lee (2005) found that a negative relationship exists between university students' flow and procrastination in an Educational Psychology course. In the study, the author included five dimensions of flow: clear goal, challenge-skill balance, concentration on the task, unambiguous feedback, and loss of self-consciousness. The author reported that in particular, college students' concentration on the task, clear goals, and loss of self-consciousness negatively predicted their procrastination behavior. In actuality, according to Messmer (2001), avoiding procrastination is important to experience the flow state. Messmer (2001) suggested that challenges stemming from poor planning can be offset by setting priorities, time management, focusing all one's attention on the immediate tasks and deadlines, and long-term goals. Moreover, Brinthaupt and Shin (2001) found that procrastination was positively related to action-awareness merging, challenge-skill balance, and unambiguous feedback, when considering all their current and recent courses.

Furthermore, Kim and Seo (2013) investigated the relationship between flow, self-regulation, active procrastination, and academic achievement in an Educational Psychology course. They found that challenge-skills balance was a significant positive predictor for active procrastination in both steps in the hierarchical regression analysis. According to Chu and Choi (2005), the relationship between procrastination and flow may vary depending on the type of procrastination. In fact, they found that active procrastinators (those who take volitional decisions to procrastinate and they finish their work before the deadlines) are better in flow than passive procrastinators (those who delay tasks until the last minute because they cannot manage their time effectively).

In this study, we will investigate the relationship between students' flow experience and procrastination behavior in Calculus I course. Procrastination will be measured with the Academic Procrastination Scale, developed by Aitken (1982) and adapted to Turkish by Balkıs (2006). This scale includes items which may suggest passive procrastination (e.g. "I delay starting things so long, I don't get them done by

the deadline"), and flow will be examined in 9 dimensions using the Flow State-2 Scale (Jackson & Eklund, 2004; Asci, Caglar, Eklund, Altintas, & Jackson, 2007), which was adapted to the Calculus course. When different findings from previous literature are considered, the expectation is that all nine dimensions of flow experiences will be negatively related to (passive) procrastination.

Considerable research has also examined relationships between procrastination and academic achievement in different contexts (Bruinsma & Jansen, 2009; Chu & Choi, 2015; Seo, 2011). In their meta-analysis, Kim and Seo (2015) concluded that academic performance and procrastination are negatively correlated. For example, Duru and Balkıs (2014) found that academic procrastination in undergraduate students (from different departments in the faculty of education) negatively predicts their academic achievement. Moreover, passive procrastination negatively predicts undergraduate students' Human Anatomy exam grades and course grades (Hensley, 2014). With regard to the relationship between flow, procrastination, and achievement, Kim and Seo (2013) examined the relationship between flow, self-regulation, active procrastination, and achievement. They found that challenge-skills balance positively predicts active procrastination. When students procrastinated in their studies, they increased the level of challenge (either intentionally or unintentionally). Thus, they postponed their studies in order to establish a balance between the challenges of a situation and their skills (Csikszentmihalyi, 1997). Even though there are students who delay their studies in order to increase the challenge, not all students defer their studies because of this. For example, passive procrastinators felt pessimistic, and stressed especially about their ability to achieve when a deadline gets closer (Ferrari, Parker, & Ware, 1992). However, active procrastinators delayed their work intentionally, enjoying the feeling of being challenged in the last minute. Therefore, challenge-skill balance might be a unique feature of active procrastination, different from passive procrastination (Kim & Seo, 2013). They also found that action-awareness merging, transformation of time, and autotelic experience positively predicted academic achievement.

Keeping the aforementioned literature in mind, the current study aimed to provide a comprehensive picture of the relationship between each dimension of flow, procrastination, and achievement in a Calculus course. More specifically, the purpose of this study is to examine the extent to which flow experience predicts (passive) procrastination behavior, and to what extent flow and procrastination predict students' achievement. Based on the aforementioned studies, while a negative relationship is expected between (passive) procrastination and achievement, and negative relationships between passive procrastination and dimensions of flow, a positive relationship is expected between dimensions of flow and achievement.

Purpose and Significance of the Study

The purpose of this study was twofold: (1) to examine to what extent students' flow experience (with its dimensions) predicts their academic procrastination in a Calculus I course, and (2) to explore to what extent students' academic

procrastination and flow experience (with its dimensions) predict undergraduate students' achievement in a Calculus I course.

The present study aims to fill the gap in the literature in several ways. Firstly, even though some studies examine the relationship between students' flow experience and procrastination in other domains (mostly Educational Psychology courses), flow has not been studied with its dimensions in examining both achievement and procrastination for Calculus (or mathematics). Thus, some clues can be obtained regarding how generalizable the findings in the relevant literature are concerning the proposed relations in different domains. If some differences are found, the findings can serve for more detailed practical implications for Calculus courses. Thus, this study has potential to make a contribution not only to educational psychology literature but also to mathematics education literature. In addition, the present study employed a different perspective than similar studies in the related literature (e.g. Brinthaupt & Shin, 2001; Seo, 2011). In these studies, researchers tried to determine whether procrastination is the reason for a flow state or not. They examined the relationship in terms of procrastinators' experience of time pressure, which may result in a feeling of challenge for some students and a focus on one goal, which may in turn lead to a flow experience just before the deadline. They claim that procrastination can increase the flow state before a deadline. Since Chu and Choi (2005) claim that relationship between procrastination and flow may vary depending on the type of procrastination, it was hypothesized in the current study that if students experience flow state in their studies, they may not passively procrastinate in their academic studies, as Lee (2005) also found. Therefore, a negative relationship between flow and procrastination is expected in this study.

In addition, in this study, age was a covariate in the hierarchical regression analysis because some studies have found that age is significantly related with academic achievement in Calculus or mathematics achievement (Jarvis, 2000; Lunneborg & Lunneborg, 1966). Furthermore, the findings can have important implications for undergraduate programs in various departments, including engineering, mathematics, management, and statistics. In fact, the Calculus course is important for first-year students, and it is one of the high credit courses offered in the first year of academic programs. This course is important for all engineering, science, economics, mathematics, physics, and chemistry education students. After taking a calculus course, students are able to perform calculations and algebraic manipulations, specifically limits, differentiation, and integration. A student who is successful in this course gains several skills, such as applying differentiation in real-life situations.

The present study aimed to address following research questions:

1. To what extent do different dimensions of flow experiences predict students' academic procrastination in a Calculus I course?
2. To what extent do different dimensions of flow and procrastination predict students' academic achievement in a Calculus I course?

Method

Research Sample

Participants included 117 (54 males and 63 females) Turkish undergraduate students from 22 departments in 13 universities, who have taken the Calculus I course in their departments. They ranged in age from 19 to 40 years (M_{age}= 23, SD = 3.36). The participants were from the faculty of arts and sciences (n = 47), faculty of education (n = 6), faculty of engineering (n = 55) and faculty of economics and administration sciences (n = 9). The majority of the participants (42%) were seniors, and only 15% of them were freshmen. The percentages of sophomores and juniors were equal (21% each). More than half of the participants (60%) reported that they took Calculus I only once. The number of students who took the course twice was 22 (19.1%). The percentage of participants who took Calculus I three or four times were 8.7 and 4.3, respectively. Only 3.5% of participants reported that they took the course five times. Less than 1% of participants (0.8%) took Calculus I six or eight times. The percentage of the participants taking the course seven times was 2.6.

Research Instruments and Procedures

The data were gathered through an online survey, which was shared via social media. Before students completed the survey, they were informed about the purpose of the study and that their participation was voluntary and anonymous, and they could withdraw from the study at any time. The students read and signed a consent form. The data collection process was finished in two weeks in May 2017.

Flow. Undergraduate students' perceived flow experience in the Calculus I course was measured by the 36-item Flow State-2 Scale (Jackson & Eklund, 2004). A validated Turkish version of the questionnaire (Asci, et al., 2007) was adapted to the Calculus I course. Students rated each item on a 5-point Likert scale (1-very wrong, 5-very true). The Flow State-2 Scale measures flow on nine dimensions: challenge-skill balance (4 items; e.g. "I was challenged, but I believed my skills would allow me to meet the challenge."; α = .71, when one item is excluded three-items α = .84), merging of action and awareness (4 items; e.g. "Things just seemed to be happening automatically"; α = .83), unambiguous feedback (4 items; e.g. "It was really clear to me how my performance was going."; α = .90), clear goals (4 items; e.g. "I knew clearly what I wanted to do"; α = .88), concentration on the task at hand (4 items; e.g. "My attention was focused entirely on what I was doing"; α = .90), sense of control (4 items; e.g. "I felt in total control of what I was doing in my Calculus course"; α = .90) loss of self-consciousness (4 items; e.g. "I was not concerned with what others may have been thinking of me."; α = .93), transformation of time (4 items; e.g. "the way time passed seemed to be different from normal"; α = .77, when one item is excluded three items α = .81), and autotelic experience (4 items; e.g. "I really enjoyed the experience"; α = .85). In the current study, a total of two items were excluded from challenge-skill balance and transformation of time subscales (1 item from each sub-scale) because removal of these items led to increases in the corresponding sub-scales. Moreover, due to high correlations of two dimensions (unambiguous feedback and sense of control) with other dimensions, leading to multicollinearity

problems, these two dimensions were not included in the regression analyses. Therefore, out of 36 items, in total 10 flow items were excluded from this study. A CFA with the 26 items loading on 7 latent factors yielded the following fit: *S-Bχ2*(278, *N*= 117) = 360.525, $p < .01$, CFI = .962, SRMR = .054, RMSEA = .050 (90%-*CI*: .035 - .064).

Procrastination. Perceived academic procrastination in Calculus courses was measured by the 16-item Academic Procrastination Scale (Aitken, 1982). A validated Turkish version of the questionnaire (Balkıs, 2006) was adapted to Calculus course. Four items were excluded from the analysis (e.g. "I'm careful to return library books on time") because they did not ask about course-related activities, such as studying or doing homework. Students rated each item on a 5-point Likert scale (1-very wrong, 5-very true). All twelve items measured students' academic procrastination (12 items; e.g. "If I had an important project to do, I'd get started on it as quickly as possible"; α =.92, after 2 items were excluded, α =.93). The CFA conducted with the twelve items loading on one latent factor yielded the following fit indices: *S-Bχ2*(54, *N*= 117) = 119.264, $p < .01$, CFI = .928, SRMR = .054, RMSEA = 0.102 (90%-*CI*: .081 - .122). After considering modification indices, two items were excluded from the analysis because of low-fit indices. The second CFA was conducted using the remaining ten items and provided a good model fit: *S-Bχ2*(35, *N*= 117) = 58.646, $p < .01$, CFI = .969, SRMR = .044, RMSEA = .076 (90%-*CI*: .045 - .104).

Academic achievement. Students' academic achievement in their Calculus courses was measured by their grades (0 to 100) at the end of their courses (M_{grade} = 68.74, SD = 19.61).

Data Analysis

In the current study, a multiple regression analysis was conducted in order to investigate academic procrastination in relation to dimension of flow experiences in the Calculus I course. Additionally, a two-step hierarchical regression analysis was carried out in order to examine students' achievement in the Calculus I course in relation to dimensions of flow and academic procrastination.

Results

Preliminary Analyses

Assumptions of regression analyses were checked in preliminary analyses, and means, standard deviations, and bivariate correlations among the variables were examined. Accordingly, multicollinearity, outliers, normality, linearity, homoscedasticity, and independence of residuals assumptions were checked prior to regression analyses. With regard to the multicollinearity assumption, all the bivariate correlation coefficients below 0.8 suggested that there was no violation of the multicollinearity assumption. In order to determine potential outliers, Mahalanobis distances were inspected. Absence of cases with Mahalanobis distances exceeding the critical value indicated that there were no potential outliers. Indeed, all Cook's

distances were less than 1, so there were no cases which substantially influenced the regression equation. Then, linearity, homoscedasticity, and independence of residuals assumptions were checked by examining the standardized residuals to a standardized predicted plot, and it was found that all the assumptions were met (Pallant, 2005; Tabachnick & Fidell, 2001).

After checking the underlying assumptions, descriptive statistics and bivariate correlations were calculated (see Table 1). With regard to the dimensions of flow experience, the mean scores indicated that the highest mean score belonged to the 'loss of self-consciousness' sub-scale (M = 3.49). On the other hand, the lowest mean score belonged to the 'concentration on the task at hand' sub-scale (M = 2.6). Thus, it appeared that, compared to other flow dimensions, participants tend to have lower levels of flow experience regarding concentration on the tasks in Calculus courses, but higher levels of flow experience regarding loss of self-consciousness while involved in a task. In general, the mean scores around 3 suggested that participants had a moderate level of flow experience in almost all dimensions. With regard to procrastination, the mean score of 3.52 showed that participants' procrastination levels in Calculus course were not low. In addition, their mean achievement score appeared to be at a moderate level (M = 68.74). Concerning the bivariate correlations, results indicated that age was positively related to achievement (r = .21, p < .05), and procrastination was negatively related to achievement (r = -.39, p < .01). In addition, procrastination was negatively and significantly correlated with all the dimensions of flow except loss of self-consciousness.

Table 1
Means, Standard Deviations, and Bivariate Correlations of the Measured Variables

Variables	1	2	3	4	5	6	7	8	9	10
1. Age	1									
2. Chall	.18	1								
3. Act	.14	.77**	1							
4. Cgoal	.08	.64**	.70**	1						
5. Focus	.14	.71**	.77**	.76	1					
6. Loss	-.04	.28**	.31**	.45**	.28**	1				
7. Time	.21*	.50**	.53**	.39**	.53**	.17	1			
8. Auto	.17	.74**	.67**	.63**	.73**	.30**	.70**	1		
9. Procr	-.11	-.51**	-.47**	-.53**	-.70**	-.18	-.38**	-.58**	1	
10. Ach	.21*	.51**	.47**	.41**	.50**	.08	.22*	.42**	-.39**	1
M	23.00	3.13	2.80	3.04	2.69	3.49	2.99	2.90	3.52	68.74
SD	3.36	1.05	0.93	1.04	1.09	1.20	1.10	1.13	1.00	19.61

Note. *p < .05, **p < .01; 2=Challenge-skill balance, 3=Merging of action and awareness, 4=Clear goals, 5=Concentration on the task at hand, 6=Loss of self-consciousness, 7=Transformation of time, 8=Autotelic experience, 9=Procrastination, 10=Achievement

Inferential Statistics

Multiple regression analysis. A multiple regression analysis was used to examine the students' academic procrastination in relation to their flow experiences in the Calculus I course. Procrastination was regressed on the dimensions of flow and the model was significant: (F (7, 109) = 16.50, p < .01, R^2= .51). As can be noticed in Table 2, concentration on the task at hand was found to be negatively associated with procrastination in the Calculus I course (β = -.70, p < .01). However, all the other dimensions were not significantly associated with student procrastination. It seems that when students have high concentration on the tasks, they have less tendency to procrastinate their studies in the Calculus course. In other words, when students cannot concentrate on the tasks, then they tend to procrastinate more.

Table 2
Multiple Regression Analysis for Procrastination in Calculus Course

Predictors	Procrastination		
	B	*SE*	*β*
1. Chall	-.05	.12	-.05
2. Act	.26	.14	.24
3. Cgoal	-.03	.11	-.03
4. Focus	-.63	.12	-.70**
5. Loss	.02	.06	.02
6. Time	.03	.09	.04
7. Auto	-.18	.12	-.21
F change (7, 109)		16.50	

Note. *p < .05, **p < .01; 1=Challenge-skill balance, 2=Merging of action and awareness, 3=Clear goals, 4=Concentration on the task at hand, 5=Loss of self-consciousness, 6=Transformation of time, 7=Autotelic experience.

Hierarchical regression analysis. A hierarchical regression analysis was used to explore undergraduate students' academic achievement in the Calculus I course in relation to their procrastination and flow experiences. Achievement was regressed on age and procrastination in Step 1 and flow dimensions in Step 2. The models in Step 1 and 2 were significant: (F (2, 114) = 12.84, p < .01, R^2= .18) and (F (7, 107) = 3.74, p < .01, R^2 = .34) respectively. As can it be noticed in Table 3, age was found to be positively associated with students' achievement in the Calculus I course (β = .17, p < .05), while the relationship between procrastination and Calculus achievement was negative (β = -.37, p < .01). The results also showed in the second step of the analysis that, when flow dimensions are included in the model, procrastination does not significantly predict course achievement above and beyond all the other flow dimensions. However, the link between challenge-skill balance and Calculus achievement was found to be positive (β = .30, p < .05). This finding implies that when students feel that that their abilities are well matched to their opportunities for action, they have higher levels of achievement.

Table 3
Hierarchical Two-Step Regression Analysis for Academic Achievement in Calculus Course

Predictors	Achievement					
	Step 1			Step 2		
	B	*SE*	*β*	*B*	*SE*	*β*
1. Age	1.00	.50	.17*	.88	.47	.15
2. Procr	-7.34	1.67	-.37**	-1.84	2.21	-.09
3. Chall				5.58	2.64	.30*
4. Act				2.43	3.15	.12
5. Cgoal				.63	2.57	.03
6. Focus				3.13	3.07	.18
7. Loss				-1.57	1.46	-.10
8. Time				-3.05	2.03	-.17
9. Auto				.58	2.70	.03
F change (7, 107)		12.84			3.74	

Note. *p < .05, **p < .01; 2=Procrastination, 3=Challenge-skill balance, 4=Merging of action and awareness, 5=Clear goals, 6=Concentration on the task at hand, 7=Loss of self-consciousness, 8=Transformation of time, 9=Autotelic experience.

Discussion and Conclusion

This study first explored undergraduate students' academic procrastination in relation to their flow experiences in a Calculus I course. Multiple regression analysis results showed that among flow experience dimensions, only students' concentration on the task at hand (focus) is negatively related to their procrastination. Therefore, as found in relevant literature (Lee, 2005), focus appears to be an important factor to consider to diminish students' procrastination behavior. In addition, hierarchical regression analysis showed that in Step 1, age and procrastination were significantly linked to achievement. While age was found to be positively related to achievement, procrastination was negatively related to achievement, consistent with related literature (Jarvis, 2000; Kim & Seo, 2015; Lunneborg & Lunneborg, 1966; Seo, 2011).

Hierarchical regression analysis also showed that in Step 2, when flow dimensions are included in the model, procrastination does not significantly predict course achievement above and beyond all the other flow dimensions. In Step 2, the balance between challenges and skills (i.e. individuals feel that their abilities are well matched to the opportunities for action) emerged as a powerful predictor of students' performance in Calculus. These findings suggest if they are provided with challenging activities that match well with their skills, their academic performance in Calculus appears to be better. On the other hand, results also showed that the relationships between remaining dimensions of flow and Calculus achievement were not significant. One of the reasons could be the small sample size, with students coming from various departments. Another reason could be that in Calculus courses, the most important factor seems to be the difficulties of the tasks. Therefore, students may not experience the other dimensions of flow (merging of action and awareness, having clear goals, concentrating on the task at hand, losing self-consciousness, feeling transformation of time, and feeling autotelic experience) if they don't have the

balance between their skills and the challenge of the tasks. In other words, if they don't see that their skills and the task challenge are balanced (i.e. the tasks may be much more difficult than the students' skills, or the tasks may be much easier than the students' skills), students may not experience the other dimensions. Indeed, according to Csikszentmihalyi (1975, 2000), flow experience requires a balance between challenge and skills. Fong, Zaleski, and Leach (2015) also state that "Flow is an intrinsically motivating state of consciousness characterized by simultaneous perception of high challenge and skill" (p. 425). The challenge-skill balance as a primary antecedent of flow experience is not clear, and more research is necessary to clarify the effect of challenge-skills balance on flow in multiple fields (Fong et al., 2015). Thus, it is suggested that future research can examine in detail the relationships between students' flow experiences and the reasons of procrastination behaviors, integrating qualitative research designs. For example, in depth-interviews could be conducted with students.

Overall, the present study showed that students' concentration was negatively and significantly related to their procrastination behavior. This study has contributed to the relevant literature in demonstrating that among the dimensions of flow, concentration is a crucial element against procrastination in Calculus. When students don't concentrate on their Calculus studies, they may procrastinate their studying. In addition, this study was the first step in learning about what the most important dimension is—from the students' perspectives—to prevent procrastination behavior in students' Calculus studies. This study also showed that students' procrastination behavior is negatively and significantly related to students' performance in Calculus classes, leading to lower levels of achievement. This finding was in line with the relevant literature. Indeed, Kim and Seo (2015) found a similar result. In addition, in the current study, the balance between challenges and skills is found to be significantly related to the students' performance in Calculus classes, leading to higher levels of achievement; this provides a support for the available literature (Mendelson, 2007; Seo, 2011).

One of the strongest points of this study that sets it apart from previous research is that this study focused on a Calculus course and involved students from different departments, including engineering, business administration, economy, statistics, mathematics, and science and mathematics education. For these departments, a Calculus course is mandatory, and students must pass this course in order to continue their studies. Due to this importance of this course, it is worth taking a closer look and studying the relationship between flow, procrastination, and achievement in Calculus, in order to be able to make specific suggestions to improve students' achievement behaviors.

Accordingly, based on the current findings and the available literature, it is suggested that students are provided with tasks in Calculus courses that are conducive to their flow experience. In order to help students experience flow, the tasks should be interesting, challenging, and matched to students' abilities. In addition, the classroom environment should be free from stress, anxiety, and other negative emotions (Csikszentmihalyi, 2000; Schmidt, 2010). Considerable research

also demonstrated that intrinsic motivation is related to flow experience (Choe, Kang, Soe, & Yang, 2015; Pintrich & Schunk, 2002). Therefore, in order to enhance students' flow experience—particularly fostering a balance between challenge and skills—instructors offering Calculus courses can create learning environments that are conducive to students' intrinsic motivation, satisfying their basic psychological needs of autonomy, competence, and relatedness (Deci & Ryan, 2000; 2002).

Accordingly, instructors can design a variety of interesting and challenging tasks and activities, among which students can choose. This can help students feel autonomous in their learning and experience more enjoyment. In addition, students can be expected to work in groups while dealing with activities, satisfying their need for relatedness. Moreover, especially to foster balance between challenge and skills, instructors should challenge students according to their abilities, by preparing some step-by-step tasks for students to achieve from easier to harder. Then, instructors should provide immediate feedback on students' performance and prepare the tasks in line with their capabilities, contributing to the satisfaction of their competence needs. For example, while instructing about differentiation, an instructor in mechanical engineering can provide students with velocity and acceleration. By requiring these students to calculate vehicles' velocity, it could further improve students' understanding of Calculus in daily life applications. Therefore, their skills and challenge can be balanced, and they can be interested in what they are doing and thus can be more creative.

In this aspect, STEM-related activities in Calculus courses also brings about a balance between challenge and skills. Hartzler (2000) found that integrated curricula were successful in teaching mathematics and science across all grade levels. Especially if engineering students learn Calculus and its applications in their own field, then they can be more successful and creative in their fields in their future career. Additionally, web-based or computer-based instruction can be implemented in Calculus courses. Indeed, Heo and Rha (2003) demonstrated that the different facets of web-based instruction including interactivity, navigation, and content are associated with flow. Lee, Han, Kim, and Lee (2007) also reported that students in learning environments with e-learning systems are more likely to experience flow.

Limitations and Recommendations

There are some limitations of this study. Firstly, this is a cross-sectional study; thus, results do not imply any causation. In future research, longitudinal studies (since age is also an important factor for Calculus achievement) can be conducted to reveal cause-and-effect relations, and to investigate how these relationships change over time.

Secondly, data were collected through an online survey and the participants were from different departments, including engineering, management, mathematics, and education. Therefore, studies focusing on certain domains, such as engineering, can provide stronger and more explicit implications. If students from different departments and universities are included in future studies, hierarchical linear modelling (HLM)—a type of regression analysis appropriate for multilevel data—

should be used to analyze the data (Raudenbush & Bryk, 2002). Such multilevel analysis methods also allow for examining cross-level interactions among the variables (Roudenbush & Bryk, 2002).

Thirdly, the sample size in the current study was not large. In fact, the number of students from different departments was not sufficient to conduct HLM. In future studies, researchers can work with larger samples, using HLM and also demonstrating the generalizability of the findings.

Fourthly, in the present study, not all students were administered the online survey right after completing the Calculus course. As a result, some students may have experienced difficulty while responding to the survey items in reflecting their actual experiences in Calculus course, depending on the time span between data collection and course completion. Thus, in future studies, researchers are advised to administer surveys to students immediately after they complete the Calculus course.

In addition, future research can focus more on the reasons for procrastination in studying Calculus, and how students can experience flow, especially the balance between challenge and skills, in Calculus and mathematics in general. There is a need for interviewing students and finding out in which situations students have flow (or not) in their Calculus studies.

Finally, high correlations of two dimensions of flow experience (unambiguous feedback and sense of control) with other dimensions, lead to multicollinearity problems. Hence, these two dimensions were not included in the regression analyses. Therefore, flow could not be examined with all its dimensions, and future research could address this gap.

References

Aitken, M. E. (1982). *A personality profile of the college student procrastinator*. Dissertation Abstracts 43A, 722-723.

Akinsola, M. A. & Tella, A. (2007). Correlates of academic procrastination and mathematics achievement of university undergraduate students. *Eurasia Journal of Mathematics, Science and Technology Education, 3*(4), 363-370.

Asci F.H., Caglar E., Eklund R., Altintas A. & Jackson S. (2007) Optimal performans duygu durum-2 olcekleri'nin uyarlama calismasi. [The adaptation study of dispositional flow scale-2 and flow state scale -2] *Hacettepe Journal of Sport Sciences, 18*, 182-196.

Asikhia, O. A. (2010). Academic procrastination in mathematics: Causes, dangers and implications of counselling for effective learning. *International Education Studies, 3*(3), 205-210.

Baker, F. A., & MacDonald, R. A. (2013). Flow, identity, achievement, satisfaction and ownership during therapeutic songwriting experiences with university students and retirees. *Musicae Scientiae, 17*, 131-146.

Balkıs, M. (2006). *Ogretmen adaylarının davranislarindaki erteleme egiliminin, dusunme ve karar verme tarzları ile iliskilerinin incelenmesi, [The relationships between student teachers' procrastination behaviors, and decision-making styles]* Yayınlanmamis Doktora Tezi. Dokuz Eylul Universitesi Egitim Bilimleri Enstitusu, İzmir.

Bassi, M., Steca, P., Monzani, D., Greco, A., & Delle Fave, A. (2014). Personality and optimal experience in adolescence: Implications for well-being and development. *Journal of Happiness Studies, 15*(4), 829-843.

Beck, B. L., Koons, S. R., & Milgrim, D. L. (2000). Correlates and consequences of behavioral procrastination: The effects of academic procrastination, self-consciousness, self-esteem and self-handicapping. *Journal of Social Behavior and Personality, 15*(5), 3-13.

Beswick, G., Rothblum, E. D., & Mann, L. (1988). Psychological antecedents to student procrastination. *Australian Psychologist, 23*(2), 207-217.

Brinthaupt, T. M., & Shin, C. M. (2001). The relationship of academic cramming to flow experience. *College Student Journal, 35*(3), 457-472.

Bruinsma, M., & Jansen, E. P. (2009). When will I succeed in my first-year diploma? Survival analysis in Dutch higher education. *Higher Education Research & Development, 28*(1), 99-114.

Carli, M., Delle Fave, A., & Massimini, F. (1988). The quality of experience in the flow channels: Comparison of Italian and U.S. students. In M. Csikszentmihalyi & I. Csikszentmihalyi (Eds.), *Optimal experience: Psychological studies of flow in consciousness* (pp.288-306). Cambridge, Cambridge University Press.

Choe, K., Kang, Y., Seo, B. S., & Yang, B. (2015). Experiences of learning flow among Korean adolescents. *Learning and Individual Differences, 39*, 180–185.

Chu, A. H. C., & Choi, J. N. (2005). Rethinking procrastination: Positive effects of "active" procrastination behavior on attitudes and performance. *The Journal of Social Psychology, 145*(3), 245-264.

Collins, A. L., Sarkisian, N., & Winner, E. (2009). Flow and happiness in later life: An investigation into the role of daily and weekly flow experiences. *Journal of Happiness Studies, 10*(6), 703-719.

Corkin, D. M., Shirley, L. Y., Wolters, C. A., & Wiesner, M. (2014). The role of the college classroom climate on academic procrastination. *Learning and Individual Differences, 32*, 294-303.

Csikszentmihalyi, M. (1975). Play and intrinsic rewards. *Journal of Humanistic Psychology, 15*(3), 41-63.

Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience*. New York, NY: Harper & Row.

Csikszentmihalyi, M. (1996). *Flow and the psychology of discovery and invention.* New York: Harper Collins.

Csikszentmihalyi, M. (1997). *Finding flow: The psychology of engagement with everyday life*. New York: Basic Books.

Csikszentmihalyi, M. (2000). *Beyond boredom and anxiety*. San Francisco: Jossey Bass.

Deci, E. L., & Ryan, R. M. (2000). The "what" and" why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*(4), 227-268.

Deci, E. L., & Ryan, R. M. (2002). The paradox of achievement: The harder you push, the worse it gets. In J. Aronson (Eds.), *Improving academic achievement: Impact of psychological factors on education* (pp. 61-87). San Diego: Academic Press.

Duru, E., & Balkis, M. (2014). The role of academic procrastination tendency on the relationships among self-doubt, self-esteem and academic achievement. *Education and Science, 39*(173), 274–287.

Ferrari, J. R., & Emmons, R. A. (1995). Methods of procrastination and their relation to self-control and self-reinforcement: An exploratory study. *Journal of Social Behavior and Personality, 10*(1), 135-142.

Fong, C. J., Zaleski, D. J., & Leach, J. K. (2015). The challenge–skill balance and antecedents of flow: A meta-analytic investigation. *The Journal of Positive Psychology, 10*(5), 425-446.

Hartzler, D. S. (2000). *A meta-analysis of studies conducted on integrated curriculum programs and their effects on student achievement* (Doctoral dissertation, [Sl: sn]).

Heine, C. (1996). *Flow and achievement in mathematics.* Unpublished doctoral dissertation, University of Chicago.

Hensley, L. C. (2014). Reconsidering active procrastination: Relations to motivation and achievement in college anatomy. *Learning and Individual Differences, 36*, 157-164.

Heo, G., & Rha, I. J. (2003). Optimal flow experience in Web based instruction. *Korea Association of Computer Education Papers, 6*(2), 71-79.

Hopper C. H. (2005). Mathematics anxiety. *The study skills workshop* (pp. 117).

Jackson, S. A., & Eklund, R. C. (2004). *The flow scales manual*. Morgantown, WV, USA: Fitness Information Technology, Inc.

Jackson, S. A., Thomas, P. R., Marsh, H. W., & Smethurst, C. J. (2001). Relationships between flow, self-concept, psychological skills, and performance. *Journal of Applied Sport Psychology, 13*(2), 129–153.

Jarvis, T. J. (2000). Class size and teacher effects on student achievement and dropout rates in university-level calculus. Preprint. Retrieved from http://www.math.byu.edu/~jarvis/classsize/class-size.html

Joo, Y. J., Joung, S., & Sim, W. J. (2011). Structural relationships among internal locus of control, institutional support, flow, and learner persistence in cyber universities. *Computers in Human Behavior, 27*(2), 714-722.

Joo, Y. J., Oh, E., & Kim, S. M. (2015). Motivation, instructional design, flow, and academic achievement at a Korean online university: A structural equation modeling study. *Journal of Computing in Higher Education, 27*(1), 28-46.

Kim, K. R., & Seo, E. H. (2015). The relationship between procrastination and academic performance: A meta-analysis. *Personality and Individual Differences, 82*, 26-33.

Klingsieck, K. B., Grund, A., Schmid, S., & Fries, S. (2013). Why students procrastinate: A qualitative approach. *Journal of College Student Development, 54*(4), 397-412.

Lay, C. H. (1986). At last, my research article on procrastination. *Journal of Research in Personality, 20*(4), 474-495.

Lee, E. (2005). The relationship of motivation and flow experience to academic procrastination in university students. *The Journal of Genetic Psychology, 166*(1), 5-15.

Lee, E., Han, K., Kim, S., & Lee, Y. (2007). A study on teaching–learning strategies for flow experience in e-learning environment. *Journal of Korea Association of Computer Education, 10*, 21–30.

Lunneborg, P. W., & Lunneborg, C. E. (1966). The differential prediction of college grades from biographic information. *Educational and Psychological Measurement, 26*(4), 917-925.

Mendelson, N. (2007). *The functional mediation of flow between achievement anxiety, academic procrastination, and academic performance.* Ph.D. dissertation, Fordham University, United States -- New York. Dissertations & Theses: Full Text database. (Publication No. AAT 3255013).

Messmer, M. (2001). Becoming a peak performer. *Strategic Finance, 82*, 8-10.

Nakamura, J. (1988). Optimal experiences and the uses of talent. In M. Csikszentmihalyi & I. Csikszentmihalyi (Eds.), *Optimal experience: Psychological studies of flow in consciousness* (pp. 319-326). Cambridge, Cambridge University Press.

Nakamura, J., & Csikszentmihalyi, M. (2002). The concept of flow. In Snyder & Lopez (Eds.), *Handbook of positive psychology* (pp. 89–105). New York: Oxford University Press.

Noran, F. Y. (2000). Procrastination among students in institutes of higher learning: challenges for K-Economy. [Online] Available:

http://www.mahdzan.com/paper/procrastinate/Accessed on 10th Oct. 2017.

Onwuegbuzie, A. J. (2000). Academic procrastinators and perfectionistic tendencies among graduate students. *Journal of Social Behavior and Personality, 15*(5; SPI), 103-110.

Ozer, A. (2012). Procrastination: Rethinking trait models. *Education & Science/Egitim ve Bilim*, 37(166), 303-317.

Pallant, J. (2005). *SPSS survival manual: A step by step guide to data analysis using SPSS for Windows (Version 12)*. Sydney: Allen & Unwin.

Pintrich, P. R., & Schunk, D. H. (2002). *Motivation in education: Theory, Research, and Applications,* Second Edition, Merrill Prentice Hall, Columbus, Ohio.

Popoola, B. I. (2005). A study of the relationship between procrastinatory behaviour and academic performance of undergraduate students in a Nigerian University. In *the African Symposium: An Online Journal of African Educational Research* (p. 60).

Puca, R. M., & Schmalt, H. D. (1999). Task enjoyment: A mediator between achievement motives and performance. *Motivation and Emotion, 23*, 15-29.

Radu, O. and Seifert, T. (2011). Mathematical Intimacy within Blended and Face-to-face Learning Environments. *In European Journal of Open, Distance and E-Learning, Special issue: Best of EDEN 2010*. Retrieved on September 26, 2017, from http://www.eurodl.org/?p=special&sp=articles&inum=3&article=444

Rakes, G. C., & Dunn, K. E. (2010). The impact of online graduate students' motivation and self-regulation on academic procrastination. *Journal of Interactive Online Learning, 9*(1), 78-93.

Rothblum E.D. (1990) Fear of Failure. In: Leitenberg H. (eds) *Handbook of social and evaluation anxiety*. Springer, Boston, MA.

Schmidt, J. (2010). Flow in education. In E. Baker, P.P. Petereson, & B. Mcgraw (Eds.), *International encyclopedia of education* (3rd ed., pp. 605–611). London: Elsevier.

Schraw, G., Wadkins, T., & Olafson, L. (2007). Doing the things we do: A grounded theory of academic procrastination. *Journal of Educational Psychology, 99*(1), 12-25.

Schüler, J. (2007). Arousal of flow experience in a learning setting and its effects on exam performance and affect. *Zeitschrift für Pädagogische Psychologie, 21*(3/4), 217-227.

Seifert, T., Radu, O. & Doyle, A. (2009). *Flow: An emotional experience in mathematics problem solving*. Paper presented at the Third International Symposium of Mathematics and its Connections to the Arts and Sciences, Moncton, Canada.

Seo, E. H. (2011). The relationships among procrastination, flow, and academic achievement. *Social Behavior and Personality: An International Journal, 39*(2), 209-217.

Shernoff, D. J., Csikszentmihalyi, M., Shneider, B., & Shernoff, E. S. (2003). Student engagement in high school classrooms from the perspective of flow theory. *School Psychology Quarterly, 18*(2), 158-176.

Solomon, L. J., & Rothblum, E. D. (1984). Academic procrastination: Frequency and cognitive-behavioral correlates. *Journal of Counseling Psychology, 31*(4), 503-509.

Sutton, S. (1997). Finding the glory in the struggle: Helping our students thrive when math gets tough. *Math Instruction Bulletin, 81*(586), 43-52.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics* (4th edn). NewYork: HarperCollins.

Tall, D. (1993). Students' Difficulties in Calculus. *Proceedings of Working Group 3 on Students' Difficulties in Calculus,* ICME-7, Québec, Canada: 13–28.

Tice, D.M, & Baumeister, R.F. (1997). Longitudinal study of procrastination, performance, stress and health: The costs and benefits of dawdling. *Psychological Science 8(*6), 454-458.

Öğrencilerin Analiz Dersindeki Akış Deneyimi, Akademik Erteleme Davranışı ve Akademik Başarısı Arasındaki İlişkilerin İncelenmesi

Atıf:

Alp, A., & Sungur, S. (2017). Investigating relationships between undergraduate students' flow experience, academic procrastination behavior, and calculus course achievement. *Eurasian Journal of Educational Research,* 72, 1-22, DOI: 10.14689/ejer.2017.72.1

Özet

Problem Durumu: Üniversitelerde çeşitli bölümlerde (işletme ve iktisat bölümleri, mühendislik bölümleri, temel bilimler -matematik, istatistik, fizik, kimya, biyoloji- ve ilgili eğitim bilimleri) Analiz dersleri zorunlu ders olarak akademik programlarda yer almaktadır. Analiz dersleri genelde birinci sınıf öğrencilerine verilmektedir ve en yüksek kredili derslerden biridir. Ayrıca çoğu bölümde ön koşullu ders olarak okutulmaktadır. Bu dersi alan öğrenciler, limit, türev ve integral gibi temel konularda bilgi sahibi olmakta ve bu derste başarılı olanlar kendi alanlarında bu teorik bilgileri uygulama yeteneklerini geliştirmektedirler. Fakat, Analiz derslerinde lisans öğrencilerinin başarı düzeyi beklenenin altında kalmaktadır. İlgili alanyazına göre öğrencilerin akademik erteleme davranışının da başarıyı negatif yönde etkilediği bilinmektedir. Fakat, alanyazında, üniversite öğrencileri bağlamında, öğrencilerin motivasyonları çeşitli teorileri baz alarak ölçülmeye çalışılmış olsa da Analiz dersleri başarısına yönelik ve öncelikle "Akış" deneyimine odaklanan geniş çapta araştırmalar yapılmamıştır. Ayrıca, öğrencilerin akademik başarısının, akış deneyimi ve akademik erteleme davranışı arasındaki ilişki Analiz dersleri kapsamında çalışılmamıştır.

Araştırmanın Amacı: Bu araştırmanın 2 temel amacı bulunmaktadır. İlk olarak, lisans öğrencilerinin Analiz I derslerindeki akademik erteleme davranışlarının, akış deneyimin alt boyutlarıyla (görev zorluğu-beceri dengesi, eylem-farkındalık

birleşimi, belirlenmiş hedefler, göreve odaklanma, kendilik farkındalığının azalması, zamanın dönüşümü, amaca ulaşma deneyimi) ilişkilendirilerek incelenmesi amaçlanmıştır. İkinci olarak, lisans öğrencilerinin Analiz I dersindeki akademik başarısının, akademik erteleme davranışı ve akış deneyiminin alt boyutlarıyla ilişkilendirilerek incelenmesi hedeflenmiştir. Bu amaçlar doğrultusunda, bu çalışmada aşağıdaki sorulara cevap aranacaktır:

1. Analiz I dersi öğrencileri için akış deneyiminin alt boyutları akademik erteleme davranışını ne derece yordamaktadır?
2. Akış deneyimi ve akademik erteleme davranışı ne derecede Analiz I dersi başarısını yordamaktadır?

Araştırmanın Yöntemi: Toplamda 117 lisans öğrencisi çeşitli bölümlerden çevrimiçi ankete katılmıştır. Öğrencilerin yaş ortalaması 23'tür (%54 kız ve %46 erkek). Öğrenciler her Likert tipi maddeyi 1'den 5'e kadar derecelendirmişlerdir (1-çok yanlış, 5-çok doğru). Lisans öğrencilerinin Analiz dersindeki akış deneyimi, 36 maddeden oluşan ve 9 alt boyutu olan Akış Durum-2 Ölçeği ile ölçülmüştür. Ölçeğin geçerli Türkçe çevirisi Analiz dersine adapte edilerek kullanılmıştır. Gerekli görülen maddeler çıkarıldıktan sonra, 26 maddeden oluşan ve 7 örtük faktöre yüklenen modelin doğrulayıcı faktör analizi sonuçları şu şekildedir: S-Bχ2(278, N= 117) = 360.525, p < .01, CFI = .962, SRMR = .054, RMSEA = .050 (90%-*CI*: .035 - .064). Lisans öğrencilerinin Analiz dersindeki akademik erteleme davranışı 12 maddeden oluşan Akademik Erteleme Ölçeği ile ölçülmüştür. Ölçeğin geçerli Türkçe çevirisi Analiz dersine adapte edilerek kullanılmıştır. Gerekli görülen 2 madde çıkarıldıktan sonra, 10 maddeden oluşan modelin doğrulayıcı faktör analizi sonuçları şu şekildedir: S-Bχ2(35, N= 117) = 58.646, p < .01, CFI = .969, SRMR = .044, RMSEA = .076 (90%-*CI:* .045 - .104).

Araştırmanın Bulguları: İkili korelasyon sonuçları, yaşın başarıyla pozitif ilişkili olduğunu (r = .21, p < .05), ve akademik erteleme davranışının başarıyla negatif ilişkili olduğunu (r = -.39, p < .01) göstermiştir. Ayrıca, akademik erteleme davranışı kendilik farkındalığının azalması alt boyutu hariç akış deneyiminin bütün alt boyutlarıyla negatif ilişkili olduğunu göstermiştir. Çoklu regresyon analizinde, akademik erteleme davranışı bağımlı, akış deneyimin alt boyutları bağımsız değişken alınarak regresyon modeli oluşturulmuştur ve model anlamlı bulunmuştur: (F (7, 109) = 16.50, p < .01, R^2= .51). Çoklu regresyon analizi, akış kavramının alt boyutlarından olan, odaklanma'nın, akademik erteleme davranışını negatif yordadığını göstermiştir (β = -.70, p < .01). Ayrıca, iki aşamalı hiyerarşik regresyon analizi, ilk aşamada (F (2, 114) = 12.84, p < .01, R^2= .18) akademik erteleme davranışının Analiz dersindeki akademik başarıyı negatif şekilde yordadığını (β = -.37, p < .01), ikinci aşamada (F (7, 107) = 3.74, p < .01, R^2 = .34) ise akademik erteleme davranışının akademik başarıyı yordamadığını ve sadece akış deneyiminin alt boyutlarından olan görev zorluğu-beceri dengesi'nin Analiz dersindeki akademik başarıyı pozitif şekilde yordadığını (β = .30, p < .05) göstermiştir.

Araştırmanın Sonuçları ve Önerileri: Bu çalışmada ilk olarak lisans öğrencilerinin Analiz dersindeki akademik erteleme davranışı ve akış deneyiminin alt boyutları

arasındaki ilişki incelenmiştir. İkinci olarak bu iki kavramın Analiz dersindeki akademik başarı arasındaki ilişki incelenmiştir. Bulgulara göre, akış deneyimin bir alt boyutu olan "göreve odaklanma" akademik erteleme davranışını negatif şekilde yordamaktadır. Bir diğer bulguya göre akademik erteleme davranışı akademik başarıyı negatif şekilde yordarken, "görev zorluğu-beceri dengesi" Analiz dersindeki akademik başarıyı pozitif olarak yordamaktadır. Dolayısıyla, Analiz derslerinde bu iki kavrama önem verilmelidir: "göreve odaklanma" ve "görev zorluğu-beceri dengesi". Eğer öğrencilerin odaklanmasını sağlayan görevler verilirse, erteleme davranışının azalması tahmin edilebilir. Ayrıca eğer öğrencilere onların yeteneklerine ve düzeylerine uygun aktiviteler kolaydan zora doğru hazırlanırsa başarılarının artması tahmin edilebilir. Ayrıca öğrencilerin bu görevleri seçmede onlara sorumluluk ve seçme hakkı verilmesi, kendi yeteneklerinin de farkında olmasını sağlayabilir. Bu bağlamda, ders kapsamında gerçek hayata uygun ve her öğrencinin yeteneğine göre ödevler verilebilir. Bunun bir örneği, son yıllarda uygulamaya başlanan FeTeMM (Fen, Teknoloji, Mühendislik ve Matematik) eğitimidir. Disiplinler arası çalışmalar ve projeler, Analiz derslerinde hem öğrencilerin ilgilerini artırarak odaklanmasını kolaylaştırabilir, hem de öğrencilerin yeteneklerine uygun olması sağlanarak, onların başarılarını artırmada yardımcı olabilir. Bu çalışmanın yanında sonraki çalışmalar, hem daha çok katılımcı sayısıyla yapısal eşitlik modeli kullanarak, bu değişkenler arasındaki ilişkileri doğrudan ve dolaylı etkileri bakımından inceleyebilirler. Ayrıca öğrencilerle yapılacak olan birebir görüşmeler, öğrencilerin Analiz dersindeki akış deneyimi, erteleme davranışları ve akademik başarısı arasındaki ilişkiyi anlamada önemli bir rol oynayacaktır.

Anahtar Sözcükler: Akış, erteleme davranışı, başarı, Analiz dersi.

Eurasian Journal of Educational Research 72 (2017) 23-42

Eurasian Journal of Educational Research
www.ejer.com.tr

An Investigation of Ordering Test Items Differently Depending on Their Difficulty Level by Differential Item Functioning *

Ebru BALTA[1] Secil OMUR SUNBUL[2]

ARTICLE INFO

Article History:
Received: 29 Sep. 2017
Received in revised form: 19 Nov. 2017
Accepted: 21 Nov. 2017
DOI: 10.14689/ejer.2017.72.2

Keywords
Item Orderings, Mantel-Haenszel, Logistic Regression, Moodle

ABSTRACT

Purpose : Position effects may influence examinees' test performances in several ways and trigger other psychometric issues, such as Differential Item Functioning (DIF) .This study aims to supply test forms in which items in the test are ordered differently, depending on their difficulty level (from easy to difficult or difficult to easy), to determine whether the items in the test form result in DIF and whether a consistency exists between the methods for detecting DIF. **Research Methods:** Methods of Mantel Haenszel (MH) and Logistic Regression (LR) have been taken into consideration to identify whether the items in the tests involve DIF. The data of the work includes the answers of 300 students in the focal group and the reference group, who sat for three mathematics achievement tests. The data obtained from the tests have been statistically analyzed by using the R- 3.2.0. software program. **Findings:** Results of this study can be summarized with the following findings: "ordering the items differently, depending on their difficulty level, affects the probability of individuals in various groups answering the items correctly; also, LR and MH methods produce different results with respect to the items with DIF, which they have identified similar in terms of magnitude order in the amount of DIF. **Implications for Research and Practice:** In further test-developing studies, in order to identify if DIF emerges when giving the test form which has a different ordering of items, with regard to subjects and cognitive difficulty levels.

* This article has been produced from Ebru BALTA's master thesis.

[1] Corresponding author: Ankara University, Faculty of Educational Science, Department of Measurement and Evaluation, TURKEY, ebrubalta2@gmail.com, ORCID: orcid.org/0000-0002-2173-7189

[2] Mersin University, Faculty of Educational Science, Department of Measurement and Evaluation, TURKEY, secilomur@gmail.com, ORCID: orcid.org/0000-0001-9442-1516

Introduction

In the field of education and psychology, multiple-choice tests are primarily used to determine student performance. In testing situations, one strategy to deter cheating and to enhance test security in test administration is using alternate test forms, or forms constructed with the same items presented in different order. Scrambling, or the rearrangement of the same set of items to create additional test forms, is often used to discourage examinee copying. The assumption is that an examinee's response to a test item is independent of the context in which that item appears, an assumption that has always been a fundamental postulate underlying the derivations of classical test theory formulas and their applications in practical test analysis procedures (Lord & Novick, 1968). However, the responses of examinees who respond to the alternate forms are organized differently; therefore the scores taken from the test can change, and this situation can affect item and test statistics (Barciovski & Olsen, 1975; Kleinke, 1980). A *position effect* occurs when examinees' response behaviors are inadvertently influenced by the position of an item within a test (Kingston & Dorans, 1984; Leary & Dorans, 1985; Yen, 1980). Position effects may influence examinee test performance in several ways. Learning effects occur when items become easier when they are located at the end of the test. On the other hand, a fatigue effect occurs when items become more difficult when they are located later in the test. When examinees experience fatigue or practice effects on the test items, item difficulty estimation might be biased (Hohensinn et all., 2011). Thus, taking test items in different orders can possibly lower the reliability of the test, by causing test items to be perceived more difficult or easier (Leary & Dorans, 1985). Literature has shown that taking account of position effect is important to the test validity of an assessment (Hahne, 2008). Therefore, it is important to determine the location and order of an item within the test form when the test forms are being edited, in order to ensure that the test scores of individuals with the same ability level are controlled to eliminate differences due to one or more variability sources which are not related to the intended variable to be measured. In other words, it is important in terms of ensuring that test scores are not biased.

Bias is defined as the systematic errors of the measurement process; it is a condition that reduces the validity of the important psychometric properties of a test. Item bias occurs when people who have the same ability level but come from different groups and therefore have a different probability of a correct response (Holland & Wainer, 1993). Item bias involves processes that both investigate statistically the differences in responses given to the items and determine the source of the difference. Statistically differentiating the responses given to the items is called "Differential Item Functioning (DIF)" (Camilli & Shephard, 1994). DIF is a function that determines the situation of displaying differences in responding to an item correctly, depending on subgroups in every ability level or psychological structure targeted for measurement with the item. DIF detection methods can be examined in two groups: methods based on Classical Test Theory (CTT), and methods based on Item Response Theory (IRT). Some of the commonly-used approaches based in CTT, such as the Mantel-Haenszel and Logistic Regression, are powerful methods and are

used in dichotomously-scored items for detecting uniform DIF (Camilli & Shepard, 1994). In this study, methods were used that are based on the classical test theories Mantel-Haenszel (MH) and Logistic Regression (LR); as such, these methods will be discussed here briefly.

Mantel-Haenszel Method (MH)

When using the MH procedure based on a chi-square statistic, examinees are divided into levels according to their abilities, based on their total test scores, and a 2 x 2 contingency table is created for each ability level This table is created by cross-classifying each examinee as being either the Focal and Reference group and as having answered a particular item as right or wrong (Camilli & Shepard, 1994, p.105). The first step in the analysis is to calculate the common odds ratio, α_{MH}. Because the interpretation of these values (α_{MH}) is difficult, a logistic transformation is used. This measure is usually transformed into $\beta MH = \log_e(\propto MH)$. The common odds ratio is often transformed into the scale of differences in item difficulty used by the Educational Testing Service (ETS) by the Formula $\Delta_{MH} = -2{,}35\ \beta_{MH}$ (Holland &Wainer, 1993). ETS uses three categories to reflect the degree of DIF in items, labeling these A, B, and C. The categories are then defined by Zieky (1993) as follows: Type A items—negligible DIF: items with $|\Delta_{MH}| < 1$; Type B items—moderate DIF: items with $1 \leq |\Delta_{MH}| < 1.5$; Type C items—large DIF: items with $|\Delta_{MH}| \geq 1.5$.

Logistic Regression Method (LR)

The LR model, when applied to DIF detection, uses item response (0-1) as the dependent variable. Independent variables include group membership, ability, and group-by-ability interaction variables. The procedure for identifying DIF uses logistic regression and consists of fitting the models (Camilli & Shepard, 1994, p.126). A model comparison test can be used to simultaneously detect uniform and nonuniform DIF (Swaminathan & Rogers, 1990). With the Chi-squared (χ^2) test for logistic regression one can compute the statistical tests for DIF. In addition, the chi-squared value of each step is obtained, and the $R^2\Delta$ value is also calculated. Zumbo and Thomas (1996) proposed $R^2\Delta$ as a weighted least squares effect size measure for the LR DIF procedure, which could be used to quantify the magnitude of uniform or nonuniform DIF in items. Zumbo and Thomas (1996) suggested a negligible, moderate, and large classification method for $R^2\Delta$. They proposed $R^2\Delta$ values below 0.13 ($\Delta R^2 < 0.13$) for negligible or A-level DIF; between 0.13 and 0.26 ($0.13 \leq \Delta R^2 \leq 0.26$) for moderate or B-level DIF; and above 0.26 ($\Delta R^2 \geq 0.26$) for large or C-level DIF. We used the Zumbo and Thomas (1996) classification schemes in this study.

This study aims to supply test forms in which items in the test are ordered differently, depending on their difficulty level (from easy to difficult or difficult to easy), to determine whether the items in the test form result in DIF and to determine whether a consistency exists between the methods for detecting DIF. When the related literature is examined, studies are found—in Turkey and internationally—on item ordering in multiple choice tests, item and test statistics, test stress, test anxiety and test performance. Furthermore, some other studies have examined whether a difference exists between individuals from different groups and item ordering. These

studies have investigated item orderings with regard to various variables (e.g. gender, school type, etc.). All of this is to say that DIF has been examined in the relevant literature (Bulut, 2015; Chiu, 2012; Klimko, 1984; Miller, 1989; Ryan & Chiu, 2001). However, there is little research from abroad—and much less in Turkey—examining whether ordering items in respect of difficulty levels in a multiple-choice test creates DIF. Hence, this study is expected to contribute to the literature and to shed light on future studies. The study aims to answer the following questions with the results of the analyses with the following methods:

1. In the analysis performed with MH and LR methods

Is there any item indicating DIF

a. Under the conditions that the focal group takes the test form of item ordering with the difficulty level processing from easy to difficult, while the reference group takes the test form of item ordering with the difficulty level processing from difficult to easy?

b. Under the conditions that the focal group takes the test form of item ordering with the difficulty level processing from difficult to easy, while the reference group take the test form of item ordering with the difficulty level processing from easy to difficult?

c. In the analysis performed with MH and LR methods in both situations, are the items which indicate DIF are the same, or do they differ?

2. In the analysis performed with MH and LR methods

Are the items which indicate DIF in accordance with each other

a. Under the conditions that the focal group takes the test form of item ordering with the difficulty level processing from easy to difficult, while the reference group take the test form of item ordering with the difficulty level processing from difficult to easy?

b. Under the conditions that the focal group takes the test form of item ordering with the difficulty level processing from difficult to easy, while the reference group take the test form of item ordering with the difficulty level processing from easy to difficult?

Method

Research Design

This study aims to determine whether any DIF occurs, depending on: the different test forms in which items in the test are ordered differently; their difficulty level; and various analysis methods. Therefore, it may be considered as a baseline survey. Moreover, the study has a theoretical feature, in terms of giving information about the similarities and differences between the methods that are used in the study.

Research Sample

Participants were selected by purposive sampling method from among the students who study at Mersin University in Turkey, particularly students in the Erdemli and Social Sciences Vocational High School. Since the study has a repeated-measuring basis, the sample group of the study was assigned after some matching and data preview processes; it consisted of 300 students in total (focal group, 150 students, 50%; reference group, 150 students, 50%).

Research Instrument and Procedure

Three tests were used in the research, including two parallel tests on 'Square Roots and Operations with Square Roots', which is the subtitle of the Basic Mathematics Course topic of 'Numbers'. Test 1 was employed for constituting focal and reference groups and for measuring the students' competence levels, in terms of their knowledge and skills in basic mathematics course. Test 2 and Test 3, which are parallel tests, were employed for detecting whether DIF arises as a result of giving different test forms, ordered from difficult to easy and from easy to difficult. In order to make sure participants answered the items in the tests in the presented order, an open-source learning system via computer, called Moodle, was used. Table 1 demonstrates the test implementation design.

Table 1

The Design of Test Implementation

Group	Test 1	Before	After
Focal	✓	Test 2(ED Test Form)	Test 3
Reference	✓	Test 3(DE Test Form)	Test 2

According as the aim of the study, before starting the exam, participants partaking in the practice at the same time were equalized in terms of math knowledge and skills, with respect to their Test 1 scores; after that, they were divided into two groups, the focal group and the reference group. The tests were implemented in a balanced way, by ensuring that the focal group began with Test 2 while the reference group began with Test 3. At a one-week interval, the focal group (who had taken Test 2 in the previous application) was given Test 3, whereas the reference group (who had taken Test 3 in the previous application) was given Test 2. Thus, all participants took all test forms. Sequence effect has been eliminated by using a counter-balanced design.

Validity and Reliability

Before the trial test application, expert opinions were consulted to review the drawn items in terms of some criteria. The opinions were obtained from a group of 10 people consisting of experts in the fields of measurement and evaluation, and mathematics education, as well as teaching assistants of Vocational High Schools who give basic mathematics courses. Fleiss's Kappa coefficient was used to compute inter-rater consistency. Fleiss's Kappa Coefficients was 0.931 for Test 1, while the coefficients for Tests 2 and 3 were 0.930. In line with these results, a perfect

consistency can be considered as occurring the experts (raters). Additionally, experts were consulted about whether items of Test 2 and Test 3 were parallel; consequently, Fleiss's kappa coefficient was found to be 0.947 between Test 2 and Test 3. It can be said that there is a perfect consistency between experts about parallelism of the tests according to this kappa. The trial test form of Test 1 (which consisted of 40 multiple-choice items) was implemented to 365 students, whereas trial forms of parallel Tests 2 and Test 3 were implemented to 167 students repeatedly with a one-week interval. After implementation, the number of items in the tests was reduced to 20. Table 2 and Table 3 indicate test and item statistics about the final test form of Test 1, which consisted of 20 multiple-choice items used to measure students' competence levels in terms of their knowledge and skills in basic mathematics.

Table 2

Test Statistics of Test 1

Number of Items	20
Number of Participants	365
Mean	10.3
Variance	45.02
Standard Deviation	6.71
Skewness	0.22
Kurtosis	1.46
Median	8.00
KR 20	0.94

Table 3

Item Statistics of Test 1

Item Number	Item Difficulty Index	Item Discrimination Index	Item Standard Deviation
1	0.73	0.71	0.44
2	0.68	0.84	0.46
3	0.66	0.79	0.47
4	0.62	0.77	0.48
5	0.61	0.78	0.49
6	0.57	0.68	0.49
7	0.55	0.75	0.5
8	0.53	0.79	0.5
9	0.52	0.74	0.5
10	0.50	0.7	0.5
11	0.49	0.76	0.5
12	0.48	0.81	0.5
13	0.47	0.79	0.5
14	0.46	0.72	0.5
15	0.44	0.77	0.5
16	0.43	0.59	0.49
17	0.42	0.84	0.49
18	0.41	0.69	0.49
19	0.38	0.76	0.48
20	0.3	0.52	0.46

Table 4 and Table 5 indicate test and item statistics of the final test forms of the parallel tests (Test 2 and Test 3), which consisted of 20 multiple-choice items.

Table 4

Test Statistics of Test 2 and Test 3

	Test No.	
	2	3
Number of Items	20	20
Number of Participants	167	167
Mean	10.54	10.73
Variance	40.96	46.92
Standard Deviation	6.4	6.85
Skewness	1.54	1.38
Kurtosis	0.03	0.02
Median	11.00	10.00
KR 20	0.93	0.94

Table 5

Item Statistics of Test 2 and Test 3

Item Number	Item Difficulty Index	Item Discrimination Index	Item Standard Deviation	Item Number	Item Difficulty Index	Item Discrimination Index	Item Standard Deviation
1	0.77	0.46	0.42	20	0.75	0.77	0.43
2	0.71	0.54	0.45	19	0.71	0.86	0.45
3	0.7	0.76	0.46	18	0.7	0.86	0.46
4	0.67	0.66	0.47	17	0.65	0.66	0.48
5	0.66	0.67	0.48	16	0.6	0.79	0.49
6	0.6	0.78	0.49	15	0.56	0.79	0.5
7	0.58	0.72	0.49	14	0.55	0.78	0.5
8	0.57	0.73	0.49	13	0.56	0.81	0.5
9	0.56	0.77	0.5	12	0.55	0.78	0.5
10	0.54	0.7	0.5	11	0.55	0.71	0.5
11	0.53	0.78	0.5	10	0.51	0.8	0.5
12	0.51	0.57	0.5	9	0.5	0.63	0.5
13	0.47	0.64	0.5	8	0.49	0.77	0.5
14	0.45	0.75	0.5	7	0.48	0.75	0.5
15	0.41	0.78	0.49	6	0.47	0.84	0.5
16	0.4	0.74	0.49	5	0.45	0.73	0.5
17	0.38	0.77	0.49	4	0.39	0.72	0.49
18	0.34	0.74	0.48	3	0.37	0.71	0.48
19	0.32	0.56	0.47	2	0.34	0.58	0.47
20	0.21	0.64	0.41	1	0.29	0.53	0.46

Mean and median values of the test scores are close; kurtosis and skewness coefficient values are positive and close to zero; and reliability is observed as quite

high. Moreover, the correlation coefficient between Test 2 and Test 3 is calculated as 0.941. Once the test and item statistics are considered, it can be accepted that the tests are parallel. In addition to statistical parallelism, 8 experts studying in the measurement/evaluation and math education fields were consulted about parallelism of the tests. As a result of this consultation, a Fleiss Kappa consistency coefficient has been computed to check whether the tests are parallel in terms of the content as well. This Fleiss Kappa coefficient was 0.908 between Test 2 and Test 3. In conclusion, a perfect consistency among the experts has been asserted on the parallelism of the tests. In order to reveal the content validity, some experts were asked to evaluate selected items in the final tests, with regard to particular criteria; as a consequence, a Fleiss Kappa consistency coefficient was calculated for each test. This Fleiss Kappa consistency coefficient was found as 0.869 for Test 2 and Test 3. Thus, the perfect consistency among the experts is regarded as an indicator of the content validity.

Data Analysis

DIMTEST T statistic, which is a nonparametric multidimensionality, has been computed by using the Dimpack 1.0 packaged program in order to examine whether the data meet the assumption. According to the analysis results, regarding the unidimensionality of the tests, for Test 1, T=1.391 (p=.082); for Test 2, T=1.389 (p=.082); for Test 3, T=1.230 (p=.109). Therefore, the assumption of unidimensionality was not rejected for three tests. Descriptive statistics of Test 1 were calculated. Table 6 illustrates the descriptive statistics about Test 1.

Table 6

Descriptive Statistics of Test 1

	Group	
	Focal	Reference
Number of Participants	150	150
Mean	8.26	8.27
Median	8.00	8.00
Mode	7.00	7.00
Standard Deviation	4.38	4.39
Variance	19.21	19.34
Skewness	-0.14	-0.12
Kurtosis	0.52	0.53
Minimum	1.00	1.00
Maximum	19.00	19.00

It can be asserted that the focal and reference groups have similar features, and that similar statistical values have been obtained regarding group mean and homogeneity. Once kurtosis and skewness values are investigated, tiny deviations can be observed according to the normal distribution. A Mann-Whitney U test was performed to determine whether focal group and reference group participants significantly differed in their means of rank difference; with respect to these results,

there was no significant difference between the means of rank difference at 0.05 significance level (U= 11247,00, p>.05). Descriptive statistics can provide a view on whether a significant difference prevents DIF analysis for subgroups.

To analyze data for the first sub-problem, two separate MH and LR analyses were performed according to the first condition (focal group takes ED Test Form and reference group takes DE Test Form) and the second condition (focal group takes DE Test Form and reference group takes ED Test Form), after determining focal and reference groups. As a result of the first and second MH analyses, items demonstrating DIF were compared in terms of numbers and their levels. In the LR analysis method, two different analysis results were obtained in order to determine uniform and non-uniform DIF. Independent sample *t*-tests were performed to indicate the group to which DIF detected items providing an advantage. Items demonstrating DIF as a result of the first and second LR analyses were compared in terms of numbers and their levels.

To analyze data for the second sub-problem—whether the results regarding to DIF are concordant—DIF levels were compared with total number of DIF items, with respect to the findings of both MH and LR analyses in both conditions. Spearman's rank difference correlation coefficient was computed to determine the similarities between two methods regarding item ordering according to the amount of DIF they demonstrated. Analyses determining DIF were conducted with the R.3.0.1 packaged program and the "*difR*" package (Magis, Beland and Raiche, 2015), while the other analyses were performed using SPSS 20.0 and Microsoft Excel 2010.

Results

Findings Related to Items that Demonstrate DIF in Analyses Performed with MH and LR Methods

After the analysis performed with MH method for the first condition, 4 items were discovered to demonstrate moderate level (B) DIF, and 1 item demonstrated large level (C) DIF. One of the items showing B level DIF (item 15) was observed to have a medium difficulty level. One of the other items showing B level DIF (item 17) has a high difficulty level (difficult item); in addition, it is in support of the examinees given the ED test form (focal group). The other two items showing B level DIF (items 18 and 19) have a high difficulty level (difficult item) and are in favor of the examinees given the DE test form (reference group). Item 7, with a C level DIF, has a medium level difficulty and is support of the group that took the DE test form.

After the analysis performed for the second condition, 1 item was discovered to demonstrate moderate level (B) DIF, and 5 items demonstrated large level (C) DIF. Item 20 with a B level DIF has a high difficulty level (difficult item) and is in favor of the group that took the ED test form (reference group). Two of the 5 items demonstrate C level DIF: item 5, which has a low difficulty level (easy item); and item 13, which has a medium level difficulty. Both are in support of the group that took the DE test form (focal group). Two of the remaining 3 items (items 7 and 16) have a medium level difficulty, and the last item (item 19) has a high difficulty level

(difficult item); these are in favor of the group that took the ED test form (reference group). The graphs of the Δ_{MH} values of the test items are shown in Figure 1 and Figure 2.

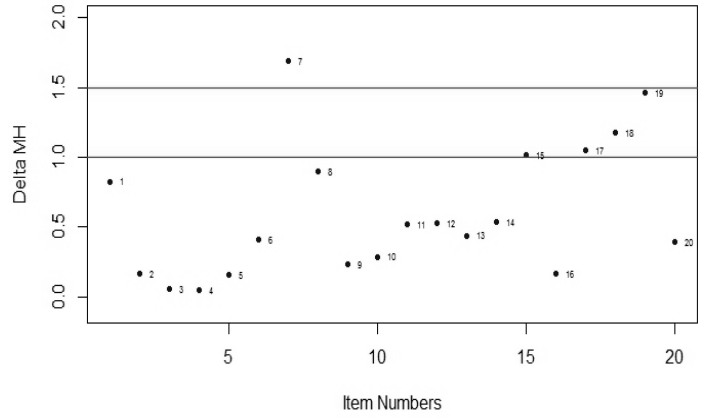

Figure 1. The Δ_{MH} values of items related to the MH analysis performed for the first circumstances

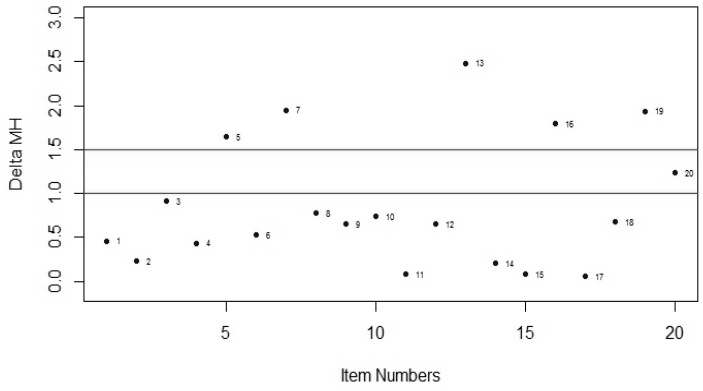

Figure 2. The Δ_{MH} values of items related to the MH analysis performed for the second circumstances

An analysis performed with the LR method was used to identify whether the items in the tests demonstrate both uniform and non-uniform DIF in the first condition; in these results, it appears that no item demonstrates moderate level (B) and/or large level (C) DIF. An analysis performed with the LR method was used to identify whether the items in the tests demonstrate uniform DIF in the second condition; in these results, it can be seen that 1 item has demonstrated moderate level (B) DIF. One of the items having B level DIF (item 13) has a medium difficulty level

and is in favor of the group that took the DE test form (focal group). One of the other items having B level DIF (item 17) has a medium difficulty level and is in favor of the group that took the ED test form (reference group). Another analysis was performed with the LR method to identify whether the items in the tests demonstrate non-uniform DIF in the second condition; in these results, it appears that no item demonstrates moderate level (B) and large level (C) DIF. The graphs of the $R^2\Delta$ values of the test items are shown in Figure 3, Figure 4, Figure 5, and Figure 6.

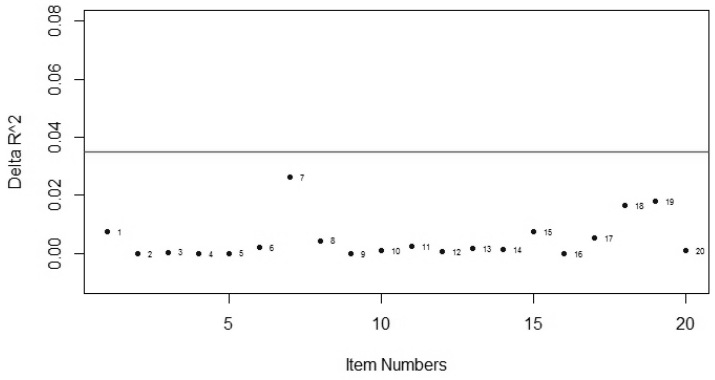

Figure 3. The $R^2\Delta$ values of items related to the LR analysis used to identify uniform DIF performed for the first circumstances

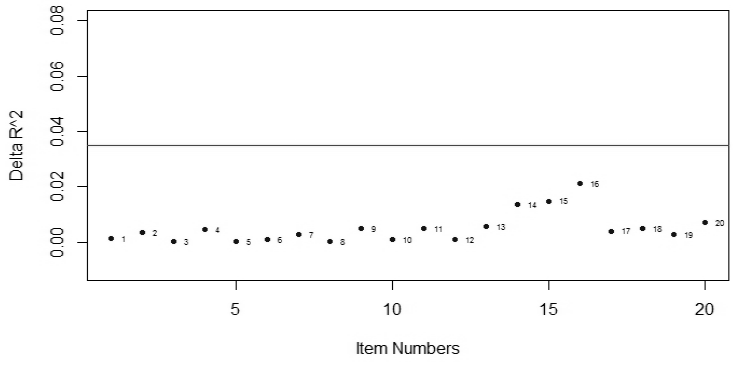

Figure 4. The $R^2\Delta$ values of items related to the LR analysis used to identify non-uniform DIF performed for the first circumstances

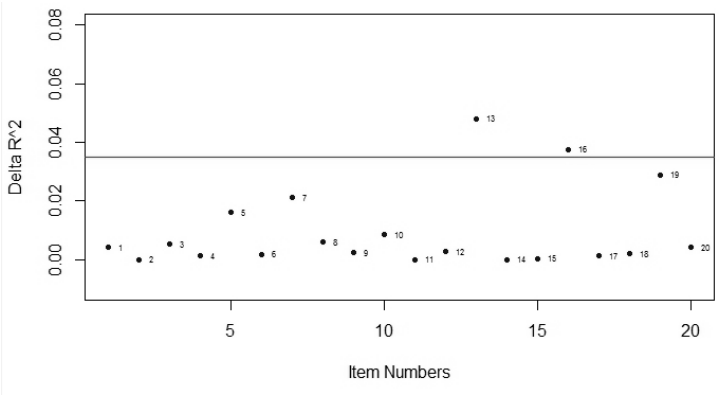

Figure 5. The $R^2\Delta$ values of items related to the LR analysis used to identify uniform DIF performed for the second circumstances

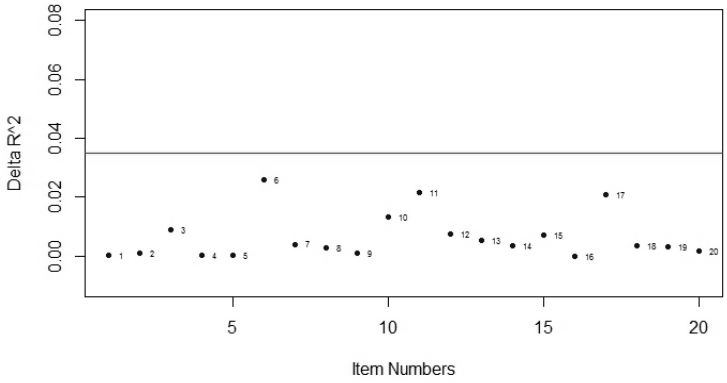

Figure 6. The $R^2\Delta$ values of items related to the LR analysis used to identify non-uniform DIF performed for the second circumstances

Findings whether Items Demonstrating DIF Correspond to Each Other in the Analyses Performed with MH and LR Methods

To determine similarities in magnitude order in the amount of DIF, Spearman's rank correlation coefficient was computed between chi-square values. These values were obtained by the LR method used to identify whether the items in the tests demonstrate uniform DIF and MH method. As a result of the calculations for both conditions, a statistically significant relationship can be seen between magnitude orders in the amount of DIF of the two methods ($r_1 = 0.90$, $r_2 = 0.92$, $p < .01$).

Discussion and Conclusion

Evaluation of MH Method-Analyze Results

When examinees from the focal group took the ED test form first, DIF emerged in favor of this group for the high difficulty level items (difficult items). On the other hand, DIF did not emerge in favor of this group for the low difficulty level items (easy items) when they took the DE test form later. As for examinees from the reference group, who took the ED test form second, it was observed that items with DIF at the moderate level increased, while DIF was highest at the high-difficulty level items. In light of these findings, the ordering of taking the test forms in other words, order effect can be said to affect the probability of answering the items correctly.

According to the findings of both analyses examined in terms of low difficulty level items (easy items), it can be argued that the group who took easy items later had a higher probability of answering the items correctly. Encountering items with medium difficulty after encountering easy or difficult items affects the probability of answering the items correctly. Similarly, it was found that it does not matter if difficult items are at the beginning or the end of test; their ordering affects the probability of answering the items correctly according to the findings of both two analyses. Therefore, it can be concluded that correct response probability is affected by encountering particularly difficult items both in the beginning and at the end of test or encountering items with medium difficulty after easy or difficult items. Additionally, analyses performed with the MH method revealed that the number of items that have DIF, and the items with DIF, differentiate according to the DIF level and the groups they support.

Therefore, it can be concluded from this study that ordering items differently depending on their difficulty level affects the probability of examinees in various groups answering the items correctly. Furthermore, it can be concluded that the placement of difficult items at the end of the test leads to an increased difference in the probability of the items being answered correctly. This finding is in agreement with learning effects, which exist in cases where items are put in order from easy to difficult—in other words, placing difficult items at the end of the test. In addition, this finding is consonant with other studies that have concluded that different item orderings (with respect to difficulty levels) make a significant difference in individuals' test performances (Barciovski & Olsen, 1974; Louisa, 2013).

Evaluation of LR Method-Analyze Results

The results of the analysis performed with the LR method (used to identify both uniform and nonuniform DIF in the first condition) indicated that there is no difference between the probabilities of examinees in both groups answering the items correctly; in other words, individuals from both the focal and the reference group have similar responses to the items. In the second condition, however, both the focal and the reference group showed higher performance on two item. In addition, examinees from different sub-groups differed in the probability of answering two items correctly. Thus, it can be concluded that encountering items with medium difficulty after easy or difficult items influences the probability of the items being answered correctly. Moreover, taking a test form first or second can affect the examinees' correct response probability, that is, order effect can influence the correct response probability.

Comparison of MH and LR Analyses Results

Concerning the findings, the LR and MH methods used in two analyses revealed similar consequences in terms of magnitude order in the amount of DIF; however, they produced different results with respect to the items with DIF. The MH method is more sensitive than the LR method with regard to the number of items containing DIF. This sensitivity might be explained, as the MH method estimates item parameters of the focal and reference groups at the same time, and thus the total sample size is larger than LR. From this point of view, the reason for why LR finds fewer items with DIF might be regarded as stemming from sample size (Penfield & Camilli, 2007). It has been stated that the LR method may reveal more sensitive results in larger samples (Jodoin & Gierl, 2001; Pang et al., 1994). Other studies have also failed to find an exact accordance between these two DIF determining methods (Betrand & Bouteau, 2003; Gomez, Benito & Navas Ara, 2000). Although several studies have argued that the MH method is more powerful in identifying DIF and gives more consistent results (Betrand & Bouteau, 2003; Narayanan & Swaminathan, 1994), other studies have argued that the LR method is one of the most effective and recommended methods in the literature (Clauser & Mazor, 1998; Wiberg, 2007). Despite this fact, similarity in terms of magnitude order in the amount of DIF, and difference in the criteria used for identifying the items with DIF, are considered to produce variation in DIF levels and the number of items with DIF. Some recommendations for future research are as follows:

Future studies may use other methods based on CTT or other methods based on IRT, in order to identify DIF. Results from these various studies may be compared.

Future studies may investigate whether DIF (in terms of lower skill levels) is caused by giving different test forms in which the items are encountered in different orders.

References

Barcikovski, R. S., & Olsen, H. (1975). Test item arrangement and adaptation level. *The Journal of Psychology, 90(1),* 87-93. doi: 10.1080/00223980.1975.9923929.

Bertrand, R., & Boiteau, N. (2003). *Comparing the stability of IRT-based and non IRT-based DIF methods in different cultural context using TIMSS data.* (EDRS Reports – Research -143 , ED 476 924, TM 034 975). Quebec, Canada: NA. (ERIC Document Reproduction Service No. ED476924).

Bulut, O. (2015). An empirical analysis of gender-based DIF due to test booklet effect. *European Journal of Research on Education*, *3(1),* 7-16. Retrieved from http://iassr2.org/rs/030102.pdf

Camilli, G., & Shepard, L. A. (1994). *Methods for identifying biased test items.* Hollywood: Sage Publication.

Clauser, B. E., & Mazor, K. (1998). Using statistical procedures to identify differentially functioning test items. *Educational Measurement, Issues and Practice. 17(1),* 31–44. doi: 10.1111/j.1745-3992.1998.tb00619.x.

Chiu, P. (2012,April) . *The Effect of item position on state mathematics assessment.* Paper presented at the Annual Meeting of the American Educational Research Association, Vancouver, Canada.

Gomez-Benito, J., & Navas-Ara, M. J. (2000). A comparison of Ki-kare, RFA and IRT based procedures in the detection of DIF. *Quality ve Quantity*, *34(1),*17–31. doi: 10.1023/A:1004703709442.

Hahne, J. (2008). Analyzing position effects within reasoning items using the LLTM for structurally Incomplete data. *Psychology Science Quarterly*, *50(3),* 379-390. Retrieved from http://journaldatabase.info/articles/analyzing_position_effects_within.html

Hohensinn, C., Kubinger, K. D., Reif, M., Schleicher, E., & Khorramdel, L. (2011). Analysing item position effects due to test booklet design within large-scale assessment. *Educational Research and Evaluation*, *17(6)*, 497-509. doi: 10.1080/13803611.2011.632668.

Holland, P. W., & Wainer, H. E. (1993). Differential item functioning. Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Jodoin, M. G., & Gierl, M.J. (2001). Evaluating type I error and power rates using an effect size measure with logistic regression procedure for DIF detection. *Applied Measurement in Education*, *14(4),* 329-349. doi:10.1207/S15324818AME1404_2.

Kingston, N. M., & Dorans, N. J. (1984). Item location effects and their implications for IRT equating and adaptive testing. *Applied Psychological Measurement*, *8(2),* 147–154. Retrieved from doi: 10.1177/014662168400800202.

Kleinke, D. J. (1980). Item order, response location, and examinee sex and handedness on performance on multiple-choice tests. *Journal of Educational Research, 73(4)*, 225–229. doi:10.1080/00220671.1980.10885240.

Klimko, I. P. (1984). Item arrangement, cognitive entry characteristics, sex, and test anxiety as predictors of achievement examination performance. *Journal of Experimental Education, 52(4),* 214-219. doi: 10.1080/00220973.1984.11011896.

Leary, L. F., & Dorans, N. J. (1985). Implications for altering the context in which test items appear: A Historical Perspective on Immediate Concern. *Review of Educational Research, 55(33),* 387-413. doi: 10.3102/00346543055003387.

Lord, F. M.,& Novick, M. R. (1968). *Statistical theories of mental test scores.* Reading, Mass.: Addison-Welsley Publishing Company.

Louisa, N. (2013). Effect of item arrangement on test reliability coefficients: implications for testing. *Journal of Research in Education and Society*, *4(3),* 54-62. Retrieved from http://journals.sagepub.com/doi/abs/10.1177/001316447303300224?journalCode=epma

Magis, D., Beland, S., & Raiche, G. (2015). *difR: Collection of methods to detect dichotomous differential item functioning (DIF).* [Computer software]. Available from http://CRAN.R-project.org/package=difR

Miller, S. K. (1989). *Interaction effects of gender and item arrangement on test and item performance (*Unpublished doctoral dissertation). University of Nebraska, Lincoln.

Narayanan, P., & Swaminathan, H. (1994). Performance of the Mantel-Haenszel and simultaneous item bias procedures for detecting differential item functioning. *Applied Psychological Measurement*, *18(4),* 315-338. doi: 10.1177/014662169401800403.

Pang, X. L., & et all. (1994,April). *Performance of Mantel-Haenszel and Logistic Regression DIF procedures over replications using real data.* Paper presented at the Annual Meeting of the American Educational Research Association,New Orleans, LA.

Penfield, R. D., & Camilli, G. (2007). Differential item functioning and item bias. In C. R. Rao & S. Sinharay (Eds.), *Handbook of statistics psychometrics* (Vol.26, pp. 125–167). Amsterdam: Elsevier.

Ryan, K. E. ,& Chiu, S. (2001). An examination of item context effects, DIF, and gender DIF. *Applied Measurement in Education, 14 (1),* 73–90. doi:10.1207/S15324818AME1401_06.

Wiberg, M. (2007). *Measuring and detecting differential item functioning in criterion-referenced licensing test: a theoretic comparison of methods* (EM No. 60). Umea, Sweden: Umea University, Department of Educational Measurement.

Swaminathan, H., & Rogers, H. J. (1990). Detecting differential item functioning using logistic regression procedures. *Journal of Educational Measurement*, *27(4)*, 361-370. doi: 10.1111/j.1745-3984.1990.tb00754.x.

Zieky, M. (1993). Practical questions in the use of DIF statistics in test development. In P. W. Holland & H. Wainer (Eds.), *Differential item functioning* (pp. 337-347). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Yen, W. M. (1980). The extent, causes and importance of context effects on item parameters for two latent trait models. *Journal of Educational Measurement, 17(4)*, 297–311. doi: 10.1111/j.1745-3984.1980.tb00833.x.

Zumbo, B. D., & Thomas, D. R. (1996). *A measure of effect size for a model-based approach for studying DIF* (Working paper of the Edgeworth Laboratory for Quantitative Behavioral Science). Prince George, Canada: University of Northern British Columbia.

Maddeleri Güçlüklerine Göre Farklı Sıralamanın Birey Tepkilerine Etkisinin Değişen Madde Fonksiyonuyla İncelenmesi

Atıf:

Balta, E. & Sunbul Omur, S. (2017). An investigation of ordering test items differently depending on their difficulty level by differential item functioning. *Eurasian Journal of Educational Research,* 72, 23-42, DOI: 10.14689/ejer.2017.72.2

Özet

Problem Durumu: Bireylerin maddelere verdiği tepki davranışlarının, maddenin, test içerisindeki sırasından beklenmedik şekilde etkilenmesi sıra etkisi (position effect) olarak tanımlanmaktadır. Sıra etkisi bireyin test performansını çeşitli şekillerde etkilemektedir. Madde güçlüğü açısından kolay ve zor maddelerin testin başında ya da sonunda yer almasına bağlı olarak öğrencilerin test boyunca motivasyonları artıp ya da azalmakta ve böylece test puanları etkilenmektedir. Ayrıca, maddelerin güçlük düzeylerine göre kolaydan zora doğru sıralandığı, yani madde güçlüğü açısından zor maddenin testin sonlarına doğru yer aldığı durumlarda pratik ya da öğrenme etkisi (learning effect), madde güçlüğü açısından kolay maddelerin testin sonlarına doğru yer aldığı durumlarda ise yorgunluk etkisi (fatique effect) gözlenmekte ve böylece maddelerin güçlük düzeyleri farklı değerler alabilmektedir. Literatür incelendiğinde madde sıra etkisinin göz önünde bulundurulması test geçerliğini değerlendirmede önemli olduğu görülmektedir.

Araştırmanın Amacı ve Önemi: Bu çalışmada, maddelerin güçlük düzeylerine göre test içerisinde farklı sıralarda (kolaydan zora ve zordan kolaya) yerleştirildiği farklı test formlarının verilmesinin, testte yer alan maddelerde DMF oluşturup

oluşturmadığının ve kullanılan DMF belirleme yöntemleri arasındaki uyumun belirlenmesi amaçlanmıştır. Çoktan seçmeli bir testte yer alan maddelerin güçlük düzeylerine göre sıralanmasının maddelerde Değişen Madde Fonksiyonu (DMF) yaratıp yaratmadığına ilişkin yurtdışında çok az çalışmaya rastlanmış olup yurtiçinde ise doğrudan bir çalışmaya rastlanamamıştır. Bu açıdan, bu çalışmanın alan yazına katkı sunacağı ve bu tarz çalışmalara ve geniş çapta yapılan sınavlara da ışık tutacağı düşünülmektedir.

Araştırmanın Yöntemi: Araştırmada, araştırmacı tarafından ikisi paralel olmak üzere toplamda üç adet Matematik Başarı Testi kullanılmıştır. Testlerden biri, odak ve referans gruplarının oluşturulması için, öğrencilerin Temel Matematik dersindeki bilgi ve becerileri açısından yetenek düzeylerinin belirlenmesinde ve paralel olan diğer iki test ise, maddelerin güçlük düzeylerine göre kolaydan-zora ve zordan-kolaya sıralanarak verilmesi durumunun DMF yaratıp yaratmadığının tespit edilmesinde kullanılmıştır. Öğrencilerin testlerdeki maddeleri, testlerde yer alan sıraya göre cevapladıklarından emin olmak için testler, bilgisayar ortamında Moodle açık kaynak kodlu uzaktan eğitim sistemi kullanılarak uygulanmıştır. Araştırmanın çalışma grubunu, amaçlı örnekleme yöntemiyle seçilen, araştırmanın tekrarlı ölçümlere dayanmasından kaynaklı olarak yapılan eşleştirme ve veri ön izleme süreçlerinin ardından belirlenen, toplamda 300 (odak grup (150 öğrenci) ve referans grup (150 öğrenci)) öğrenci oluşturmaktadır. Uygulamaya katılan öğrencilerin üç test formunu da alması sağlanmıştır. Karşıt dengelenmiş desen kullanılarak testlerdeki sıra etkisi ortadan kaldırılmıştır. Testlerde yer alan maddelerin DMF içerip içermediği Mantel-Haenszel (MH) ve Lojistik Regresyon(LR) yöntemleriyle odak grubunun KZ (maddelerin kolaydan zora doğru sıralandığı test formu), referans grubunun ZK (maddelerin zordan kolaya doğru sıralandığı test formu) test formunu alması (birinci durum) ve odak grubunun ZK, referans grubunun KZ test formunu alması durumuna (ikinci durum) göre belirlenmiştir. Bu testlerden elde edilen veriler R-3.2.0 ve "*difR"* paketi kullanılarak analiz edilmiştir.

Araştırmanın Bulguları: Birinci duruma göre, MH yöntemiyle yapılan analiz sonuçlarına göre DMF gösteren maddelerden, dört tanesinin orta düzeyde (B), bir tanesinin de yüksek düzeyde (C) DMF gösterdiği belirlenmiştir. B düzeyinde DMF gösteren maddelerden bir tanesinin orta güçlükte madde, bir tanesinin ise zor madde ve KZ test formunu alan öğrencilerin (odak grup) lehine olduğu ve diğer iki tanesinin ise zor madde ve ZK test formunu alan öğrencilerin (referans grup) lehine olduğu görülmektedir. C düzeyinde DMF içeren maddenin ise, orta güçlükte bir madde olduğu ve ZK test formunu alan öğrencilerin lehine olduğu görülmektedir. LR yöntemiyle hem TB DMF hem de TBO DMFyi belirlemek için yapılan analizlerde ise, orta düzeyde (B) ve yüksek düzeyde (C) DMF gösteren maddenin bulunmadığı görülmektedir. İkinci duruma göre, MH yöntemiyle yapılan analiz sonuçlarına göre, bir maddenin orta düzeyde (B), beş maddenin de yüksek düzeyde (C) DMF gösterdiği belirlenmiştir. B düzeyinde DMF içeren maddenin zor madde olduğu ve KZ test formunu alan öğrencilerin lehine olduğu, C düzeyinde DMF gösteren iki maddeden bir tanesinin kolay madde, bir tanesinin ise orta güçlükte madde ve ZK test formunu alan öğrencilerin lehine olduğu ve üç maddeden iki tanesinin orta

güçlükte madde ve bir tanesinin ise zor madde olduğu ve KZ test formunu alan öğrencilerin lehine olduğu görülmektedir. LR yöntemi ile TB DMF'yi belirlemek için yapılan analiz sonucuna göre iki maddenin orta düzeyde (B) DMF gösterdiği belirlenmiştir. Orta düzeyde (B) DMF gösterdiği belirlenen iki maddenin de orta güçlükte madde olduğu ve maddelerden bir tanesinin ZK test formunu alan öğrencilerin lehine diğerinin ise KZ test formunu alan öğrencilerin lehine işlediği görülmektedir. Yöntemlerin maddelerdeki DMF miktarlarının büyüklük sıralaması bakımından benzerliklerinin belirlenebilmesi için, test maddelerinin TB DMF gösterip göstermediğini belirleyebilmek için yapılan LR ve MH yöntemlerine göre elde edilen ki-kare değerleri arasında Spearman sıra farkları korelasyon katsayısı hesaplanmıştır. Hesaplamalar sonucunda her iki durum için de, iki yöntemin DMF büyüklük sıralamaları arasında istatistiksel olarak manidar bir ilişkinin bulunduğu görülmektedir ($r_1 = .90$, $r_2 = .92$; $p < .01$).

Araştırmanın Sonuçları ve Önerileri: Araştırmanın bulguları, güçlük düzeyi düşük olan maddeler açısından incelendiğinde, kolay maddeleri sonra alan grubun, maddeleri doğru cevaplama olasılıklarında artışların olduğu söylenebilir. Orta güçlükte yer alan maddelerin, her iki uygulamada da hem odak hem de referans grubunun lehine işlediği görülmektedir. Bu durumda, orta güçlükteki maddelerin kolay ya da zor maddeden sonra gelmesinin maddenin doğru cevaplama olasılığını etkilediği söylenebilir. Güçlük düzeyi yüksek olan maddeler (zor maddeler) açısından, her iki analize dair bulgular incelendiğinde, zor maddelerin hem testin başında yer aldığı durumda hem de testin sonunda yer aldığı durumda, maddelerin doğru cevaplandırılma olasılığını etkilediği söylenebilir. Böylece bu çalışmada, maddelerin güçlük düzeylerine göre farklı şekilde sıralanmasının farklı gruplarda yer alan bireylerin, maddelere, doğru cevap verme olasılıklarını etkilediği sonucuna ulaşılmıştır. Ayrıca, zor maddelerin test formunun sonunda yer alması, maddelerin cevaplanma olasılığındaki farklılığın artmasına neden olmaktadır. Ayrıca yapılan her iki analizde kullanılan LR ve MH yöntemlerinin, DMF miktarlarındaki büyüklük sıralamalarında benzer, DMF'li maddeler bakımından farklı sonuçlar ürettiği sonucuna ulaşılmıştır. DMF içeren madde sayısı bakımından, MH yönteminin LR yönteminden, daha duyarlı olduğu görülmektedir. Bu araştırma kapsamında, DMF'nin belirlenmesinde, Klasik Test Kuramı'na dayalı yöntemlerden MH ve LR yöntemleri kullanılmıştır. Daha sonraki yapılacak olan çalışmalarda, KTK'ya dayalı diğer yöntemler ve IRT'ye dayalı yöntemlerle DMF belirlenebilir. Farklı yöntemlerden elde edilecek sonuçlar karşılaştırılabilir.

Anahtar Kelimeler: Madde Sıralamaları, Mantel-Haenszel, Lojistik Regresyon, Moodle.

Eurasian Journal of Educational Research 72 (2017) 43-62

Eurasian Journal of Educational Research
www.ejer.com.tr

The Relationship of Art and Music Education with Adolescents' Humor Styles and Interpersonal Problem Solving Skills*

Elifcan DIDIN[1] Aysel KOKSAL AKYOL[2]

ARTICLE INFO

Article History:
Received: 27 Apr. 2017
Received in revised form: 30 Oct. 2017
Accepted: 22 Nov. 2017
DOI: 10.14689/ejer.2017.72.3

Keywords
Adolescent, fine arts high school, regular high school

ABSTRACT

Purpose: Today's education system focuses primarily on the academic skills of individuals. However, art and music education is thought to affect both humor and interpersonal problem-solving skills by supporting the social and emotional skills of adolescents. Therefore, this study was designed to investigate how receiving art and music education relates to adolescents' humor styles and interpersonal problem-solving skills. **Methods:** A total of 178 adolescents were included in the study; this sample included 54 students attending the music department and 60 students attending the art department in a fine arts high school, and 64 students who were not receiving any art education and were studying in a regular high school. The "Humor Styles Questionnaire" and "Interpersonal Problem Solving Inventory (High School Form)" were used. Two-way analysis of variance and correlation coefficient significance test were applied to analyze the data. **Findings**: The results of the study showed that adolescents with healthy and compatible humor styles had effective problem-solving methods. Moreover, the results of the study revealed that the adolescents receiving art and music education both adopted more positive humor styles and preferred more effective methods for solving interpersonal problems than those who did not receive such education. These results demonstrate the importance of art education in supporting children developmentally. **Implications for Research and Practice**: Based on the results of the study, it can be asserted that a qualified art education is required, with sensitivity to the necessity of art education and its effect on development in societies.

* This study was partly presented at the 3rd International Eurasian Educational Research Congress in Muğla, 31 May – 03 June, 2016

[1] Kırklareli University, TURKEY, e-mail: elifcandidin@gmail.com, ORCID: orcid.org/0000-0002-9364-2293

[2] Ankara University, TURKEY, e-mail: koksalaysel@gmail.com, ORCID: orcid.org/0000-0002-1500-2960

Introduction

Many people agree that individuals have a sense of humor to varying degrees, despite the lack of a common definition of humor that is accepted by scholars from different disciplines like philosophy, literature, and psychology. In their study, Martin and Lefcourt (2004) mention that humor has effects on the health of an individual via various mechanisms. The first of these mechanisms is the physiological changes created by laughter. Laughter enables the relaxation of muscles, the increase of the breath rate, the increased production of pain-relieving endorphins, and the decreased release of stress-induced hormones. As a result of these, the immune system develops. Another mechanism is its ability to allow individuals to see life from a humorous perspective, and experience positive emotions as a result of relieving the psychosocial stress. Finally, laughter has an indirect effect on health by increasing the social support of people. An individual who easily solves interpersonal problems and conflicts by means of humor can establish many satisfying relationships (Martin & Lefcourt, 2004). When considering all these advantages of humor, it can be asserted that humor is important for individuals. These positive results of using humor increase people's self-confidence; facilitate their adaptation processes; and make them psychologically, socially, and physically happier, by contributing to the solving of interpersonal problems.

When considering the benefits of humor, the role that a sense of humor plays cannot be underestimated in finding solutions to the problems encountered by today's individuals in ever-complicated societies. The ability of humans, social beings, to solve interpersonal problems—the most commonly encountered problems—is defined as the ability to detect an interpersonal disagreement and to use effective strategies for overcoming these disagreements (D'Zurilla, Nezu, & Maydeu Olivares, 2004). According to Kendall and Fischler (1984), people with interpersonal problem-solving skills are empathetic individuals who are sensitive to problems, can see from different perspectives, produce creative solutions, express themselves, and establish cause and effect relationships. We assert that these properties are improved by art education and will develop in virtue of art. Art education is necessary for the individual. It supports the creativity of the individual, enables him/her to realize his/her potential, and constructs aesthetic thoughts and attention. Art allows a person to recognize and change the world and him-/herself (Erbay, 2013).

We can say that art and music education affect behaviors, creativity, attention, and observation skills of individuals; they develop individuals' thought systems and enhance communication skills in separate ways, with different stimuli. Music and visual arts uncover the potential of individuals and support their full participation in society. By means of painting, individuals can comprehend the difference between looking and seeing, can improve their productive and creative sides, can express themselves, and can develop an aesthetic understanding. They can give clearer answers to questions in certain matters, such as what is liked and what provides beauty (Erbay, 2013; Rabkin & Redmond, 2006). Music is one branch of art education, and it can be defined as an expression of mental processes. People express

themselves easily by, and derive personal satisfaction from, playing instruments or singing; they develop positive self-concept by experiencing a sense of accomplishment through music. They also have the opportunity to develop social skills, adaptation skills, and working skills in cooperation through group works (Eskioglu, 2003).

When the literature is reviewed, it can be seen that art education has positive effects on brain functions, mood, and behaviors (Park et al., 2015). Education in the visual arts supports multidirectional thinking and productivity skills; makes individuals feel happier and more self-confident (Kaya, 2015); develops creativity, problem solving, and self-expression skills; feeds aesthetic feelings and supports mental skills (Ture, 2007); and positively affects verbal creativity (Hui, He, & Ye, 2015). Music education is seen to positively affect emotional development by improving pulmonary functions and breathing, as well as reducing stress with positive developments in physical health and mood (Clift & Hancox, 2001); increasing adaptation skills (Author, 2000); developing social relations while performing in groups (Davidson & Good, 2002); and causing a significant difference in self-esteem (Broh, 2002; Toy, 2006). Some studies indicate that music education contributes to cognitive development, improving the ability of the brain to process the word it hears and thus better discern between changing voices (Wong, Skoe, Russo, Dees, & Kraus, 2007). This enhances performance in language and literacy fields by developing a phonological awareness that is effective in learning to read (Piro & Ortiz, 2009) and further supports academic success (Sendurur & Akgul Baris, 2002).

Martin et al., (2003) defined four types of humor styles including two compatible and two incompatible ones. In Self-Enhancing Humor within compatible category, individuals use humor to have fun without harming others and avoid stress and negative feelings against the problems they encounter; whereas, in Affiliative Humor, individuals use humor to develop interpersonal relationships in a respectful manner to others (Martin et al., 2003). On the other hand, in Self-defeating Humor within incompatible category, individuals use humor in a self-harming manner in order to improve their relations with others and allow to be mocked and humiliated (Yerlikaya, 2003). In Aggressive Humor, individuals use humor by acting with their own superiority and pleasure feelings, harming others, mocking them, joking about them or humiliating them (Martin et al., 2003). When the literature was examined, the results of the studies by Akyol (2011), Soyaldin (2007) and Yerlikaya (2007) indicated that while girls had higher mean scores in Affiliative Humor, boys had higher mean scores in Aggressive Humor; also the results of the studies by Chan and Martin (2007) and Kazarian and Martin (2004) stated that boys adopted negative humor styles more than girls.

Cam and Tumkaya developed the Interpersonal Problem Solving Skills Inventory with five factors indicating how individuals approach to problems when they encounter interpersonal problems. The Approaching Problems in a Negative Way among these factors is related to negative feelings and thoughts such as helplessness, pessimism, and sadness experienced in case of interpersonal problems; on the other

hand Constructive Problem Solving is associated with the feelings, thoughts, and behaviors contributing to solve the problem in an effective and constructive manner. Insistent-Persevering Approach signifies the insistent endeavor for solving the problems in interpersonal relations, Lack of Self-confidence expresses the lack of confidence experienced by the individuals for solving a problem, and Unwilling to Take Responsibility approach signifies failure to take responsibility in problem solving (Cam & Tumkaya, 2006; 2008). When the literature was examined, it was observed in the study by Arslan, Hamarta, Arslan, and Saygin (2010) that female students had higher scores in the Approaching Problems in a Negative Way, Constructive Problem Solving, and Insistent-Persevering Approach subscales of the Interpersonal Problem Solving Skills Inventory, while male students had higher scores in the Lack of Self-confidence and Unwilling to Take Responsibility subscales. In addition, the common results of Nacar (2010) and Ozkan, Akgun, Yanardag, and Yuceer (2013) showed that boys had higher scores in the Lack of self-confidence subscale; Nacar (2010) also found that girls' scores were higher in the Insistent-Persevering Approach subscale.

Although much research studies the effects of art education, no study has been found in the literature that examines the effect of art education on humor styles and interpersonal problem solving skills. While the cognitive skills of an individual are supported in the traditional education system, emotional skills are not much emphasized. Art allows an individual to be productive, solve problems, arrange social relations, cooperate, and adapt. It is thought that art education has effects on both humor and interpersonal problem-solving skills for adolescents. For these reasons, the aim of this study is to examine how art and music education and gender relate to the humor styles and interpersonal problem-solving skills of adolescents, and to accordingly present recommendations for researchers and educators.

Method

Research Design

This study is a descriptive study with a correlational survey model, designed to investigate the relationship of gender and the reception of art and music education with humor styles and interpersonal problem-solving skills among adolescents studying in the city center of Isparta. Buyukozturk, Kilic Cakmak, Erkan Akgun, Karadeniz, and Demirel (2016) describe this method as determining the correlation between two or more variables and defining the given situation as exactly as possible.

Research Sample

The sample group was determined using the purposeful sampling method. The sample group consisted of 178 adolescents in total, including 54 students attending the music department and 60 students attending the art department at the Fine Arts High School located in the city center of Isparta, along with 64 students who were not receiving any art education and were studying in a regular high school. The data

collection process was realized by the researcher in groups in class environment based on voluntariness. Table 1 shows the demographic characteristics of the adolescents included in the study.

Table 1

Demographic Characteristics of Sample Group

Characteristics of Sample Group	Music Department		Art Department		Not receiving Art Education		Total	
	N	%	N	%	N	%	N	%
Gender								
Girl	34	30.6	39	35.1	38	34.2	111	100.0
Boy	20	29.9	21	31.3	26	38.8	67	100.0
Total	54	30.3	60	33.7	64	36.0	178	100.0

Research Instruments and Procedures

In the study, a "General Information Form" was prepared by the researchers to obtain information about the adolescents' gender and their schools/departments; the "Humor Styles Questionnaire" and the "Interpersonal Problem-Solving Inventory (high school form)" were also used.

Validity and Reliability

Humor Styles Questionnaire. The Humor Styles Questionnaire is a self-assessment scale developed by Martin et al. (2003) and adapted into Turkish by Yerlikaya (2003); it measures four different dimensions related to individual differences in the daily use of humor. The scale was applied to 471 high school students with an average age of 16.1, in order to test the construct validity of the scale for the high school students. As a result of the factor analysis, it was found that the internal consistency Cronbach's alpha values of its subscales were between .63 and .75 (Yerlikaya, 2007).

Interpersonal Problem Solving Inventory (High School Form). The reliability and validity studies for the interpersonal problem-solving inventory for high school students aged 15-18 years were conducted by Cam and Tumkaya in 2008. As a result of the factor analysis, it was found that Cronbach's alpha values ranged from .67 to .89, and test-retest correlation coefficients were between .67 and .84 (Cam & Tumkaya, 2008).

Data Analysis

In terms of the variables examined in this study, the normality of distributions was examined by one sample Kolmogorov-Smirnov test, and the distribution was determined to be normal (p>.05). Two-way analysis of variance (used to simultaneously test the effects of two factors on one dependent variable and the interactive effect of the two factors on the dependent variable) was applied in order to determine whether or not gender and status of the adolescent's art/music education cause differences in humor styles and interpersonal problem-solving skills. In case the common effect was found to be significant, Scheffe's test (used when the

group variance is equal, among post-hoc multiple comparison tests) was applied to determine whether the mentioned differentiation was dependent on the difference between mean scores of paired sub-groups. In order to determine the correlation between adolescents' humor styles and interpersonal problem-solving skills, a correlation coefficient significance test (used to find and interpret the amount of correlation between two variables showing normal distribution) was applied (Buyukozturk, 2015).

Results

The study was conducted to determine the effects of gender and art education on humor styles and interpersonal problem-solving skills of adolescents; the results are presented in tables.

Table 2

The Means and Standard Deviations of the Humor Styles-related Subscale Scores of the Adolescents receiving and not receiving Art Education in Terms of Gender

		Affiliative Humor		Self-Enhancing Humor		Aggressive Humor		Self-Defeating Humor	
Gender	N	M	S	M	S	M	S	M	S
Music Education									
Girl	34	42.7	7.9	34.6	10.2	21.3	7.5	25.4	8.6
Boy	20	39.2	6.9	31.7	9.6	27.5	5.66	26.6	5.0
Total	54	41.4	7.6	33.5	10.0	23.6	7.51	25.8	7.4
Art Education									
Girl	39	43.0	8.2	35.4	7.5	20.1	7.74	26.4	8.6
Boy	21	39.1	8.5	33.5	8.9	24.1	9.44	26.5	8.5
Total	60	41.6	8.4	34.7	8.0	21.5	8.52	26.5	8.5
Those not receiving Art Education									
Girl	38	43.0	8.6	37.1	11.3	24.1	7.63	26.9	8.1
Boy	26	37.5	8.7	32.2	9.3	27.3	6.88	24.3	7.8
Total	64	40.7	9.0	35.1	10.7	25.4	7.45	25.8	8.1
Total									
Girl	111	42.9	8.2	35.7	9.7	21.8	7.77	26.3	8.3
Boy	67	38.5	8.0	32.5	9.1	26.4	7.5	25.7	7.3
Total	178	41.2	8.4	34.5	9.6	23.5	7.9	26.1	8.0

When Table 2 was examined, it was determined that girls had higher mean scores in the Affiliative Humor (M=42.9) and Self-Enhancing Humor (M=35.7) subscales compared to boys, whereas boys had a higher mean score in the Aggressive Humor subscale (M=26.4) compared to girls. It was also observed that the mean score of the Self-Defeating Humor subscale was higher for boys studying in art and music departments (M=26.6; M=26.5) than for girls, as well as for girls not receiving art education (M=26.9) than boys not receiving art education (M=24.3).

Table 3

Results of Two-Way Analysis of Variance for Humor Styles of the Adolescents Receiving and Not Receiving Art Education in Terms of Gender

Source of Variance	Sum of squares	SD	Mean Square	F	p	Significant Difference
Affiliative Humor						
Art Education	23.167	2	11.583	.170	.844	
Gender	754.212	1	754.212	11.092	**.001**	0-1
Art Education X Gender	31.413	2	15.707	.231	.794	
Error	11695.517	172	67.997			
Total	315787.000	178				
Self-enhancing Humor						
Art Education	69.470	2	34.735	.376	.687	
Gender	414.155	1	414.155	4.481	**.036**	0-1
Art Education X Gender	65.318	2	32.659	.353	.703	
Error	15897.368	172	92.427			
Total	228617.000	178				
Aggressive Humor						
Art Education	368.559	2	184.280	3.197	**.043**	2-1
Gender	831.799	1	831.799	14.429	**.000**	1-0
Art Education X Gender	63.465	2	31.733	.550	.578	
Error	9915.160	172	57.646			
Total	110291.000	178				
Self-defeating Humor						
Art Education	21.672	2	10.836	.166	.847	
Gender	9.280	1	9.280	.142	.706	
Art Education X Gender	112.621	2	56.311	.864	.423	
Error	11208.426	172	65.165			
Total	132565.000	178				

* $p < .05$

When Table 3 was examined, with the variance results related to humor styles of adolescents receiving and not receiving art education in terms of gender, it was found that art education caused a significant difference in the scores of the Aggressive Humor [$F(1,172)= 3,197$, $p=.043$] subscale. As a result of Scheffe's Test, Aggressive Humor mean scores were found to be higher in adolescents who did not receive art education than those with art education. It was observed that gender caused a significant difference in the scores of the Affiliative Humor [$F(1,172)=11,092$, $p=.001$], Self-Enhancing Humor [$F(1,172)=4,481$, $p=.036$], and Aggressive Humor [$F(1,172)=14,429$, $p=.000$] subscales. While girls had higher mean scores in Affiliative

Humor and Self-Enhancing Humor subscales than the boys, the boys had a higher mean score in the Aggressive Humor subscale than the girls.

Table 4

The Means and Standard Deviations of the Subscale Scores Related to the Interpersonal Problem-Solving Skills of Adolescents Receiving and Not Receiving Art Education in terms of Gender

		APNW[2]		CPS[3]		LS[4]		UTR[5]		IPA[6]	
G[1]	N	M	S	M	S	M	S	M	S	M	S
Music Department											
Girl	34	43.1	12.6	50.4	10.8	16.9	5.6	13.4	4.1	20.0	5.0
Boy	20	40.0	8.3	47.5	9.5	18.1	4.8	13.9	3.4	16.8	5.6
Total	54	41.9	11.2	49.3	10.3	17.3	5.3	13.5	3.8	18.8	5.4
Art Department											
Girl	39	47.1	13.2	52.5	10.6	14.9	5.1	12.7	4.1	21.7	4.4
Boy	21	45.2	14.6	49.7	12.8	16.4	5.2	13.9	4.5	19.7	5.3
Total	60	46.4	13.6	51.5	11.4	15.4	5.1	13.1	4.3	21.0	4.8
Those Not Receiving Art Education											
Girl	38	47.1	12.5	52.2	10.8	17.9	6.3	12.5	4.6	21.1	5.7
Boy	26	43.8	14.3	48.6	12.5	20.0	5.6	15.1	4.5	21.0	4.5
Total	64	45.7	13.3	50.8	11.5	18.7	6.1	13.5	4.7	21.1	5.2
Total											
Girl	111	45.8	12.8	51.8	10.7	16.5	5.8	12.8	4.3	21.0	5.0
Boy	67	43.1	12.9	48.6	11.6	18.3	5.4	14.4	4.2	19.3	5.3
Total	178	44.8	12.9	50.6	11.1	17.2	5.7	13.4	4.3	20.4	5.2

[1] Gender, [2] Approaching Problems in a Negative Way, [3] Constructive Problem Solving, [4] Lack of Self-confidence, [5] Unwilling to Take Responsibility, [6] Insistent-Persevering Approach

When Table 4 was examined, it was observed that girls had higher mean scores compared to boys in the Approaching Problems in a Negative Way (M=45.8), Constructive Problem Solving (M=51.8), and Insistent-Persevering Approach (M=21.0) subscales of Interpersonal Problem Solving Inventory, whereas boys had higher mean scores in Lack of Self-confidence (M=18.3) and Unwilling to Take Responsibility (M= 14.4) subscales compared to girls.

When Table 5 was examined, with the results of variance analysis concerning interpersonal problem-solving skills scores of adolescents receiving and not receiving art education in terms of gender, it was found that art education caused a significant difference in scores in the Lack of Self-confidence [$F(1,172)= 4,982$, $p=.008$] and Insistent-Persevering Approach [$F(1,172)= 4,380$, $p=.025$] subscale. As a result of Scheffe's Test, it was discovered that adolescents who did not receive art education had a higher mean score in the Lack of Self-confidence subscale than those studying in the art department; adolescents not receiving art education also had a higher mean score in the Insistent-Persevering Approach subscale than those studying in the music department. It was determined that gender causes a significant difference in the Unwilling to Take Responsibility [$F(1,172)= 4,805$, $p=.030$] and Insistent-Persevering Approach [$F(1,172)=5,091$, $p=.025$] subscales, where boys had a higher

mean score than girls in the Unwilling to Take Responsibility subscale, and girls had a higher mean score than boys in the Insistent-Persevering Approach subscale.

Table 5.

Results of Two-Way Analysis of Variance concerning the Interpersonal Problem-Solving Skills of the Adolescents Receiving and not Receiving Art Education in Terms of Gender

Source of Variance	Sum of squares	SD	Mean Square	F	p	Significant Difference
Approaching Problems in a Negative Way						
Art Education	656.314	2	328.157	1.979	.141	
Gender	303.040	1	303.040	1.827	.178	
Art Education X Gender	14.910	2	7.455	.045	.956	
Error	28526.699	172	165.853			
Total	387365.000	178				
Constructive Problem Solving						
Art Education	129.845	2	64.923	.520	.595	
Gender	392.192	1	392.192	3.141	.078	
Art Education X Gender	5.347	2	2.673	.021	.979	
Error	21475.491	172	124.858			
Total	478298.000	178				
Lack of Self-confidence						
Art Education	310.639	2	155.319	4.982	**.008**	2-1
Gender	101.078	1	101.078	3.242	.074	
Art Education X Gender	6.526	2	3.263	.105	.901	
Error	5362.574	172	31.178			
Total	58694.000	178				
Unwilling to Take Responsibility						
Art Education	7.653	2	3.826	.205	.815	
Gender	89.639	1	89.639	4.805	**.030**	1-0
Art Education X Gender	35.699	2	17.850	.957	.386	
Error	3208.424	172	18.654			
Total						
Insistent-Persevering Approach						
Art Education	229.248	2	114.624	4.380	**.014**	2-0
Gender	133.232	1	133.232	5.091	**.025**	0-1
Art Education X Gender	68.030	2	34.015	1.300	.275	
Error	4501.575	172	26.172			
Total	79031.000	178				

* $p < .05$

Table 6

Results of Correlation Coefficient Significance Test Related to Adolescents' Scores of Humor Styles Questionnaire and Interpersonal Problem Solving Inventory

	APNW[1]	CPS[2]	LS[3]	UTR[4]	IPA[5]
Affiliative Humor					
R	.084	.134	.084	.158	.214
p	-.263	.075	-.267	**-.035***	**.004****
N	178	178	178	178	178
Self-Enhancing Humor					
R	.122	.176	.021	.020	.313
p	-.105	**.019***	-.784	-.796	**.000****
N	178	178	178	178	178
Aggressive Humor					
R	.010	.092	.338	.336	.119
p	-.896	-.224	**.000****	**.000****	-.115
N	178	178	178	178	178
Self-Defeating Humor					
R	.185	.023	.243	.108	.094
p	**.013***	-.761	**.001****	.150	.210
N	178	178	178	178	178

**p*< .05; ***p*<.01

[1] *Approaching Problems in a Negative Way,* [2] *Constructive Problem Solving,* [3] *Lack of Self-confidence,* [4] *Unwilling to Take Responsibility,* [5] *Insistent-Persevering Approach*

When Table 6 was examined, presenting the correlations between humor styles and interpersonal problem solving skills of the adolescents, it was observed that there was a significant negative correlation between the Affiliative Humor subscale and the Unwilling to Take Responsibility subscale (*p*=.035). However, the following significant positive correlations were found: between the Affiliative Humor subscale and the Insistent-Persevering Approach subscale (*p*=.004); between the Self-Enhancing Humor subscale and the Constructive Problem Solving subscale (*p*=.019); between the Self-Enhancing Humor subscale and the Insistent-Persevering Approach subscale (*p*=.000); between the Aggressive Humor subscale and the Lack of Self-confidence and Unwilling to Take Responsibility subscales (*p*=.000); and between the Self-defeating Humor subscale and the Approaching Problems in a Negative Way and Lack of Self-confidence subscales (*p*=.013; *p*=.001).

Discussion and Conclusion

This study was conducted to determine the relationship between art/music education and gender variable with humor styles and interpersonal problem solving skills among adolescents. The study is limited to the questions and the measured qualifications in the "Humor Styles Questionnaire" and the "Interpersonal Problem Solving Inventory" assessment instruments used in the study, as well as to the students at a fine arts high school and a regular high school located in Isparta province. The results obtained from the study are summarized below.

It was found in this study that adolescents who do not receive art education had higher mean score on the Aggressive Humor subscale, compared to those studying in the art department. Previous studies showed that Aggressive Humor was used by individuals who had low self-esteem and considered themselves socially incompetent (Fox, Dean & Lyford, 2013). By means of art education, individuals begin to examine more carefully the beings and events around them. As a result of developing their observation ability, they also develop their perception, comparison, and interpretation skills, thus gaining a sense of confidence (Erbay, 2013; Kaya, 2015; Ture, 2007). Therefore, it can be asserted that adolescents who did not receive art education were more likely to have low self-esteem and considered themselves socially incompetent, and thus they use Aggressive Humor more often as compared to adolescents studying in the art department.

According to the results of the study, it was found that girls had higher mean scores than boys in the Affiliative Humor and Self-Enhancing Humor subscales, whereas boys had a higher mean score than girls in the Aggressive Humor subscale. When the literature is examined, the results of the studies by Soyaldın (2007), Yerlikaya (2007), Akyol (2011), Kazarian and Martin (2004), and Chan and Martin (2007) also support the present study. While boys preferred an Aggressive Humor style (which is unhealthy and incompatible), girls preferred healthy and compatible humor styles, which may be associated with the gender roles they perceived. Turkish culture has attributed the characteristics of compassion, sensitivity, understanding, and dependency to girls in gender roles; as a result, they are expected to tend towards a respectful humor style which they can use without hurting others. In contrast, as a result of characteristics like leadership, dominance, and independence being attributed to male gender roles, boys are expected to use humor in a socially inappropriate way, to meet their needs with their own superiority and feelings of pleasure.

Another result of the study was that the mean score of the Lack of Self-confidence subscale was higher in adolescents not receiving art education than those studying in the art department, and the mean score of the Insistent-Persevering Approach subscale was higher in adolescents not receiving art education than those studying in the music department. As a result of the aforementioned benefits brought by art education to the child, the child will feel more powerful in many aspects and will be a more creative and productive individual (Kaya, 2015; Ture, 2007). It can be expected that while art students find more serial and more diverse solutions to each

problem in their mind, adolescents who do not receive art education feel unconfident in their solutions of interpersonal problems. As a result of conducting music education with a group, communication skills of individuals will be supported and they will gain cooperation skills. They will have personal satisfaction in their own works, and their self-confidence will increase (Koksal, 2000; Broh, 2002; Eskioglu, 2003; Toy, 2006). For this reason, students studying in the music department may insist on solving interpersonal problems they encounter more often, as compared to students not receiving art education.

It was also determined in this study that while boys had higher mean scores than girls in the Unwilling to Take Responsibility subscale, girls had higher mean scores than boys in the Insistent-Persevering Approach subscale. When the literature is examined, the studies by Arslan et al. (2010), Nacar (2010) and Ozkan et al. (2013) indicate that boys display an unconfident attitude towards approaching problems at higher rates; this result is in parallel with the results of the present study. In this sample, boys' unconfident approach towards problems may be associated with the gender roles they perceive. In Turkish culture, it is very difficult for men to accomplish solving interpersonal problems, since behaviors such as domination and use of force are expected in their relations. For this reason, it can be expected for men to experience negative feelings and feel themselves incompetent. In Turkish culture, girls are exposed to protection and oppression, and are often deprived of the rights and privileges of boys. It can be asserted that this causes girls to consider their problems more important, and they act more insistent and persevering in the solutions of their interpersonal problems.

When the relationship between humor styles and interpersonal problem-solving skills of adolescents was examined, it was observed that adolescents with healthy and compatible humor styles also had effective problem-solving methods, and adolescents with unhealthy and incompatible humor styles had ineffective problem-solving methods. In the Affiliative Humor style in the compatible category, individuals develop interpersonal relationships and interactions in a respectful manner to both themselves and others (Martin, 2007). For this reason, it is expected that a person who adopts this humor style adopts the Insistent-Persevering Approach (Cam & Tumkaya, 2008), which is related to insistent/persevering thoughts and behaviors in solving the problems he/she encounters in developing interpersonal relations. Individuals with Self-Enhancing Humor style, the other humor style in the compatible humor category, can change their viewpoints on problems in coping with stress and can reduce their negative emotions (Martin, 2007). For this reason, individuals with Self-Enhancing Humor used Constructive Problem Solving and Insistent-persevering Approach methods, which are effective problem-solving methods, since they had the feelings, thoughts, and behaviors required to solve the problem in an effective and constructive manner when they encountered interpersonal problems. This result is in parallel with the literature.

In the self-defeating humor style (an incompatible humor category), an emotional need, low self-esteem, or escapist behavior is hidden under the funny appearances of individuals (Martin et al., 2003). Therefore, it is expected for individuals with this

humor style to use the Approaching Problems in a Negative Way and Lack of Self-confidence approaches, as a result of feeling incompetent in solving the problem(s) stemming from the relationship of Self-defeating Humor style and low self-esteem. The Aggressive Humor style, the other incompatible humor style, is used by individuals who have low self-esteem and consider themselves socially incompetent (Fox et al., 2013). Therefore, the person who has low self-esteem and is not self-confident in social relations uses the Lack of Self-confidence and Unwilling to Take Responsibility approaches towards interpersonal problems. This is in parallel with the literature.

The results of this study showed that boys preferred to use humor in a socially inappropriate manner, and they adopted negative approaches more for solving interpersonal problems; on the other hand, girls used humor more positively, and adopted more positive approaches for solving interpersonal problems. These results are an indication of the fact that gender discrimination should not be made to make gender a disadvantageous factor in the development and socialization processes of adolescents, and that both parents and educators should pay attention and act more objectively when attributing gender roles to children.

The result of the study indicate that adolescents receiving art education both adopted more positive humor styles and preferred more effective methods in solving interpersonal problems than did adolescents not receiving art education, results which bring the necessity of art education to the forefront. By means of art education, children can develop their skills of observation, creativity, socialization, adaptation, and synthesis; in turn, they become productive, conscious, and self-confident individuals. The results of this study prove that art education is extremely important to the developmental support of children. It can be asserted, based upon these results, that it is necessary demand qualified art education, with a sensitivity to the necessity of art education and its effect on development in societies.

In this study, adolescents' humor styles and interpersonal problem solving skills were emphasized. In future studies, planning can be made to determine the humor styles and interpersonal problem-solving skills of preschool and school-age children. Experimental studies can be conducted using different support programs to develop children's or adolescents' humor styles and interpersonal problem-solving skills. A limited number of studies focus on determination of humor development and humor styles of children and adolescents, and tools must be developed to determine humor development and styles in other studies, since data collection tools in this field are not sufficient. In addition, different research methods can be employed to determine humor styles and interpersonal problem-solving skills.

References

Akyol, U. (2011). *Ergenlerde iletisim becerilerinin yordayicilari olarak oz-duyarlik ve mizah tarzlari [Self-compassion and humor styles as predictor of communication skills in adolescents].* Yuksek Lisans Tezi, Mugla Univ. Egitim Bilimleri Enstitusu.

Arslan, C., Hamarta, E., Arslan, E. & Saygin, Y. (2010). Ergenlerde saldirganlik ve kisilerarasi problem cozmenin incelenmesi [An investigation of aggression and interpersonal problem solving in adolescents]. *Ilkogretim Online, 9*, 379-388.

Baris, A.D. (2002). *Muzik egitimi alan ve almayan lise ogrencilerinin benlik tasarimi duzeylerinin cesitli degiskenlere gore incelenmesi [Regarding several variations examining levels of self-concept of the students both getting or not getting music education].* Yayinlanmamis Doktora Tezi, Gazi Univ. Egitim Bilimleri Enstitusu.

Broh, B.A. (2002). Linking extra curricular programming to academic achievement: Who benefits and why? *Sociology of Education, 75*(1), 69-95.

Buyukozturk, S. (2015). *Sosyal bilimler icin veri analizi el kitabi*. Ankara: Pegem Akademi.

Buyukozturk, S., Kilic Cakmak, E., Erkan Akgun, O., Karadeniz, S. & Demirel, F. (2016). *Bilimsel arastirma yontemleri [Scientific research methods].* Ankara: Pegem Akademi.

Cam, S., & Tumkaya, S. (2008). Kisilerarasi problem cozme envanteri lise ogrencileri formu'nun gecerlik ve guvenirlik calismasi [Development of interpersonal problem solving inventory for high school students: The validity and reliability process]. *Uluslararasi Insan Bilimleri Dergisi, 5, 1-17.*

Chen, G.H. & Martin, R.A. (2007). A comparison of humor styles, coping humor, and mental health between Chinese and Canadian university students. *Humor, 20*(3), 215–234.

Clift, S.M. & Hancox, G. (2001). The perceived benefits of singing: Findings from preliminary surveys of a university college choral society. *The Journal od The Royal Society for the Promotion of Health, 121*(4), 248-256.

D'Zurilla, T.J., Nezu, A.M., & Maydeu Olivares, A. (2004). Social problem solving: Theory and assessment. In E. C. Chang, T. J. D'Zurilla, L. J. Sanna (Eds.), *Social problem solving: Theory, research, and training* (pp. 11-28). Washington, DC: American Psychological Association.

Davidson, J.W. & Good, J.M.M. (2002). Social and musical coordination between members of a string quartet: An exploratory study. *Psychology of Music, 30*, 186-201.

Erbay, M. (2013). S*anat egitimi uzerine [On art education].* Istanbul: Beta.

Eskioglu, I. (2003). Muzik egitiminin cocuk gelisimi uzerindeki etkileri [The effects of music education on child development]. *Cumhuriyetimizin 80. Yilinda Muzik Sempozyumu, Inonu Univ. Bildiriler,* 116-123.

Fox, C.L., Dean, S.& Lyford, K. (2013). Development of a humor styles questionnaire for children. *Humor,* 26, 295–319.

Hui, A.N.N., He, M.W.J. & Ye, S.S. (2015). Arts education and creativity enhancement in young children in Hong Kong. *Educational Psychology, 35*(3), 315–327.

Kaya, B. (2015). *Gorsel sanatlar dersinin ogrencilere ozguven kazandirmada etkisi [The effects of visual art lesson in gaining self-confidence to the students].* Yuksek Lisans Tezi. Gazi Univ. Egitim Bilimleri Enstitusu.

Kazarian, S.S. & Martin, R.A. (2004). Humour styles, personality, and well-being among lebanese university students. *European Journal of Personality, 18*, 209–219.

Kendall, P.C. & Fischler, G.L. (1984). Behavioral and adjustment correlates of problem solving: Validational analyses of interpersonal cognitive problem solving measures. *Child Development,* 55, 879-892.

Koksal, A. (2000). Muzik egitimi alma, cinsiyet ve sinif duzeyi degiskenlerine gore ergenlerin empatik becerilerinin ve uyum duzeylerinin incelenmesi [The investigation of empathic skills and adaptation levels of adolescents according to music education, gender and grade level variables]. *Hacettepe Universitesi Egitim Fakultesi Dergisi, 18*, 99-107.

Martin, R.A. & Lefcourt H.M. (2004). Sense of humor and physical health: Theoretical issues recent findings, and future directions. *Humor, 17*, 1–20.

Martin, R.A. (2007). *The psychology of humor: An integrative approach,* San Diego, CA: Elsevier Academic Press.

Martin, R.A., Puhlik, D.P., Larsen, G., Gray, J., & Weir, K. (2003). Individual differences in uses of humor and their relation to psychological well-being: Development of the humor styles questionnaire. *Journal of Research in Personality, 37*, 48-75.

Nacar, F. S. (2010). *Sinif ogretmenlerinin iletisim ve kisilerarasi problem cozme becerilerinin incelenmesi [Analysis of the relationship between the communication of the class teachers and their skills to solve interpersonal problems].* Yuksek Lisans Tezi, Cukurova Univ. Sosyal Bilimler Enstitusu.

Ozkan, Y., Akgun, R., Yanardag, M. Z., & Yuceer, T. (2013). Sosyal hizmet bolumu ogrencilerinin bazi degiskenlere gore kisilerarasi problem cozme becerilerinin incelenmesi [According to some variables department of social work students study of interpersonal problem solving skills]. *TSA Dergisi, 17*, 197-213.

Park, S., Lee, J.M., Baik, Y., Kim, K., Yun, H.J., Kwon, H., Jung, Y.K. & Kim, B.N. (2015). A preliminary study of the effects of an arts education program on executive function, behavior, and brain structure in a sample of nonclinical school-aged children. *Journal of Child Neurology, 30*(13), 1757-1766

Piro, J.M. & Ortiz, C. The effect of piano lessons on the vocabulary and verbal sequencing skills of primary grade students. *Psychology of Music, 37*(3), 325–347.

Rabkin, N. & Redmond, R. (2006). The arts make a different. *Helping Struggling Students, 63*(5), 60-64.

Sendurur, Y. & Akgul Baris, D. (2002). Muzik egitimi ve cocuklarda bilicsel basari [Music education and cognitive achievement of children]. *G.U. Gazi Egitim Fakultesi Dergisi, 1*, 165-174.

Soyaldin, S.Z. (2007*). Ortaogretim ogrencilerinin ofke ifade tarzlari ile mizah tarzlari arasindaki iliski [The relationships between anger expression styles and humor styles among secondary school students].* Yuksek Lisans Tezi, Mersin Univ. Sosyal Bilimler Enstitusu.

Toy, B. (2006*). Sanat egitimi alan ve almayan 15-17 yas grubundaki ergenlerin sosyal uyumlarinin ve benlik tasarim duzeylerinin incelenmesi [A study on the social adaption and self-concept levels of 15-17 years old adolescents getting or not getting art education].* Yayinlanmamis Yuksek Lisans Tezi, Ankara Univ. Fen Bilimleri Enstitusu.

Ture, N. (2007). *Egitimde ve ogretimde bir arac olarak gorsel sanatlar egitiminin ogrencilere sagladigi katkilar [The contributions that gothic arts education supplies as a mean in education and school in to students].* Yuksek Lisans Tezi. Selcuk Univ. Sosyal Bilimler Enstitusu..

Wong, P.C.M.,Skoe, E., Russo, N.M., Dees, T. & Kraus, N. (2007). Musical experience shapes human brainstem encoding of linguistic pitch patterns. *Nature Neuroscience, 10*(4), 420-422.

Yerlikaya, E.E. (2003). *Mizah tarzlari olceginin uyarlama calismasi [The adaptation of Humor Styley Questionnaire into Turkish language].* Yuksek Lisans Tezi, Cukurova Univ. Sosyal Bilimler Enstitusu.

Yerlikaya, N. (2007). *Lise ogrencilerinin mizah tarzlari ile stresle basa cikma tarzlari arasindaki iliskinin incelenmesi [The relationship between humor styles and coping styles of high school students].* Yuksek Lisans Tezi, Cukurova Univ. Sosyal Bilimler Enstitusu.

Müzik ve Resim Eğitiminin Ergenlerin Mizah Tarzları ve Kişilerarası Problem Çözme Becerileriyle İlişkisi

Atıf:

Didin, E., & Koksal Akyol, A. (2017). The relationship of art and music education with adolescents' humor styles and interpersonal problem solving skills. *Eurasian Journal of Educational Research,* 72, 43-62, DOI: 10.14689/ejer.2017.72.3

Özet

Problem Durumu: Mizahın bireye psikolojik ve sosyal yönden birçok olumlu etkileri olmaktadır. Bireyin stresini azaltmakta, olumlu duygular yaşamasını sağlayarak kaslarını gevşetmekte, bağışıklık sistemini güçlendirmekte, sosyal ilişkilerini geliştirmekte ve yaşanan kişilerarası çatışmaları azaltmaktadır. Kişilerarası problem çözme becerisine sahip kişiler, empati yeteneği yüksek, olaylara farklı bakış açısı ile bakabilen, ifade becerileri yüksek ve yaratıcı çözümler üretebilen bireylerdir ki bu becerilerin sanat eğitimi ile desteklendiği bilinmektedir. Resim ve müzik eğitimi ile bireylerin farklı mekanizmalarca yaratıcılıkları, dikkat ve yorum becerileri, düşünce sistemleri gelişmekte, iletişim becerileri desteklenmektedir. Mevcut eğitim sisteminde bireylerin daha çok akademik becerileri üzerinde durulmaktadır. Bu durum bireylerin sosyal-duygusal hayatlarında problemler yaşamasına neden olabilmektedir. Bu nedenle sanat eğitiminin ergenlerin hem mizah hem de kişilerarası problem çözme becerileri üzerinde etkili olduğu düşünülmektedir.

Araştırmanın Amacı: Resim ve müzik eğitiminin beynin işlevlerinde, bireylerin psikolojik durumları, sosyal ilişkileri ve yaratıcılık becerilerinde, kendini ifade etme, estetik duygular ve benlik saygısında olumlu gelişmelere neden olduğu yapılan araştırmalarda kanıtlanmıştır. Sanat eğitiminin etkilerine ilişkin birçok araştırma olmasına rağmen, literatürde sanat eğitiminin mizah tarzları ve kişilerarası problem çözme becerilerine olası etkilerini inceleyen bir araştırmaya rastlanılmamıştır. Bu nedenle bu araştırmada resim ve müzik eğitiminin ergenlerin mizah tarzları ve kişilerarası problem çözme becerileriyle ilişkisinin incelenmesi amaçlanmıştır.

Araştırmanın Yöntemi: Araştırma Isparta il merkezinde bulunan Güzel Sanatlar Lisesi Müzik Bölümüne devam eden 54, resim bölümüne devam eden 60, sanat eğitimi almayan ve Anadolu Lisesine devam eden 64 olmak üzere toplam 178 ergen ile yürütülmüştür. Araştırmaya katılan ergenlerin demografik özelliklerini belirlemek amacıyla araştırmacılar tarafından hazırlanan "Genel Bilgi Formu", mizah tarzlarını belirlemek için Martin vd. (2003) tarafından geliştirilen ve Türkçeye uyarlaması Yerlikaya (2003) tarafından yapılan "Mizah Tarzları Ölçeği" ve kişilerarası problem çözme becerilerini belirlemek için de Çam ve Tümkaya (2008) tarafından geliştirilen "Kişilerarası Problem Çözme Envanteri (Lise Formu)" kullanılmıştır. Çalışmada ele alınan değişkenler açısından dağılımların normalliği tek örneklem kolmogorov-smirnov testi, ergenlerin resim ve müzik eğitimi alma durumlarının, cinsiyetin mizah tarzları ve kişilerarası problem çözme becerilerine etkisini belirlemek amacıyla çift

yönlü varyans analizi ve mizah tarzları ile kişilerarası problem çözme becerileri arasındaki ilişkiyi tespit etmek amacıyla korelasyon katsayısı önemlilik testi yapılmıştır.

Araştırmanın Bulguları: Araştırma sonucunda ergenlerin cinsiyetinin, sanat eğitimi alıp almamalarının mizah tarzlarında ve kişilerarası problem çözme becerilerinde anlamlı farklılıklar yarattığı görülmüştür (p<0.01, p<0.05). Ergenlerin mizah tarzları ile kişilerarası problem çözme becerileri arasında da anlamlı ilişkiler tespit edilmiştir (p<0.01, p<0.05).

Araştırmanın Sonuç ve Önerileri: Ergenlerin mizah tarzları ve kişilerarası problem çözme becerileri arasındaki ilişki incelendiğinde sağlıklı ve uyumlu mizah tarzlarına sahip ergenlerin, etkili problem çözme yöntemlerine sahip oldukları görülürken sağlıksız ve uyumsuz mizah tarzlarına sahip ergenlerin ise etkili olmayan problem çözme yöntemlerine sahip oldukları saptanmıştır. Araştırmanın bir diğer bulgusu, sanat eğitimi almayan ergenlerin resim bölümünde okuyan ergenlere göre Mizah Tarzları alt ölçeğinden Saldırgan Mizahı daha çok kullandıkları yönündedir. Ayrıca sanat eğitimi almayan ergenlerin resim bölümünde okuyan ergenlere göre Kişilerarası Problem Çözme Envanteri alt ölçeğinden Kendine Güvensizlik ve müzik bölümünde okuyan ergenlere göre ise Israrcı-Sebatkar Yaklaşım alt ölçeğinde daha yüksek puan ortalamasına sahip oldukları saptanmıştır. Alınan resim eğitimiyle yaratıcılık, algılama ve yorumlama becerileri desteklenen ergenler sosyal alanda yeterlilik kazanacak ve özgüvenleri desteklenecektir. Bu nedenle resim eğitimi alan ergenlerin sanat eğitimi almayan ergenlere göre hem kişilerarası problemlerin çözümünde kendilerini daha yetkin hissettikleri hem de olumlu mizah tarzlarını kullanmaya yöneldikleri söylenebilir. Müzik eğitimi alan ergenlerin de kişisel doyum sağlayarak kendilerine olan güvenlerinin arttığı, grup eğitimi sayesinde de iletişim becerilerinin gelişmesiyle yaşadıkları kişilerarası problemleri çözüme ulaştırmak için daha ısrarcı oldukları düşünülebilir. Araştırma bulguları çocukların gelişimsel olarak desteklenmesinde sanat eğitiminin önemini kanıtlamaktadır. Elde edilen bu sonuçtan yola çıkarak sanat eğitiminin gerekliliği ve toplumların gelişmesindeki etkisine yönelik duyarlılık ile nitelikli bir sanat eğitimi için talep oluşturulması gerektiği söylenebilir. Cinsiyet değişkenini ele aldığımızda kızların, Mizah Tarzları Ölçeğinin alt ölçeklerinden Katılımcı Mizah ve Kendini Geliştirici Mizah puanlarının daha yüksek olduğu görülürken, Saldırgan Mizahta erkeklerin daha yüksek puan ortalamalarına sahip oldukları saptanmıştır. Ayrıca Kişilerarası Problem Çözme Envanteri alt ölçeğinden Sorumluluk Almamada erkeklerin ortalamalarının kızlardan, Israrcı-Sebatkar Yaklaşımda ise kızların ortalamalarının erkeklerden yüksek olduğu görülmüştür. Uyumlu ve uyumsuz kategorilerdeki mizah tarzlarının benimsenme sürecinde ve karşılaştıkları problemlere yaklaşırkenki tutumların belirlenmesinde toplumsal cinsiyet rollerinin etkili olduğu söylenebilir. Türk kültüründe erkekler lider, baskın ve bağımsız olmaya yönlendirilirken kızlara daha çok merhamet, anlayış ve bağımlılık özellikleri yüklenmeye çalışılır. Bu nedenle erkeklerin kendi üstünlük duygularını tatmin etmek ve haz duymak amacıyla Saldırgan Mizahı benimsedikleri, ancak bu baskın ve bağımsız olma davranışlarının da kişilerarası yaşanan problemleri çözmede etkili tutumlar olmasından dolayı

kendilerini yetersiz hissetmeleriyle Sorumluluk Almama yaklaşımını tercih ettikleri söylenebilir. Kızların ise kendilerine yüklenen rollerden dolayı karşısındaki kişileri incitmeden, saygı çerçevesi içinde kullanılan Katılımcı Mizah ve Kendini Geliştirici Mizahı tercih etmeleri ve sürekli korunma ve baskı altına olmalarından dolayı yaşadıkları problemleri erkeklere göre daha önemli görmeleri ve bu problemlerin çözümünde daha ısrarcı olmaları beklenebilir. Bu bulgular ergenlerin gelişimlerinde ve sosyalleşme süreçlerinde çocuklara cinsiyet rolleri yüklerken hem ailelerin hem de eğitimcilerin daha objektif davranmaya dikkat etmesi gerektiğini ortaya koymaktadır.

Anahtar Sözcükler: Ergen, güzel sanatlar lisesi, anadolu lisesi

Eurasian Journal of Educational Research 72 (2017) 63-82

Eurasian Journal of Educational Research
www.ejer.com.tr

Case Study of Science and Social Studies Teachers Co-Teaching Socioscientific Issues-Based Instruction*

Engin KARAHAN[1] Gillian ROEHRIG[2]

ARTICLE INFO

Article History:
Received: 06 July 2017
Received in revised form: 4 Oct. 2017
Accepted: 21 Nov. 2017
DOI: 10.14689/ejer.2017.72.4

Keywords
environmental ethics, case study, community involvement, service learning projects

ABSTRACT

Purpose: Science education literature has indicated that teachers do not always feel comfortable teaching socioscientific issues (SSI) that are infused with several social domains. In order to address this problem in teaching SSI, this study is designed to understand and describe the experiences of a science teacher and a social studies teacher, who collaboratively designed and taught an SSI-based environmental ethics class. **Research Methods:** The purpose of this descriptive case study was to portray how a science and a social studies teacher co-design and co-teach an environmental ethics class. The data collection instruments were interviews, observations, and reflective journals. Thematic analysis of the data was made via a qualitative data analysis software. **Findings:** The findings indicated that both participants criticized the science curriculum for not being able to address every dimension of SSI. Therefore, they structured their environmental ethics class based on the "triple bottom idea" in order to look at those issues from social, economic, and environmental points of view. One of the highlights of their environmental ethics class was the opportunity given to the students to work on projects they felt passionate about. The participants described their role in the environmental ethics class as a consultant, which was different from traditional settings. Therefore, they no longer provided the content, but rather consulted with their students to explore their vested interests. **Implications for Research and Practice**: Giving students power to choose their own project topics, the teachers aimed at enhancing the motivation of students in taking pro-environmental actions, as well as developing their own perspective about controversial SSI. Considering the community involvement of the students, this missing piece of students' community involvement and agency in most educational settings was strongly present in the environmental ethics class.

* This study was made possible by National Science Foundation grant CBET 1209402. The findings, conclusions, and opinions herein represent the views of the authors and do not necessarily represent the view of personnel affiliated with the National Science Foundation.
** This article has been produced from Engin Karahan's doctoral dissertation.
[1] Corresponding Author: Eskişehir Osmangazi University, TURKEY, karahan@umn.edu, ORCID: https://orcid.org/0000-0003-4530-211X
[2] University of Minnesota, USA, roehr013@umn.edu

Introduction

Socioscientific issues (SSI) are described as scientific topics with social significance as identified by society. (Fleming, 1986; Sadler, 2009; Sadler & Zeidler, 2003; Zeidler, Walker, Ackett, & Simmons, 2002). These ill-structured problems "do not have single correct answers, cannot be meaningfully addressed through memorized or well-rehearsed responses and are not subject to relatively simple algorithms" (Sadler, 2009, p. 11). They are subject to different social factors, such as politics, economics, and ethics (Sadler, 2011), various social domains, and areas of open inquiry (Klosterman, Sadler, & Brown, 2012). Their solutions are multiple and uncertain, and are necessarily influenced by science concepts and theories as well as social factors such as political, economic, humanistic and ethical aspects (Klosterman, Sadler, & Brown, 2012). Science education literature has indicated that science educators do not always feel comfortable teaching SSI that are infused with several social domains (Levinson & Turner, 2001; Zeidler, 2014). However, students need to be exposed to different alternatives and perspectives in order to make informed and critical decisions in socioscientific issues (Hyslop-Margison & Graham, 2004).

Teachers experience challenges in the teaching of social and ethical aspects of science in secondary schools. The literature has indicated that even though controversial socioscientific issues in science classrooms have been a main focus in the science education field since the Science, Technology, and Society (STS) movement in the 1970s (Levinson, 2006), teachers have not fully addressed these issues in their classes for several reasons, such as lack of knowledge or experience (Dillon, 1994; Osborne, Duschl, & Fairbrother, 2002). Thus, although teachers hold positive attitudes for teaching controversial SSI, only a small percentage regularly integrate them into their science curricula (Sadler, Amirshokoohi, Kazempour, & Allspaw, 2006; Lee & Witz, 2009). While examining the perspectives of teachers on SSI integration in science classes, Sadler et al. (2009) found that teachers held different belief systems regarding incorporating SSI in their instruction, such as the position that science education should be value free or non-committal with respect to focusing on SSI instruction.

The literature has revealed that science curriculum is usually not able to address every aspect of SSI (Ryder, 2001), because those issues are subject to various social domains, such as politics, economics, and ethics (Klosterman, Sadler, & Brown, 2012; Sadler, 2011). Hence, science teachers often struggle to address socioscientific issues in their classrooms due to their lack of expertise in social domains of SSI. In order to address this problem in teaching SSI, this study investigated how a science teacher and a social studies teacher collaboratively designed and implemented an SSI-based environmental ethics class. The literature indicates that only a few studies (e.g., Levinson & Turner, 2001; Harris & Ratcliffe, 2005) explored the collaboration between science teachers and social studies teachers in teaching SSI. Therefore, there is a gap in the literature regarding the co-teaching of science teachers and social studies teachers in teaching SSI.

Co-Teaching

The profession of teaching has long been recognized as an isolated work (Barth, 1990). However, research on teaching has been intrigued with the possibilities created by collaboration among educators in the same physical space (Cook & Friend, 1995). Research has indicated that collaboration among teachers with planning and teaching help them meet the needs of diverse students, as well as fulfill professional responsibilities in the classrooms (Thousand, Villa, & Nevin, 2006). When teachers with varied expertise and frames of references collaborate regularly, their students benefit more socially, behaviorally, and academically (Morgan, 2012).

Co-teaching became popular during the era of open schools (Cohen, 1973). In co-teaching, "two or more professionals deliver substantive instruction to a diverse or blended group of students in a single physical space" (Cook & Friend, 1995, p. 2). Friend and Cook (2007) explained co-teaching as having four components: two certified teachers, instruction delivered by both teachers, a heterogeneous group of students, and a single classroom where all students are taught together. It aims to bring the strengths of teachers with different expertise together, therefore, allowing them to better meet student needs (Bauwens, Hourcade, & Friend, 1989; Walsh, 1992). Thousand, Villa, and Nevin (2006) listed four predominant co-teaching approaches as follows:

> (a) supportive teaching, in which one teacher takes the lead and others rotate among students to provide support, b) parallel teaching, in which co-teachers work with different groups of students in different areas of the classroom, c) complementary teaching, in which co-teachers do something to enhance the instruction provided by another co-teacher, and d) team teaching, in which coteachers jointly plan, teach, assess, and assume responsibility for all of the students in the classroom. (p. 242)

Research has indicated that the positive outcomes of co-teaching models include improved academic and social skills, attitudes, and self-concepts for low-achieving students (Walther-Thomas, 1997; Schulte, Osborne, & McKinney, 1990), and increased student performance on high-stakes assessments (Thousand, Villa, & Nevin, 2006). Students with diverse learning characteristics in K-12 could be taught effectively in settings where teachers collaborate (Villa, Thousand, Nevin, & Malgeri, 1996). Students in co-taught classes can "receive more instruction and are involved more systematically in their learning than would be possible in a classroom with only one teacher, [therefore,] the combination of two teachers reduces the student-teacher ratio and provides opportunities for greater student participation and engaged time" (Cook & Friend, 1995, p. 6). In addition to student outcomes, co-planning and co-teaching also result in a variety of positive outcomes for the teachers (Thousand, Villa, & Nevin, 2006). The literature has highlighted the collaboration of the teachers in their professional development by sharing their pedagogical and content-related strengths and expertise, as suggested by co-teaching practices (Bauwens, Hourcade, & Friend, 1989; Walsh, 1992).

Method

Research Design

The purpose of this descriptive case study was to portray the ways a science and a social studies teacher co-design and co-teach an environmental ethics class that focuses on SSI around a large watershed. Therefore, the research question that guided this study was, "How do a science and a social studies teacher experience co-designing and co-teaching an SSI-based environmental ethics class?" Using a descriptive type of case study (Yin, 2003), it aimed to describe a phenomenon (teachers' experiences of co-designing and co-teaching an SSI-based environmental ethics class) and the real-life context (a classroom located in a community within a large watershed in Midwestern USA) in which it occurred. Since the contextual factors for the socioscientific issues addressed in this case were so significant, the classroom within the context of the community in which they were located was represented as a whole case in order to fully understand the teachers' experiences in the setting.

Among four types of case studies, a single case with embedded units was employed in this study to look at the same issue, but investigate the different decisions made by participants (Yin, 2003). For this single case, the embedded units included the science and social studies teachers in a school located in a large watershed. The justification for this configuration is that, even though the experiences of each participant (science teacher and social studies teacher) centered around an SSI-based environmental ethics class, the smaller contexts they were in (e.g., their roles in the class, background, and expertise) allow them to be categorized as subunits within the big case.

Research Sample

The participants of this study included a science teacher and a social studies teacher who co-taught a high school environmental ethics class. Participant teachers of this study were actively involved in a National Science Foundation (NSF) funded project, which was an on-going professional development program striving to provide secondary science teachers with a context to teach local socioscientific issues related to a large river basin watershed. Their teaching assignments were mostly in biology, ecology, environmental ethics, world history, microeconomics, and humanities (see Table 1).

Table 1

Information about participant teachers

	Alex	*Dirk*
Age	32	42
Teaching Experience	10 years	20 years
Teaching in Current School	8 years	20 years
Subjects Currently Teaching	Biology, Ecology, Environmental Ethics	World History, Humanities, CIS Microeconomics, Environmental Ethics
Subjects Previously Taught	Biology (10 years), Ecology (5 years)	World History (20 years), Microeconomics (15 year), Humanities (15 years), Environmental Ethics (6 year)
Classes/Specific Minnesota River Basin Content	Ecology, Environmental Ethics	Environmental Ethics
Degrees Held	Life Science (BA), Education (MA)	Economics (BA), Educational Leadership (MEd)
Teaching License	7-12th Grade Life Science	7-12th Grade Social Studies

Research Instruments and Procedures

The data collection instruments for this case study were interviews, observations, and reflective journals. Two different semi-structured interview protocols for participant teachers were designed and implemented. The first interview protocol aimed at illustrating the participant teachers' epistemological and pedagogical beliefs about SSI, specifically around the Minnesota River Basin. The second interview protocol targeted participant teachers' co-teaching practices in teaching SSI. The first interview protocol was implemented with each teacher individually, as they held unique perspectives about the SSI, whereas the second interview protocol was a group interview conducted with both teachers to explore their co-designing and co-teaching experiences. In addition to interview data, the observation data from the participant teachers' classroom with the complementary reflection journals recorded after each observation was included to support and validate the primary data sources.

Validity and Reliability

In order to support the validity of the measures, the codes emerging within one data source were compared with the other data sources, thus triangulating the codes

against multiple data sources. Another validation strategy in this study was to provide rich and thick descriptions for transparency. Last, intercoder reliability methods were employed. Part of the data was coded by two researchers and then checked the congruity between these code groups.

Data Analysis

The data analysis procedure occurred via open coding, identification of patterns and categories, and building themes and models. Thematic analyses of the data were made via a qualitative data analysis software called NVivo. In the open coding procedure, the essential codes that illustrate the phenomena were revealed. Hence, main findings emerged as patterns. These patterns represented the meso-context level (social, cultural, political, organizational, and economic conditions established in the local community and educational institution), the micro-context (expectations, beliefs, preferences, and goals of teachers), and eventually participant teachers' co-teaching practices of SSI integration. Lastly, the themes were built based on those patterns that initially emerged.

Results

In this section, the contexts of community and school are first described. Then, each participant teacher's beliefs about the SSI around the Minnesota River Basin, as well as teaching SSI around those issues, are addressed. Lastly, their co-teaching experiences are portrayed.

The Community

The high school is located in a large suburb in Midwestern USA. The city has experienced a rapid growth in population in the last few decades. People growing up here have witnessed a shift from a primarily agricultural community, to a second-ring suburb of retail shopping, single-family home subdivisions, and an increasing variety of local industry.

In describing the river-related issues in their communities, participant teachers discussed a variety of different problems. The issues participant teachers mentioned involved seasonal floods, frac sand mining, renewable energy efforts in malt brewing, and algae blooms in a local lake. They frequently complained about lack of awareness and even ignorance of residents in their community about the issues around the river. Since they live in a community, neither a rural town nor a metropolis, the teachers believed that it was a challenge for the residents to have a solid perspective. They added that individual interests and backgrounds of the community members played a significant factor in dealing with these community-based issues.

The School and Classroom

This study took place in an environmental ethics class co-designed and co-taught by a science and a social studies teacher. The class was comprised of 25 male and 6

female students. The class was taught in the Environmental Learning Center (ELC), a free-standing building that sits on the edge of the high school's campus, surrounded by plenty of open space. The physical structure of the building caused the nature of this class to be different than that of most classes in formal school environments. The students taking this elective class had been mostly those "who wanted to go out in the environment and take responsibilities in community-based issues," Alex stated. The ELC building is surrounded by an open area where former students' environmental science projects are presented. The building is mostly used by Alex and another science teacher for the science classes, and Dirk uses the ELC only for the Environmental Ethics class.

Portrait I: Alex

Alex is a science teacher with 10 years of experience. His teaching assignments have mostly been biology, ecology, and environmental sciences. In addition to the ELC where he teaches most of his classes, Alex sometimes uses another classroom in the school building. In general, Alex was confident in using the classroom in the ELC and the different technologies available there, since it was the place where he usually taught his environmental classes. As he described his teaching style, Alex frequently highlighted the idea of place-based education and project-based learning. "We need to push that idea of kids learning by doing, and helping their community," Alex often said. Even though he strongly supported the idea of student-centered instruction, Alex also admitted that he sometimes gives lectures, especially in his Biology classes.

Alex's beliefs about the SSI around the river basin. Alex had focused on community-based environmental issues in his previous environmental science classes and was aware of the issues around the river basin. Through the student projects in which groups of students focused on a variety of different community-based environmental problems, he had become more aware of those issues, as well as being actively involved in the solution of those problems. He addressed the complexity of the issues around the river basin and different perspectives and positions involved in the issue. Alex described how people's interests affect their perspectives about the issue as follows:

> *Depending on what your interest is or what you see value in, you're going to make it so you don't feel that what your interests are causing the problem. #Semi-structured teacher interview I*

While expressing his point of view about the issue, Alex often used the analogy of a "silver bullet" to describe the multifaceted nature of the issue. He stated that although there was no silver bullet in the issue, many people still considered agriculture as the only focus. Alex criticized the perspective of the people who focused on agriculture as the only contributor to the issue. In order to demonstrate his empathy for farmers, Alex often made arguments about the ambiguity of the controversy. For instance, he specifically pointed out Native Americans' long-term observations about the conditions of the river. He stated that the Native American

community in their town believed that the sediment was always in the river, which caused them to call the river "cloudy river."

Regardless of their interests, Alex believed that every actor in the issue held some sort of bias based on their vested interests. Therefore, the public needed to hear the voice of each actor in order to be able to take a multi-perspective approach. He also criticized environmental agencies for dominating the controversy by blaming only farmers for being responsible for the river basin issues.

Alex's beliefs about scientific studies around the river issues. Being a science teacher, Alex often addressed scientific data collection and analysis used while studying the river. According to him, comparison of the data collected in different times and locations was the way to explore the problem. In terms of studying the river, he often suggested that scientists needed to collaborate with the local residents, as they had been observing the changes in the river for a long time. He believed that researchers studying the river basin needed to have conversations with the local residents in order to understand the science behind what those residents had been observing for their whole lives.

In general, Alex was quite skeptical about scientists and their studies. He often addressed the different factors affecting the trustworthiness of science, such as funding and personal background. He highlighted that scientists could possibly skew their data in order to show what their funders wanted them to show. As he recognized the potential bias in science, Alex also highlighted that the public usually listened to the scientists who had better arguments. However, he felt that having a better argument in science did not necessarily mean having strong scientific findings. That is why Alex hoped that the scientists with stronger arguments also had better science behind their arguments. In order to determine the credibility of scientific studies, Alex believed that people, including high school students, needed critical thinking skills to ask the right questions and evaluate the scientific arguments. Regardless of their background, he hoped that his students were able to look at the scientific studies critically to be able to decide whether these studies were biased or not.

Alex's beliefs about SSI-based instruction. As he expressed his beliefs about SSI based instruction, Alex highlighted the potential of socioscientific contexts in creating space for student agency. Criticizing traditional science classes, Alex believed that teachers usually assumed students had an interest in science content,

> *Telling the kid that you have an interest in something is not gonna work, either. That used to be like, what do you mean I am interested in something. They are actually forced to have an interest, and it is sometimes fake to make it a little bit, too. #Semi-structured teacher interview I*

In order to address issues of student interest in science, he believed that teachers needed to help students figure out their interests, and then make the necessary connections within the context of socioscientific issues. Based on his experiences in the Environmental Ethics class, Alex believed that this was a challenging, yet

effective, way of teaching. In addition to giving students the freedom to figure out their own interests, Alex also added that students could learn better if they investigated the issue themselves. As long as students were given opportunities to control their own learning processes, they could become experts on the particular topics related to their interests,

> *For a kid to really learn a lot about it, and really, the best strategy is that the kid does it himself. The kid goes and does the research, does their project on their own. They are really gonna know a lot. And, they are gonna be an expert, and they are gonna have a greater understanding about what's going on with the Minnesota River. #Semi-structured teacher interview I*

Alex also addressed how students perceive SSI. In terms of judging the trustworthiness of information, he criticized his students for not being critical and skeptical. Therefore, Alex stated that his main objective was to have students think critically and be skeptical about SSI. However, he added that people underestimated how hard it was to be critical and skeptical. In order to think critically about the controversial SSI, he emphasized the fact that students needed to know about the issue and gain a broad perspective on it.

Portrait II: Dirk

Dirk is a social studies teacher with 20 years of experience at his current school. Even though he teaches different social studies content, such as history, microeconomics, and the humanities, Dirk and his students often described Dirk as an economics teacher due to his BA degree in economics. Correspondingly, he encourages his students to examine various issues from an economics perspective. In his social studies classes, Dirk strongly encourages his students to think critically and determine their own positions. As a social studies teacher, Dirk often makes references to citizenship education in the context of environmental science classes. In one of his interviews, Dirk stated that "you talk about immersing and connecting the kids to where they live, and then you have an active citizen on your hands." Despite his social studies background, Dirk takes advantage of his outdoor interests while teaching the Environmental Ethics class.

Dirk's beliefs about the SSI around the river basin. While demonstrating his understanding of the river-related issues, Dirk expressed his struggle to understand the science related to these issues. He was also disappointed about the disagreement among scientists as to whether steep riverbanks/increased precipitation or agricultural activities were the main contributor to the river basin issues, which is why he rarely attempted to explain the science behind these issues. Nevertheless, Dirk was aware of the social factors that he thought made these issues more complex. According to him, the social dimensions of the issue require people to look through different lenses while investigating it.

> *We have to understand those lens ideas, social, environment, economic. I think it is hard. Sometimes it is a situation that all three are engaged…I think you have to be willing to hear all points of view, but you can't take one as the truth. #Semi-structured teacher interview I*

Dirk also addressed the decision-making processes in dealing with the issue. He stated that he personally preferred listening to extreme points of view first, and then trying to find the consistent ideas from both extremes that can be centered to bring a more moderate view. Dirk believed that the complexity of the issue, as well as the involvement of groups with different vested interests, required people to make their decisions based on critical thinking. However, he was concerned that most people made up their minds based on their initial thoughts, which were more emotionally driven than logical. He added that people did not make decisions unless the consequences impacted them directly. Therefore, the closer people were to the issue, the more they were engaged, but this proximity also caused them to follow their emotions rather than logic.

Dirk's beliefs about scientific studies around the river issues. Even though he rarely addressed the science in his interviews, Dirk frequently addressed the bias factor in science. Although he expected researchers to be less biased, he added that funding played a significant role in presenting the reality. In addition, Dirk believed that the scientific data itself did not necessarily tell the truth, because the data could be fit into the lens that people held based on their vested interests,

> *I think you can make the data and research fit what lens you want to see it incorporated into. That's where I get nervous about who is doing the right study. I always try to remain objective to see what's their bias, what's their slant on the issue. #Semi-structured teacher interview I*

In order to decide who demonstrated bias in their study, Dirk suggested taking an objective look at the scientific studies. He added that if he had a chance to ask questions to those scientists, he would probably ask them to reveal their own biases, as well as to defend each other's positions.

Dirk's beliefs about SSI-based instruction. Similar to Alex, Dirk highlighted the necessity of helping students find connections to their interests while exploring SSI. Dirk believed that, in order to be fully engaged in an issue, students needed to see the connections to their lives. In order to do that, he suggested taking students to the places where they could see the parallels to their own experiences. One of the reasons why Dirk was so insistent on the idea of finding connections to students' lives was because the students did not think about the river issues, even though the river was their backyard. He believed that students needed to define their feelings first in order to ground their ethics.

> *I think the big thing here is our vested interest. And, that's a huge topic. Like he said, I don't think some kids even think about it. Because my side of ethics, you gotta define what you feel about certain things to have any type of platform to base your ethics out of. #Semi-structured teacher interview II*

In terms of students' criteria for the reliability of information resources, he stated that students paid attention to the resources that were easier to understand. That is why they usually made inquiries about SSI via media because scientific resources were too hard to understand. Dirk also criticized his students for not having critical

reading skills. He stated that if he did not lead them, his students read to complete the task instead of really understanding and critically thinking about it.

In order to encourage students to think critically about an issue like the ones around the river basin, Dirk suggested pushing the extremes first in presenting the issue to the students. He believed that students could be provoked as they saw the extreme sides of the issue because students' thinking about controversial issues was driven by their emotions. Thus, the classroom discourse about controversy would be enriched.

> *Even dealing with controversial issues in my school, it seems that the emotional component, or whatever their parents have felt, becomes what the kid feels, and then that drives what their thinking. That's what scares me. Personally, I would enjoy pushing the extreme. To me, that would be more enriching #Semi-structured teacher interview I*

Instruction

Co-designing environmental ethics class. Environmental Ethics was an elective science class co-taught by the participant teachers. The reason that students enrolled this class was mainly its project-focused and student-driven structure. As Alex described the student body, he stated that students do not take this class just to learn science. In fact, most students taking this class were not interested in traditional environmental science content. He added that the class had both high and low achieving students in it. The main motivation to take this class was to go out and help the environment.

> *They just don't care, whatever man, I don't care. It is just a graph, it is just numbers. That's not why they are in the class. It is not what they want. It has everything in it. And, we want every kid to explore their interests. Going out and doing actual work. That's the main thing we want. #Semi-structured teacher interview I (Alex)*

While designing the class, Alex and Dirk took this into consideration. Unlike most environmental science classes, they designed a less science-driven class in order to create a space for social aspects and student-driven projects. After attending the River Run professional development program, they centered their course content around the SSI around the Minnesota River Basin. Addressing the objectives of their class, both Alex and Dirk strongly highlighted critical thinking as the main goal. As a result, they wanted their students to be informed decision makers, instead of blind consumers. While the teachers co-designed their class, Dirk strongly pushed the idea of a triple bottom line that required students to look at the SSI around the river basin from social, environmental, and economic perspectives.

> *Our class is based on the triple bottom line: social, environmental, and economic. So, we work hard to get the kids to see each of these...I think that just asking them to look at three different lenses really helps. #Semi-structured teacher interview I (Dirk)*

The idea of the triple bottom line was a baseline for the content of the Environmental Ethics class. Alex and Dirk often emphasized the triple bottom line idea and made explicit references to it throughout the academic semester. Therefore, they required their students to examine any environmental issue from social,

economic, and environmental perspectives. As a result, Alex and Dirk aimed at educating responsible citizens of the future. In their syllabus, they described their goal as "producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution." They both believed that the way to produce this citizenry was to encourage students not only to understand the science behind socioscientific environmental issues, but also to examine those issues from the three perspectives in the triple bottom line idea.

One of the main points that made the Environmental Ethics class different from other science classes was the explicit inclusion of social aspects. Dirk believed in the importance of social aspects and often criticized the traditional environmental science curriculum and textbooks. With his social studies background, Dirk's role was mostly to highlight the social aspects of environmental issues. Indicating the environmental science textbook that they were supposed to use for this class, he criticized environmental science classes about missing the opportunity to present the topics using multiple lenses. Therefore, Alex and Dirk decided not to use the environmental science textbook. Instead, they enriched their environmental ethics curriculum with outside resources, such as documentaries, newspaper articles, and outside experts in order to fully address both scientific and social aspects of environmental science content.

Student-driven projects. As mentioned before, Alex highlighted the idea of place-based education and project-based learning in teaching environmental science content. Dirk strongly believed in the premise of citizenship education and the triple bottom line as a framework for environmental science teaching. Therefore, Alex and Dirk decided the main premise of the class was to challenge students to do projects that helped their communities. In addition to being critical thinkers and informed decision makers, Alex and Dirk strongly encouraged their students to improve the quality of the environment surrounding them. They believed that the way they structured the class "challenged students to produce something" during the semester. In deciding the objectives for the student-driven projects, they assigned two different goals: "learning goals" and "content learning goals." The content learning goals involved the usual environmental science content, such as "wildlife, water quality, aquatic life, soils, bio-geochemical cycles, pollution, interconnected systems, bio indicators, and human interactions with the environment." They also explicitly stated that each content learning goal needed to be tied to SSI specific to their area. The learning goals were built on the "triple bottom line idea that required students to solve community-based problems through the perspectives of social, economic, and environmental."

Alex and Dirk strongly highlighted student agency in the Environmental Ethics class. "Vested interest" was the word both teachers frequently stated in order to address the personal reason for students wanting to work on an issue. Indeed, the first assignment they gave was asking students to determine their own vested interests. In their first class, Dirk described a person with vested interest as "an individual with strong interests in the outcome of a decision that results in gain or

loss for that individual." Presenting the service learning projects as broadly as possible, Alex and Dirk aimed at uncovering the different vested interests of their students. In addition, Dirk believed that by looking at environmental problems with diverse perspectives based on the triple bottom line idea, students would be able to make connections more easily regardless of their interests and backgrounds,

> *If they don't feel passion towards or connect it, it might not register. But, at the same time, maybe they are getting it as they begin to present many of these different diverse ways to look at different topics. #Semi-structured teacher interview I (Dirk)*

Both teachers stated that SSI-focused content also helped them to give their students opportunities to explore their own interests. Like most SSI-based content, the issues around the basin are multifaceted and incorporate the interests of different groups of people with different vested interests. Thus, it creates opportunities for students to focus on their interests within their projects.

SSI-based instruction. The environmental ethics class began with fundamental principles and concepts in environmental science. Therefore, that was where Dirk emphasized the triple bottom idea, which requires students to see different aspects of SSI. They also had field trips to different places, such as a tributary of the Minnesota River on a Native American reservation. On those field trips, Alex was usually the one who lectured students about the environmental science content. Then, Dirk fostered a discussion about ethical, economic, cultural, and social contexts. To illustrate, during their field trip to one of the tributaries of the river located on a Native land, Alex first addressed the ecosystem around the river, discussing the health of the river and surrounding vegetation, and then Dirk raised questions about land ethics and Native culture.

In the first few weeks of the semester, Alex and Dirk highlighted the content in which they had expertise. Alex explained the scientific method and the ways to use it in student-driven projects. For instance, in the first class, he introduced different chemicals that existed in the river, and then led a discussion about the ways to investigate river basin issues. When Alex introduced the science around the river basin, Dirk intervened several times to address the role of bias in scientific studies. In addition, Dirk frequently highlighted ethics and economics in environmental studies. He introduced the concepts of cultures, worldviews, ethics, economics, and sustainability in the context of environmental science. Dirk also made references to specific terminology for ethics and economics, such as anthropocentrism, biocentrism, ecocentrism, preservation, conservation, land ethics, deep ecology, ecofeminism, and environmental justice.

As they moved to the second half of the semester, students increasingly focused on their service learning projects. The goal for the first project was to make a public service announcement or an informational video that "was informative and reflects the goal of seeing the chosen topic through the triple bottom line, the different lenses of social, economic and environmental." The second project, which the teachers called a service-learning project, required students to identify "a river-related issue in their community, research the problem, examine possible solutions, and take

action/perform a service." In these two projects, Alex and Dirk had to grapple with a dilemma related to their choices of content and pedagogical approaches. One of the requirements of both projects was to focus on SSI around the river basin. However, Alex and Dirk strongly supported the idea of student agency. Thus, they decided to ask their students to focus on the community-based environmental issues towards which they demonstrated a "vested interest," as long as they stayed in the big picture of the watershed.

The role of teachers. Due to the mostly student-driven structure of the Environmental Ethics class, the roles teachers assumed were quite different from those of traditional settings. As they presented the community-based SSI, each teacher used his own content expertise to promote students' understandings of those issues. Alex often presented the ecological, biological, and environmental aspects of those issues, while Dirk added the social, cultural, economic, and ethical influences. To illustrate, when they introduced the river-related issues, Alex's role was mainly addressing the science behind the issue, such as ways to measure the pollutant levels in the river, the acceptable and extreme values in scientific data, and potential impacts of sediment and chemicals on the river system. Then, Dirk added the economic factors that forced farmers to keep their existing practices, the vested interests of the various groups, the ethical standards people needed to have while exploring solutions, and the consequences of the sediment and chemical load on social lives in surrounding communities. As they presented their expertise by approaching SSI from multiple perspectives, Alex and Dirk strongly encouraged their students to take similar approaches while investigating different community-based issues for their projects. In this way, they modeled multidisciplinary thinking.

As mentioned before, although he was not confident about the science behind the environmental topics, Dirk was quite critical about science itself. When Alex made references to scientific processes while talking about the environmental issues, Dirk played a key role in being critical about what scientists say. He frequently addressed the need to engage multiple perspectives in order to fully understand SSI around the river basin.

For the community-based service learning projects, Alex and Dirk decided to take a unique role in order to promote student agency in their classroom. Instead of assuming usual teacher roles, Alex and Dirk consulted their students on the pathways they chose to follow for their projects. They believed that it was an effective way to help students choose their projects based on their interests,

> *Our job, is it is almost like you need to be with them, you are just consulting. You are always consulting with them to see that they are going down that pathway choosing, you know, to follow that interest. That's really weird, but it is an interesting way to teach, I think. #Semi-structured teacher interview I (Alex)*

Alex and Dirk strongly encouraged their students to present the environmental issues from the perspectives of different actors, thus including the voices of different groups of people. Hence, students could examine those issues from different perspectives to figure out their own position. Dirk frequently asked their students to

be true to the triple bottom line idea. Since they introduced the triple bottom line as a basis for any student work, both teachers constantly reminded their students to adopt those perspectives in any stage of their projects, including investigating the problem, creating solutions, and presenting their work.

Discussion and Conclusion

This study investigated the experiences of a science and a social studies teacher co-teaching an SSI-based environmental ethics class. Based on the analysis of the data, this section generates discussions around the research question.

The science education literature reveals that the science curriculum is usually not able to address every aspect of SSI (Ryder, 2001), because those issues are subject to various social domains, such as politics, economics, and ethics (Klosterman, Sadler, & Brown, 2012; Sadler, 2011). There were several occasions when both Alex and Dirk criticized the science curriculum for not being able to address every dimension of SSI. Therefore, they structured their environmental ethics class based on the "triple bottom idea" in order to look at those issues from social, economic, and environmental points of view. Similar to Sadler's (2011) argument that teaching science content was not enough for students to be able to negotiate the real-world problems, Alex and Dirk dedicated a significant part of their environmental ethics curriculum to social studies content (e.g., ethics, culture, economics) in order to help their students to become better able to deal with the environmental problems in their community. Addressing both scientific and social dimensions of the community-based river issues, Alex and Dirk intended to help their students to make informed decisions, as well as taking active roles in those community-based problems. The literature reveals that when students are exposed to different perspectives and alternative viewpoints, they are more likely to make informed, critical, and democratic choices (Hyslop-Margison & Graham, 2004). The teachers presented the community based river-related issues from the viewpoints grounded on social, economic, and cultural contexts in order to prepare students being critical and informed decision makers who are able to examine those issues from multiple perspectives, instead of blind consumers.

As Alex and Dirk designed their environmental ethics class, more than half of the academic semester was dedicated to student-driven community based projects. As they prepared their students for those projects, Alex and Dirk decided to use a variety of different resources created for both the scientific community and the public, because they strongly believed that those resources were more appropriate to inform and encourage their students to explore SSI around the river basin. The literature in SSI indicates that teachers have complained about lack of useful curricular materials and textbooks in enacting educational innovations, particularly SSI-based instruction (Sadler, Klosterman, & Topcu, 2011). Zeidler's (2014) extensive review on SSI suggested that "research on how teachers can use and modify existing resources shows promise for allowing teachers to best match their curriculum to local needs and student interests" (p. 705). After deciding that the curriculum and the

textbook designed for the environmental science classes did not meet their expectations for the community-focused class, Alex and Dirk dedicated their time to design their environmental ethics curriculum based on the resources that specifically addressed the local environmental issues from multiple perspectives.

Alex and Dirk described their role in the environmental ethics class as consulting, which was different from traditional settings. Therefore, they were not the providers of content anymore, but rather consulted with their students to explore their vested interests. Both teachers reported that their students considered their projects as a passion to improve the quality of their lives, as well as those of people around them, instead of an assignment. Thus, they were able to act as individuals in making their own informed decisions and become proactive in issues of environmental sustainability, in particular, as literature has suggested (Bencze, Sperling, & Carter, 2012; Mueller, Zeidler, & Jenkins, 2011; Simmonneaux & Simmonneaux, 2009; Tytler, 2012). In the classroom, the teachers shared the roles based on their pedagogical and content-related strengths and expertise, as suggested by co-teaching practices (Bauwens, Hourcade, & Friend, 1989; Walsh, 1992). Hence, the environmental ethics class covered both science and social studies content. Moreover, because of the expertise of each teacher, the pedagogical strategies employed met the demands of providing the multidisciplinary content, as well as filled the needs of the diverse student body.

One of the highlights of their Environmental Ethics class was the opportunity given to the students to work in the projects they felt passionate about. Science in formal school environments has usually been described as authoritative and monolithic (Fensham, 1997; Yager, 1992). Giving students power to choose their own project topics, the teachers aimed at enhancing the motivation of students in taking pro-environmental actions, as well as having their own perspective about controversial SSI. As a result, students were likely to gain greater ownership of their own learning experiences throughout the academic semester. The sense of agency in the environmental ethics class empowered students to use the class to make changes in their lives and surroundings. The literature supports that by indicating that a sense of agency helps students identify themselves within science through advance participation in their community-based issues by taking actions at both individual and community levels (Basu et al. 2009; Calabrese Barton 2008; McNeill & Vaughn, 2010).

The literature indicates that teachers' personal beliefs have a great impact on their classroom instruction (Berkman et al., 2008; Rutledge & Mitchell, 2002). The findings of this study revealed that both Alex and Dirk believed in the idea of student ownership as a strong pedagogical approach. Therefore, their practices in the Environmental Ethics class were strongly influenced by their beliefs. Alex and Dirk provided their students with opportunities to explore their own interests, and centered their projects on those interests.

The implications of the study indicate that the co-teaching an SSI-based class helps teachers provide richer learning experiences through their pedagogical and

content-related expertise. Thus, teachers who co-teach SSI-based classes may feel more comfortable addressing controversial SSI that are complex and multidimensional in nature.

References

Barth, R. S. (1990). *Improving schools from within: Teachers, parents, and principals can make the difference*. San Francisco: Jossey-Bass.

Basu, S. J., Barton, A. C., Clairmont, N., & Locke, D. (2009). Developing a framework for critical science agency through case study in a conceptual physics context. *Cultural Studies of Science Education*, *4*(2), 35-371.

Bauwens, J., Hourcade, J. J., & Friend, M. (1989). Cooperative teaching: A model for general and special education integration. *Remedial & Special Education, 10*(2), 17-22.

Bencze, L., Sperling, E., & Carter, L. (2012). Students' research-informed socioscientific activism: Revisions for a sustainable future. *Research in Science Education, 42*(1), 129-148.

Berkman, M. B., Pacheco, J. S., & Plutzer, E. (2008). Evolution and creationism in America's classrooms: A national portrait. *Public Library of Science Biology, 6*, 920-924.

Cohen, E. G. (1973). Open-space schools: The opportunity to become ambitious. *Sociology of Education, 46*, 143-161.

Cook, L., & Friend, M. (1995). Co-teaching: Guidelines for creating effective practices. *Focus on Exceptional Children, 28*(3), 1-16.

Dillon, J. T. (1994). *Using discussion in classrooms*. Buckingham, UK: Open University Press.

Fensham, P. (1997). School science and its problems with scientific literacy. In R. Levinson & J. Thomas (Eds.), *Science today: Problem or crisis?* (pp. 119–136). London, UK: Routledge.

Fleming, R. (1986). Adolescent reasoning in socio-scientific issues, Part II: Nonsocial cognition. *Journal of Research in Science Teaching, 23*, 689- 698.

Friend, M., & Cook, L. (2007). *Interactions. Collaboration skills for school professionals* (5th ed.). Boston, MA: Allyn & Bacon.

Harris, R., & Ratcliffe, M. (2005). Socio-scientific issues and the quality of exploratory talk what can be learned from schools involved in a 'collapsed day' project? *The Curriculum Journal, 16*, 439-453.

Hyslop-Margison, E. J., & Armstrong, J. (2004). Critical thinking in career education: The democratic importance of foundational rationality. *Journal of Career and Technical Education, 21*(1), 39-49.

Klosterman, M. L., Sadler, T. D., & Brown, J. (2012). Science teachers' use of mass media to address socio-scientific and sustainability issues. *Research in Science Education, 42*(1), 51-74.

Lee, H., & Witz, K. G. (2009). Science teachers' inspiration for teaching socio-scientific issues: Disconnection with reform efforts. *International Journal of Science Education, 31*(7), 931-960.

Levinson, R. (2006). Towards a theoretical framework for teaching controversial socioscientific issues. *International Journal of Science Education, 28*(10), 1201–

1224.
Levinson, R. & Turner, S. (2001). *Valuable lessons: engaging with the social context of science in schools*. London, UK: Wellcome Trust.
McNeill, K. L., & Vaughn, M. H. (2012). Urban high school students' critical science agency: conceptual understandings and environmental actions around climate change. *Research in Science Education, 42*(2), 373-399.
Morgan, K. N. (2012). Middle school and high school general-education and special education teachers' coteaching experience (Doctoral dissertation, Argosy University, Nashville).
Mueller, M.P., Zeidler, D.L., & Jenkins, L.L. (2011). Earth's role in moral reasoning and functional scientific literacy. In J. DeVitis (Ed.), *Character and moral education: A reader*. New York: Peter Lang.
Osborne, J., Duschl, R., & Fairbrother, R. (2002). *Breaking the mould? Teaching science for public understanding*. London, UK: The Nuffield Foundation.
Rutledge, M. L., & Mitchell, M. A. (2002). Knowledge structure, acceptance and teaching of evolution. *American Biology Teacher, 64*, 21-27.
Ryder, J. (2001). Identifying science understanding for functional scientific literacy. *Studies in Science Education, 36*, 1-44.
Sadler, T. D. (2009). Situated learning in science education: Socioscientific issues as contexts for practice. *Studies in Science Education, 45*, 1-42.
Sadler, T. D. (2011). Situating socio-scientific issues in classrooms as a means of achieving goals of science education. In T. D. Sadler (Ed.), *Socio-scientific issues in the classroom: Teaching, learning, and research* (pp. 1-9). The Netherlands: Springer.
Sadler, T. D., Amirshokoohi, A., Kazempour, M., & Allspaw, K. M. (2006). Socioscience and ethics in science classrooms: Teacher perspectives and strategies. *Journal of Research in Science Teaching, 43*(4), 353-376.
Sadler, T. D. & Zeidler, D. L. (2003). Scientific errors, atrocities, and blunders: using bad science to promote moral reasoning. In D. L. Zeidler (Ed.), *The role of moral reasoning and discourse on socioscientific ıssues in science education*. Dordrecht: Kluwer.
Schulte, A. C., Osborne, S. S., & McKinney, J. D. (1990). Academic outcomes for students with learning disabilities in consultation and resource programs. *Exceptional Children, 57*(2), 162 172.
Simonneaux, L., & Simonneaux, J. (2009). Students' socio-scientific reasoning on controversies from the viewpoint of education for sustainable development. *Cultural Studies of Science Education, 4*(3), 657-687.
Thousand, J. S., Villa, R. A., & Nevin, A. I. (2006). The many faces of collaborative planning and teaching. *Theory into Practice, 45*(3), 239-248.
Villa, R. A., Thousand, J. S., Nevin, A. I., & Malgeri, C. (1996). Instilling collaboration for inclusive schooling as a way of doing business in public schools. *Remedial Special Education, 7*(3), 182-192.
Walsh, J. M. (1992). Student, teacher, and parent preference for less restrictive special education models-Cooperative teaching. *Case In Point, 6*(2), 1-12.
Walther-Thomas, C. S. (1997). Co-Teaching Experiences The Benefits and Problems That Teachers and Principals Report Over Time. *Journal of Learning Disabilities, 30*(4), 395-407.
Yager, R. (1992). Viewpoint: What we did not learn from the 60s about science

curriculum reform. *Journal of Research in Science Teaching, 29*, 905–910.
Yin, R. (2003). *Case study research: Design and methods* (3rd ed.). Thousand Oak, CA: Sage.
Zeidler, D. L., Walker, K. A., Ackett, W. A., & Simmons, M. L. (2002). Tangled up in views: Beliefs in the nature of science and responses to socioscientific dilemmas. *Science Education, 86*, 343–367.
Zeidler, D.L. (2014). Socioscientific Issues as a Curriculum Emphasis: Theory, Research and Practice. In N. G. Lederman & S. K. Abell (Eds.), *Handbook of Research on Science Education, Volume II* (pp. 697-726). New York, NY: Routledge.

Fen Bilimleri ve Sosyal Bilgiler Öğretmenlerinin Sosyobilimsel Konular Temelli Öğretimi: Durum Çalışması

Atıf:
Karahan, E., & Roehrig, G. (2017). Case study of science and social studies teachers co-teaching socioscientific issues-based instruction. *Eurasian Journal of Educational Research,* 72, 63-82, DOI: 10.14689/ejer.2017.72.4

Özet

Problem Durumu: Sosyobilimsel konular, bilim ile bağlantıları bulunan ve toplum tarafından sosyal önem arz edilen durumlar olarak tanımlanmaktadır. Günümüz fen bilimleri dersi öğretim programları incelendiğinde; sosyobilimsel konulara ayrı bir öğrenme alanı olarak yer verildiği görülmektedir. Fen eğitimi alanında gerçekleştirilen çalışmalar ise fen bilimleri öğretmenlerinin sosyobilimsel konuları derslerine entegre etme konusunda gerekli yeterliklere sahip olmadıklarını göstermektedir. Fen bilimleri öğretmenlerinin bilimin sosyal ve etik yönünü öğretmede yaşadıkları tüm zorluklara rağmen, sosyobilimsel konuların fen bilimleri ve sosyal bilgiler öğretmenleri tarafından işbirliği içerisinde öğretimine odaklanmış çalışmalar ise sınırlıdır. Alanyazındaki bu eksikliği gidermek adına, bu çalışmada fen bilimleri ve sosyal bilgiler öğretmeninin işbirliği içerisinde tasarladıkları sosyobilimsel konular odaklı çevre etiği dersi incelenmiştir.

Araştırmanın Amacı: Bu çalışmada fen bilimleri ve sosyal bilgiler öğretmeninin sosyobilimsel konular odaklı çevre etiği dersini işbirliği içerisinde tasarlama ve öğretim sürecindeki tecrübelerini anlama ve betimleme amaçlanmıştır.

Araştırmanın Yöntemi: Fen bilimleri ve sosyal bilgiler öğretmenlerinin sosyobilimsel konular odaklı çevre etiği dersini işbirliği içerisinde tasarlama ve öğretim sürecindeki deneyimleri üzerine odaklanılan bu çalışma, nitel araştırma yöntemlerinden durum çalışması şeklinde gerçekleştirilmiştir. Bu durum çalışmasında, araştırmacıların tek bir durumu incelerken katılımcıların farklı düşünce ve davranışlarını inceleme imkanı vermesi dolayısıyla yerleştirilmiş iç içe geçmiş tek durum deseni seçilmiştir. Araştırmanın çalışma grubunu Amerika

Birleşik Devletleri'nde bir ortaöğretim kurumunda çevre etiği dersini işbirliği içerisinde yürüten bir fen bilimleri ve bir sosyal bilgiler öğretmeni oluşturmaktadır. Araştırmanın verileri yarı yapılandırılmış görüşmeler, gözlem notları ve yansıtıcı günlükler ile toplanmıştır. İlk görüşmede katılımcıların sosyobilimsel konular ile ilgili epistemolojik ve pedagojik inançlarını belirleme, ikinci görüşme de ise öğretmenlerin çevre etiği dersini işbirliği içinde tasarım ve öğretim sürecindeki tecrübelerini anlama amaçlanmıştır. Gözlem ve günlüklerde ise öğretim sürecinde gerçekleşen durumlar, görüşmelerde katılımcıların ortaya koydukları tecrübelerini destekleme amacıyla kullanılmıştır. Elde edilen verilerin analizinde ise sırasıyla açık kodlama, örüntü ve kategorilerin belirlenmesi, tema ve modellerin oluşturulması izlenmiştir.

Araştırmanın Bulguları: Araştırma bulguları, fen bilimleri ve sosyal bilgiler öğretmenlerinin, öğretim programının ön gördüğü çevre eğitimi dersi içeriği ve ders kitaplarının sosyobilimsel konuların tüm boyutlarını yeterince içeremediklerine yönelik eleştiriler getirdiklerini göstermektedir. Dolayısıyla, sosyobilimsel konulara odaklandıkları çevre etiği dersini çevre sorunlarına sosyal, ekonomik ve çevresel bakış açıları ile inceleyebilmek adına üç boyut fikrine göre tasarlamışlardır. Öğrencilerini ders kapsamındaki projelere hazırlarken, ders dışı kaynakların öğrencileri sosyobilimsel konulara hazırlama ve motive etmede daha etkili olduğunu düşünerek ders kitapları yerine bu kaynakları kullanmayı tercih etmişlerdir. Bu bulgulara ek olarak, çevre etiği dersinin ilerleyen süreçlerinde öğrenci gruplarının ilgi duydukları alanlara yönelerek projelerini bu alanlarda gerçekleştirmelerini motive ederek, öğrencilerin karar verme süreçlerindeki kontrolünü zenginleştirmeyi amaçlamışlardır.

Araştırmanın Sonuçları ve Önerileri: Fen bilimleri ve sosyal bilgiler öğretmenleri sosyobilimsel konular odaklı çevre dersindeki rollerini açıklarken, geleneksel öğretmenlik sorumluluklarından farklı olarak kendilerini danışmanlar olarak tanımlamışlardır. Dolayısıyla, kendileri içeriği sağlamaktan sorumlu kişi olmak yerine, öğrencilerin sosyobilimsel konular bağlamındaki ilgi ve çıkarlarını keşfetmelerinde onların danışacakları uzmanlar haline gelmişlerdir. Araştırmaya katılan öğretmenler; öğrencilerine ilgi duydukları konulara yönelik projeler gerçekleştirmelerine fırsat verme, öğrencilerini çevre dostu adımlar atmaya motive ederek tartışmalı sosyobilimsel konularda kendi bakış açılarını bu adımlarda ortaya koymalarını hedeflemişlerdir. Öğrencilerin gerçekleştirdikleri toplumsal çevre hareketleri göz önünde bulundurulduğunda, çevre eğitiminin öncül hedeflerinden olan öğrencilerin çözüm süreçlerinde rol oynayarak bir parçası olmaları hedefinin bu ders kapsamında sağlanması için önemli bir çaba gösterildiği ortaya çıkmaktadır. Öğretmenlerin sosyobilimsel konular ile ilgili farklı bakış açılarını öğrencilere kazandırma ve öğrencilerin kendi kontrolleri doğrultusunda aktif rol almaları, onların toplumun sosyobilimsel konulardaki yaygın algılarını eleştirebilme ve aksi doğrultuda adımlar atabilme noktasında önemli bir faktör olmaktadır.

Anahtar Sözcükler: Çevre etiği, durum çalışması, toplumsal katılım.

Eurasian Journal of Educational Research 72 (2017) 83-106

Eurasian Journal of Educational Research
www.ejer.com.tr

Effects of Augmented Feedback on Cardiopulmonary Resuscitation Skill Acquisition: Concurrent Versus Terminal

Leyla SARAC[1]

ARTICLE INFO

Article History:
Received: 11 Mar. 2017
Received in revised form: 24 Aug. 2017
Accepted: 13 Nov. 2017
DOI: 10.14689/ejer.2017.72.5

Keywords
Motor learning
Skill acquisition
CPR
Basic life support
First aid

ABSTRACT

Purpose: While various approaches, methods, and devices have been employed to foster maximum learning of CPR skills, researchers have suggested external feedback as a crucial source for the improvement of these skills. **Purpose:** The purpose of this study was to determine the effects of augmented concurrent (AC) and augmented terminal knowledge of results (AT-KR) on cardiopulmonary resuscitation (CPR) skill acquisition. **Method:** A sample of 76 second-year university students participated in the study. All study participants, who were determined to be eligible, completed a total of four hours of CPR training (two hours a week). Immediately after the training, the pre-test (ten sets of CPR) was administered to determine the participants' baseline CPR skill level. Participants were then assigned into three groups, one control and two experimental groups (AC and AT-KR), according to their sex and baseline CPR skill level. Participants in the AC group received a simultaneous visual feedback during CPR practice; participants in the AT-KR group received a printed report of their performance after they completed the CPR practice; and students in the control group received no feedback related to their CPR performance. Upon completion, effects of the feedback were measured to show CPR performance improvement at post-test relative to the pre-test. **Findings:** Students in the AC and AT-KR group performed better in some ventilation and compression skills than the students in the control group. **Implications for Research and Practice:** Usage of advanced technical feedback devices are recommended to enhance CPR skill acquisition.

[1] Mersin University, The School of Physical Education and Sports, TURKEY
e-mail: lsarac@mersin.edu.tr
ORCID: https://orcid.org/0000-0002-8593-6873

Introduction

Cardiac arrest, sudden and unexpected cessation of effective cardiac functions, is one of the most dangerous, life-threatening conditions in the world (George, 2013; Deo & Albert, 2012). Approximately three million cardiac arrests occur annually throughout the world and survival rate of the victims is less than 1% (Josephson & Wellens, 2004). Among the several actions that should be taken during cardiac arrest conditions, the first and, the most crucial is cardiopulmonary resuscitation (CPR), which consists of the use of 30 chest compressions and 2 ventilations (30:2 CPR). CPR is used to provide oxygen to the body and circulatory support and to prevent cardiac arrest victims from brain damage and death (Tucker, Larson, Idris, & Curtis, 1994; Wenzel, Idris, Banner, Fuerst, & Tucker, 1994).

The majority of cardiac arrests occur at home or in public places and the incidents are fatal if not treated immediately (O'Rourke, 2005; Wellens, Gorgels, & Munter, 2003). Correspondingly, considering the time from cardiac arrest to arrival of emergency personnel to the scene, administration of CPR by someone at the site of the incident is mandatory to save the life of the victim. For this reason, increasing the number of people who are well equipped to provide effective CPR has been one of the most important lifesaving public health priorities (Nolan et al., 2010). Research has proven that timely and effective intervention within three to four minutes in cardiac arrest conditions improves the survival rate of the victim up to 50% (Nolan et al., 2010; Terence et al., 2000). However, despite all educational efforts to enhance the quantity and quality of resuscitation skills in society, studies have reported inadequate CPR performance in trainees even immediately after training (Brennan & Braslow, 1995; 1998). Several reasons (insufficient practice time, lack of corrective feedback, poor assessment, ineffective instructors, and teaching styles) have been proposed in the literature for this poor CPR performance (Brennan & Braslow, 1995; 1998; Chamberlain & Hazinski, 2003; Kaye et al., 1991; Parnell & Larsen, 2007; Tekelioglu, Cakici, Tansu, Hayrioglu, & Buyukyilmaz, 2010).

A great deal of research has been conducted to facilitate and ensure maximum learning in CPR training courses. These studies have concentrated on the effectiveness of a variety of approaches, methods, tools, and devices (Roppolo, Wigginton, & Pepe, 2009; Yeung, Meeks, Edelson, Gao, Soar, & Perkins, 2009). Although research evidence has suggested that these attempts, to some extent, have facilitated the acquisition and retention of CPR skill and knowledge, CPR is composed of a complex combination of skills and steps that should be carefully followed during cardiac arrest conditions to enhance survival of victims, and there is still need for improvement (Chamberlain & Hazinski, 2003; Sutton, Nadkarni, & Abella, 2012). The range of CPR skills is complex and includes nine perceptive-motor skills: multimember coordination, control accuracy, response orientation, reaction time, arm movement speed, agility, manual dexterity, arm-hand steadiness, and wrist-finger speed. CPR also requires a high level of eight physical proficiencies: static strength, dynamic strength, trunk muscle strength, extent flexibility, dynamic flexibility, gross body coordination, general body balance, and stamina. It requires physical fitness, especially when applied for long periods of time (Baubin et al., 1996;

Lucia et al., 1999; Miyadahira, 2001; Pierce, Eastman, McGowan, & Legnola, 1992; Trowbridge, Parekh, Ricard, Potts, Patrickson, & Cason, 2009).

Efficacy of CPR performance decreases significantly by the time involved and by performers who are unaware of this decrease and their true level of performance during application (Hightower, Thomas, Stone, Dunn, & March, 1995; Ochoa, Ramalle-Gomara, Lisa, & Saralequi, 1998; Ock, Kim, Chung, & Kim, 2011). This is mostly because of the difficulty of interpreting whether one's own performance is correct (Barrow & Brown, 1988). At this point, an external source of feedback from a variety of sources, such as a device or an instructor, is of vital importance in informing the performer about the efficacy of his/her performance (Young, Schmidt, & Lee, 2001). Otherwise, the performer will generally not be aware that he/she is performing inaccurately. Like other skills, improvement of CPR is influenced by and depends on a deeper understanding of performance information offered to performers to improve their skills. This information related to the performance of a skill during or after the performance is referred to as "feedback" (Magill, 2004; Schmidt & Wrisberg, 2000; Schmidt & Lee, 2011).

There are two main types of feedback: intrinsic and extrinsic or augmented. Intrinsic feedback refers to sensory information that arises from the performance itself, while augmented feedback refers to movement-related information provided by external sources (Schmidt & Wrisberg, 2000; Young et al., 2001). Each of these two feedback types are further divided into two sub-categories based on the time at which the feedback is given: concurrent (feedback provided during the performance) and terminal (feedback provided after the performance) (Sage, 1984; Schmidt & Wrisberg, 2000; Young et al., 2001). Lastly, terminal feedback is also divided into two categories: knowledge of results (KR) and knowledge of performance (KP). KR includes information about the achievement of the performance in terms of the intended environmental goal; KP, on the other hand, contains information regarding movement pattern after performance (Magill, 2004; Sage, 1984; Schmidt & Lee, 2011; Young et al., 2001). The current study focuses primarily on two types of feedback: augmented concurrent (AC) and augmented terminal (AT-KR).

Many studies have been conducted to determine whether different types of feedback are effective in skill learning (Sarac, 2006; Couper & Finn, 2013; Zapletal et al., 2013). These studies have reported mixed results of necessity and effectiveness of feedback as essential, inessential, enhancing, and hindering the skill acquisition (Magill, 2004). However, it has long been suggested that feedback from devices or instructors is crucial and inevitable for CPR skill acquisition and retention (Soar et al., 2010; Terzioglu et al., 2013). For this reason, there is a need for further studies exploring the effects of different types of feedback, specifically on CPR skill acquisition. In addition to the influence of feedback on CPR performance, studies have found evidence of an interaction between the responder's sex and the CPR quality (Hong, Park, Lee, Baek, & Shin, 2012; Peberdy, Silver, & Ornato, 2009; Tomlinson, Nysaether, Kramer-Johansen, Steen, & Dorph, 2007). There are, however, several inconsistencies among the findings of these studies. While several studies showed that males performed better than females in CPR skill performance (Ashton,

McCluskey, Gwinnutt, & Keenan, 2002; McDonald, Heggie, Jones, Thorne, & Hulme, 2012; Meissner, Kloppe, & Hanefeld, 2012; Sayee & McCluskey, 2012), other studies found no difference between males and females in CPR quality (Ochoa et al., 1998). It is still unclear whether sex of the rescuer significantly affects CPR performance. Since improvement in CPR skills is directly related to survival of cardiac arrest patients, the aim of this study is to determine the effectiveness of augmented concurrent (AC) and augmented terminal KR (AT-KR) feedback and the effects of performers' sex on CPR skill acquisition.

Method

Research Design

The current study was designed to investigate the effects of two different types of augmented feedback, AC and AT-KR, on CPR ventilation and compression skills of male and female university students. This study employed a 2 (Sex: male and female) x 3 (Groups: control, AC and AT-KR) X 2 (Time: pre-test and post). Repeated measures mixed factorial ANOVA design, with Sex and Groups as between-subjects factor and Time as a repeated measure factor. The dependent variables in the study were mean scores of the 9 ventilation skills (average ventilation volume, average number of ventilations per minute, minute ventilation volume, total number of ventilations, number of correct ventilations, percent of correct ventilations, number of too many ventilations, number of too few ventilations, and number of too fast ventilations) and 11 compression skills (average compression depth, average number of compressions per minute, average compression rate, total number of compressions, number of correct compressions, percent of correct compressions, number of too deep compressions, number of too shallow compressions, number of wrong hand positions, number of too low hand positions and number of incomplete releases) of CPR that served as pre-test and post-test measures.

Research Sample

The eligible participants for this study were eighty second-year university students of different academic disciplines enrolled at the Mersin University during the 2012 and 2013 fall semesters. All were enrolled in "First Aid (FA)," an elective course provided by the School of Physical Education and Sports. A non-probability, convenience-sampling method was used to select participants. Although 80 students initially volunteered to participate in the study, a total of 76 students` CPR performance scores were taken into consideration. One of the students was excluded from the study for having previous training in FA and CPR. Accordingly, the number of eligible participants declined to 79 at the beginning of the study. In addition to this, three students, who did not attend the FA classes regularly, were excluded from the study. However, these students remained actively enrolled in FA from the beginning to end of the course. Regular class attendance in the FA course was mandatory, but participation in the study was voluntary. Ultimately, the study sample consisted of 28 males (36.84%) and 48 females (63.16%). The participants` ages ranged from 18-24 years, with a mean age of 21.33±1.44 years. The mean age for

males was 22.00±1.33 and for females was 20.94±1.36. The potential participating students were identified and informed about the research. A signed consent form was obtained from students who were willing to participate in the research, and they were asked about their age, sex, and previous CPR training experience.

Course Description

The FA course was a one semester (14 weeks) instructor-led course involving two hours of class time per week. Although the course covered topics, such as circulatory emergencies, respiratory emergencies, soft tissue injuries, and burns, this study only included the topic of CPR. The CPR section of the FA course lasted for two weeks (two hours a week), and the content followed the 2010 guidelines of the European Resuscitation Council (Nolan et al., 2010). These standards involved application of 30 chest compressions by trained or untrained rescuers at the rate of at least 100 compressions per minute and to a depth of at least 5 cm, allowing full chest recoil and minimized interruptions between each chest compression. In addition, for trained rescuers, guidelines suggest that following 30 chest compressions, two ventilations with a tidal volume of 500-600 ml and one-second duration be performed. The certified instructor of the FA course had taught this particular topic for 12 years.

Research Instrument and Procedure

Eighty students organized into three groups (classes), each of which had the same materials and circumstances in which to learn. Each group had four hours (two hours a week) of theoretical training and practical information related to CPR ventilation and compression skills as well as hands-on practice on a Resusci Anne Basic Torso CPR Manikin (Image 1). These three groups were not treatment groups (control, AC, and AT-KR), limited in size (Group 1= 26, Group 2= 27 Group 3= 27), and formed only for the purpose of instruction in FA. The participants, instructor, and researcher as well, were aware of the purpose of the study but were blind to the treatment delivered to each participant before and during the instruction. Accordingly, this grouping process helped reduce researcher bias.

Image 1. Laerdal Resusci® Anne CPR Training Manikin

During hands-on practice, students were observed and were provided feedback by the instructor when necessary. One week after four hours of training, the pre-test

was applied and all students were required to perform ten sets of CPR (1 set= 30 chest compressions, 2 breaths). The 2010 European Resuscitation Guidelines include recommendations to change rescuers about every 2 minutes to prevent adverse effects of rescuer fatigue and maintain chest compression quality during CPR (Nolan et al., 2010). The required ten sets of CPR were chosen according to the above theoretical framework. A Laerdal Resusci Anne SkillReporter ® manikin was used in order to collect pre-test data on nine ventilation and 11 compression skills, which were described in the "Research Design" section. Although the manikin had real-time feedback and debriefing features, it was only used to record data (Image 2).

Image 2. Laerdal Resusci Anne SkillReporter CPR Manikin and SkillReporter Device

During the pretest, students did receive any feedback from the instructor or from the manikin. Each participant administered ten sets of CPR individually in a laboratory environment, which totally isolated a person from external distractions. Pre-test scores and sex of the participants were then used to randomize and assign participants anonymously into three intervention groups: control, AC, and AT-KR. It was ensured that male and female students with higher and lower CPR performance scores were equally distributed across the three groups. Twenty-five participants were placed in the control group (n_{male}= 9, n_{female} = 16), 27 students in the AC group (n_{male}= 10, n_{female} = 17), and 24 students in the AT-KR group (n_{male}= 9, n_{female} = 15). Four weeks after the pre-test, all students in the three groups were required to perform ten sets of CPR for a post-test, which was administered in the same manner. Before administering the post-test, each student in the AC group did ten sets of CPR trials on a Laerdal Resusci Anne Manikin by using its real-time visual feedback features. These features included moving light bars for dynamic and simultaneous feedback of CPR ventilation and compression performance, such as ventilation volumes, compression depths, wrong hand positions, and stomach distension. Light bars included yellow, green, and red colors. Yellow lights activated when the inflation

volume and compression depth were insufficient; the green light was activated when the inflation volume and compression depth were sufficient; and the red light activated when the inflation volume and compression depth were excessive. In addition, too fast inflations and wrong hand positions were also indicated by lights on the manikin's torso. These light indicators, which were observed by performers, on correct and incorrect CPR ventilation and compression skill performance during ten sets of CPR practice, were expected to be used as instant and objective feedback for students who were in the AC group. Students were given a five-minute recovery period after ten sets of CPR and were informed about additional time allocation for recovery, but none of the students used extra time other than the standard five-minute recovery time. Throughout the recovery period, no verbal communication occurred between student and researcher regarding the CPR performance.

At the end of this five-minute recovery period, students in the AC group were required to perform ten sets of CPR as a post-test. Students in AT-KR group were also given ten sets of CPR trial and a five-minute recovery period within the post-test. However, the real-time visual feedback features were not provided to students in the AT-KR group. They were given a printed report of their CPR ventilation and compression skill performance during the ten sets of CPR trial. This report was provided by Laerdal Resusci Anne SkillReporter ® and contributed a statistical data of ventilation and compression parameters that were given in Image 2. Because the report is in English, the data was translated into Turkish and was explained verbally by the researcher to the students. Students also analyzed their correct and incorrect attempts related to ventilation and compression performance by using this printed report. The verbal explanations given by the researcher did not include any different information from the printed report. Students in the control group were similarly given ten sets of CPR and a five-minute recovery, but did not receive any additional feedback. They completed the post-test performing ten sets of CPR. Figure 1 provides an overview of the procedures used in the current study.

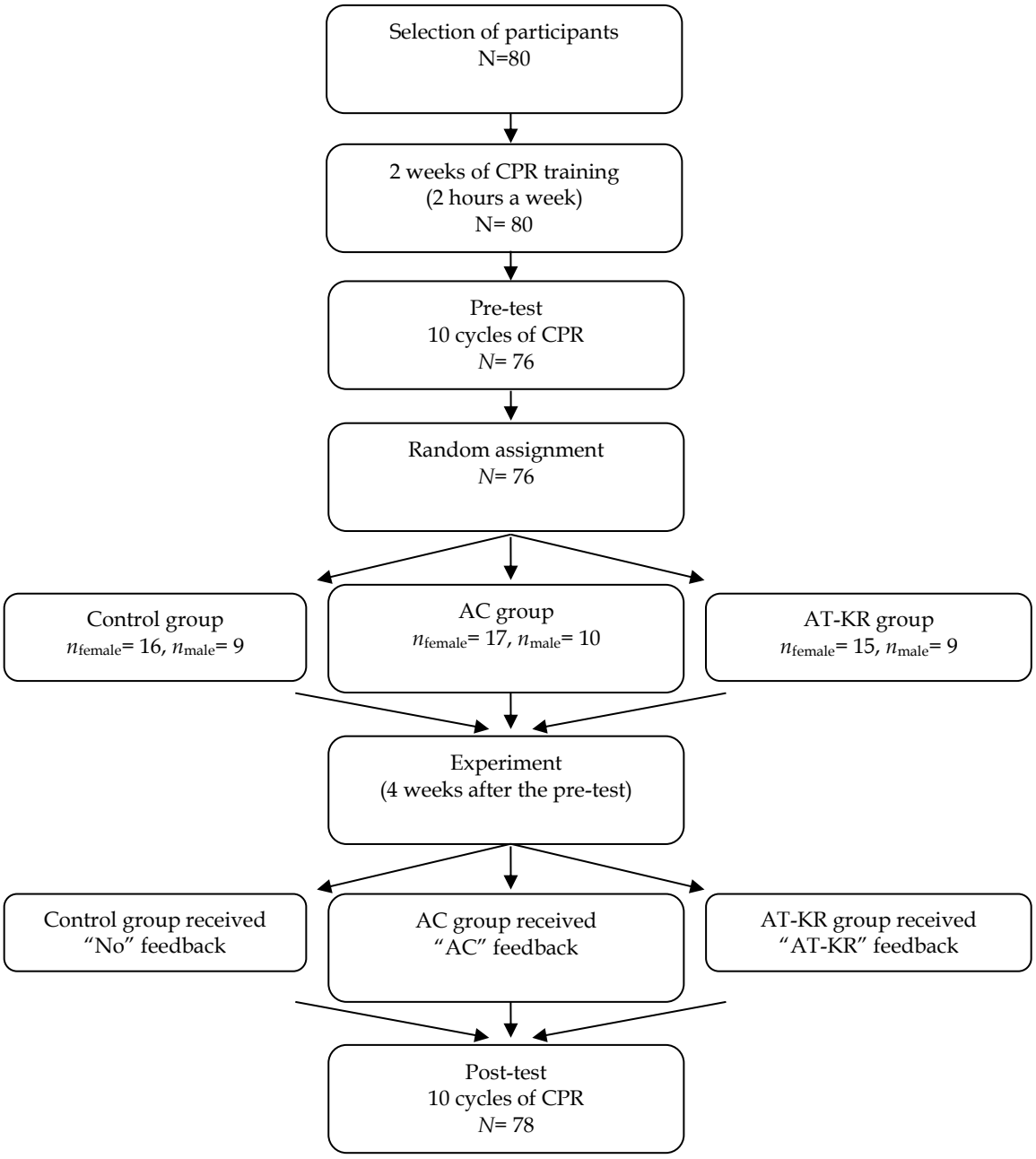

Figure 1. Flow diagram of the experimental design and procedures

Data Analysis

For two different types of augmented feedback (AC and AT-KR), mean CPR ventilation and compression data were analyzed using a three-way mixed factorial analysis of variance (ANOVA) including one within the subjects factor (Time) and two between subjects factors (Sex and Groups). The mean CPR ventilation and compression skill performance scores were dependent variables. All the analysis was performed using IBM SPSS Statistics Software, version 21. The data was interpreted for significant three-way interactions, two-way interactions, and main effects. A simple main-effects analysis was executed to analyze interaction effects. Main effects have not been interpreted in the presence of interaction effects. All differences reported are significant at the 0.05 level.

Results

Results Related to Ventilation Skill Acquisition

A Sex (male, female) x Treatment (control, AC, AT-KR) x Time (pre-, post-) mixed-factorial (2 x 3 x 2) ANOVA was conducted to examine the effectiveness of two different types of augmented feedback (AC, AT-KR) on the acquisition of CPR ventilation skills among university students. The normality assumptions in this study were satisfied for continuous variables. The analysis of results and means and standard deviations for ventilation skill performance are provided in Table 1. The mean percentage of correct ventilations on pre-test across three groups was poor; Control: M_{Male}= 8.67±11.02, M_{Female}= 11.56±19.02; AC: M_{Male}= 8.60±14.63, M_{Female}= 18.12±24.12; AT-KR: M_{Male}= 22.89±36.04, M_{Female}= 13.33±25.36. In addition, results demonstrated that Sex x Treatment x Time three-way interactions; Sex x Treatment two- way interactions; Sex x Time two- way interactions; and Sex main effects were not significant for any of the nine ventilation skills at p>.05. These results suggest that ventilation skill performance of male and female participants in control, AC feedback, and AT-KR feedback groups were comparable in pre-test and post-test.

However, results of the analysis showed that there was a significant interaction effect between Treatment and Time on average ventilation volume [F(1, 70)= 3.97, p= .02, *partial* η^2= .10], average number of ventilations per minute [F(1, 70)= 5.48, p= .01, *partial* η^2= .14], number of correct ventilations [F(1, 70)= 25.13, p= .00, *partial* η^2= .42], percent of correct ventilations [F(1, 70)= 12.91, p= .00, *partial* η^2= .27], number of too much ventilations [F(1, 70)= 7.82, p= .00, *partial* η^2= .18], number of too little ventilations [F(1, 70)= 7.55, p= .00, *partial* η^2= .18], and number of too fast ventilations [F(1, 70)= 8.56, p= .00, *partial* η^2= .20]. Simple main effects analysis conducted on the significant interactions revealed that students in control, AC, and AT-KR feedback groups performed comparable ventilation skills in the pre-test, but after getting feedback in the post-test, students in the AC and AT-KR feedback group performed better than the students in the control group on average number of ventilations per minute, number of correct ventilations, percent of correct ventilations, and number of too fast ventilations, p<.05. The mean percentage of correct ventilations by male and female in the pre-test and post-test are shown in Table 1.

Table 1
Change in Ventilation Skill Performance as a Function of AC and AT-KR Feedback

		Control Group				AC Group				AT-KR Group			
		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test	
		M	*(SD)*	*M*	*(SD)*	*M*	*(SD)*	*M*	*(SD)*	*M*	*(SD)*	*M*	*(SD)*
Average volume [f]	Male	465.6	(236.0)	644.4	(334.7)	985.0	(494.3)	631.0	(66.7)	762.2	(511.2)	672.2	(86.4)
	Female	634.4	(526.6)	725.6	(438.1)	801.2	(437.5)	682.9	(199.3)	718.7	(524.3)	676.0	(118.2
Average # per min[c,f]	Male	3.4	2.4)	3.9	(1.7)	3.8	(1.8)	4.3	(0.7)	2.3	(1.9)	4.3	(1.1)
	Female	2.6	(2.3)	2.9	(1.7)	2.9	(1.9)	4.2	(1.0)	2.1	(1.9)	4.4	(0.7)
Minute volume	Male	1923.3	(1409.5)	2671.1	(1078.9)	4158.0	(2439.8)	2710.0	(479.7)	2387.8	(2279.9)	2848.9	(572.2)
	Female	2296.3	(2229.4)	2581.9	(1747.6)	2765.9	(2207.6)	2824.7	(952.7)	2300.0	(2437.0)	2970.0	(680.0)
Total number [c]	Male	14.0	(8.0)	16.8	(6.8)	15.6	(6.9)	20.2	(1.6)	13.4	(9.4)	20.4	(1.4)
	Female	12.0	(9.9)	15.3	(8.6)	15.0	(8.3)	20.1	(1.3)	10.9	(8.9)	19.8	(2.1)
Number correct [b,c,f]	Male	1.6	(2.1)	4.6	(4.5)	1.4	(2.1)	12.2	(4.9)	2.8	(4.6)	13.9	(2.5)
	Female	2.2	(3.7)	3.1	(5.4)	2.8	(4.1)	14.7	(5.7)	1.4	(1.6)	13.2	(5.6)
Percent correct [b,c,f]	Male	8.7	(11.0)	24.2	(22.5)	8.6	(14.6)	60.3	(23.5)	22.9	(36.0)	68.2	(14.5)

Table 1 Continue

	Female	11.6	(19.0)	17.8	(28.1)	18.1	(24.1)	72.0	(27.7)	13.3	(25.4)	65.7	(26.2)
Too much [c,f]	Male	0.2	(0.7)	2.7	(5.7)	11.6	(8.7)	2.0	(3.5)	9.2	(10.1)	2.2	(3.6)
	Female	6.5	(8.5)	7.8	(9.0)	7.6	(8.8)	1.6	(3.6)	8.1	(8.0)	3.1	(4.7)
Too little [f]	Male	5.1	(7.6)	1.2	(2.1)	0.6	(1.6)	2.3	(1.8)	0.2	(0.7)	1.7	(1.9)
	Female	2.1	(4.9)	0.6	(0.9)	1.1	(1.9)	1.2	(1.3)	1.3	(1.4)	1.8	(2.0)
Too fast [c,f]	Male	7.3	(9.1)	9.0	(7.8)	11.4	(8.1)	4.7	(4.2)	9.6	(8.7)	2.9	(1.8)
	Female	5.5	(8.1)	8.9	(8.8)	10.0	(7.8)	3.6	(4.5)	5.9	(7.3)	3.3	(5.2)

[b] Treatment main effect
[c] Time main effect
[d] Sex x Treatment interaction effect
[e] Sex x Time interaction effect
[f] Treatment x Time interaction effect
[g] Sex x Treatment x Time interaction effect

Results Related to Compression Skill Acquisition

A 2 x 3 x 2 mixed-factorial ANOVA was also conducted to examine the effectiveness of AC and AT-KR on the acquisition of CPR compression skills among university students. Results obtained from the analysis are shown in Table 2. Similar to ventilation skill performance, the mean percentage of correct compressions on pre-test across three groups was poor: Control: M_{Male}= 1.33±2.83, M_{Female}= 0.13±0.34; AC: M_{Male}= 19.70±32.56, M_{Female}= 0.24±0.66; AT-KR: M_{Male}= 10.33±24.96, M_{Female}= 10.33±20.42. Additionally, the only Sex x Treatment x Time three-way interactions were found on average compression depth, [F(2, 70)= 6.52, p= .00, *partial* η^2= .16]. Simple main effects of Treatment and Time showed that the average depth of chest compressions were different between all three treatment groups in pre- and post-tests, p<.05; however, compared to the control group, participants in the AC and AT-KR feedback group improved their average compression depth after receiving feedback in post-test, p<.05. Additionally, simple main effects of Sex and Time revealed that, ignoring the influence of other variables, average depth of compressions of male and female participants were different on the pre-test, p>.05, and improved from pre- to post-test, p<.05. Results of the analysis also showed a significant interaction between Treatment and Time on students' performance of the number of correct compressions [F(2, 70)= 47.92, p= .00, *partial* η^2= .58], percent of correct compressions [F(2, 70)= 39.97, p= .00, *partial* η^2= .53], the number of too shallow compressions [F(2, 70)= 22.47, p= .00, *partial* η^2= .39], the number of wrong hand positions [F(2, 70)= 3.22, p= .05, *partial* η^2= .08], the number of too low hand positions [F(2, 70)= 3.99, p= .02, *partial* η^2= .10], and the number of incomplete releases [F(2, 70)= 5.29, p= .01, *partial* η^2= .13]. Simple main effects analysis showed that students in control, AC and AT-KR feedback groups performed similarly in the pretest, p>.05, but students in AC and AT-KR feedback groups improved their performance on number of correct compressions, percent of correct compressions, number of too shallow compressions and the number of wrong hand positions after having feedback in post-test, p<.05. The mean percentage of correct chest compressions by male and female in pre-test and post-test are shown in Table 2.

Table 2

Change in Compression Skill Performance as a Function of AC and AT-KR Feedback

		Control Group				AC Group				AT-KR Group			
		Pre-test		Post-test		Pre-test		Post-test		Pre-test		Post-test	
		M	*(SD)*	*M*	*(SD)*	*M*	*(SD)*	*M*	*(SD)*	*M*	*(SD)*	*M*	*(SD)*
Average depth [a,b,c,e,f,g]	Male	35.1	(7.6)	35.2	(9.2)	45.8	(10.0)	52.2	(8.7)	44.9	(9.3)	55.1	(2.6)
	Femaleee	33.7	(6.8)	38.0	(8.2)	32.9	(6.8)	51.7	(3.5)	44.2	(5.9)	50.5	(4.6)
Average # per min.	Male	79.1	(11.6)	78.9	(9.4)	72.2	(13.5)	70.5	(10.6)	69.1	(18.3)	75.2	(11.9)
	Female	75.4	(13.7)	70.0	(13.9)	70.3	(11.9)	72.8	(11.6)	70.5	(16.3)	74.8	(9.4)
Average compression rate	Male	119.2	(19.1)	119.6	(17.2)	120.5	(15.4)	112.4	(16.4)	124.4	(22.9)	134.7	(14.5)
	Female	120.4	(19.5)	113.3	(20.0)	115.9	(26.9)	119.9	(24.1)	124.9	(14.9)	129.3	(20.2)
Total number [d]	Male	302.3	(21.1)	305.0	(11.2)	285.1	(58.3)	297.0	(19.0)	307.2	(16.0)	329.9	(46.3)
	Female	308.5	(22.6)	306.3	(18.4)	302.1	(11.6)	313.4	(18.1)	308.2	(20.5)	305.0	(28.0)
Number correct [b,c,f]	Male	4.2	(8.9)	3.8	(10.2)	43.4	(65.5)	215.0	(89.5)	30.3	(70.0)	230.3	(58.4)
	Female	0.6	(1.6)	13.1	(25.9)	1.0	(2.5)	189.4	(72.6)	31.8	(61.9)	197.4	(91.0)
Percent correct [b,c,f]	Male	1.3	(2.8)	1.0	(3.0)	19.7	(32.6)	72.2	(30.2)	10.3	(25.0)	70.7	(19.9)
	Female	0.1	(0.3)	4.2	(8.3)	0.2	(0.7)	59.8	(22.4)	10.3	(20.4)	64.5	(29.3)
Too shallow [a,b,c,f]	Male	268.2	(70.5)	270.4	(86.9)	178.8	(141.0)	48.6	(91.4)	197.7	(139.4)	21.3	(18.7)
	Female	292.1	(56.1)	273.7	(60.6)	293.8	(26.2)	75.7	(71.5)	228.7	(94.1)	94.1	(95.4)

Table 2 Continue

Wrong hand position [c,f]	Male	103.0	(83.6)	69.8	(92.2)	142.9	(106.6)	42.0	(51.2)	136.9	(111.6)	78.6	(72.4)
	Female	180.4	(90.9)	134.4	(109.8)	169.8	(97.6)	62.2	(50.5)	176.3	(108.4)	27.9	(26.5)
Hand position too low [b,c,f]	Male	8.7	(13.3)	20.4	(61.0)	14.8	(35.7)	3.9	(7.1)	75.1	(99.8)	6.2	(11.4)
	Female	4.6	(11.6)	0.3	(1.0)	15.1	(61.8)	0.4	(1.5)	28.7	(75.2)	4.6	(14.8)
Incomplete release [f]	Male	7.4	(21.2)	14.7	(44.0)	0.2	(0.4)	5.5	(13.0)	34.8	(75.0)	7.2	(19.8)
	Female	0.1	(0.5)	0.0	(0.0)	0.1	(0.3)	0.5	(1.1)	6.5	(24.8)	0.1	(0.5)

[a] Sex main effect
[b] Treatment main effect
[c] Time main effect
[d] Sex x Treatment interaction effect
[e] Sex x Time interaction effect
[f] Treatment x Time interaction effect
[g] Sex x Treatment x Time interaction effect

Discussion and Conclusion

The findings of this study were consistent with the previous research in finding a poor CPR performance and skill acquisition among university students following resuscitation training. This may be explained by the fact that instructor led training alone, due to various reasons reported in the literature, is partially effective in acquisition of such complicated lifesaving skills (Braslow et al., 1997; Brennan & Braslow, 1995; 1998). Direct observation with the naked eye, continuous evaluation of each element of CPR, and giving objective feedback about right, wrong, good, or bad aspects of CPR skills during and/or after the performance may not be easy for instructors. However, adequate, objective, and timely feedback is essential for performers to correct their errors during and/or after the performance. Various alternative ways and devices, which will decrease the instructor's role in providing feedback, were recommended by experts and researchers to deliver CPR knowledge and skills effectively (Yeung et al., 2009; Soar et al., 2010).

In addition, this study provided evidence that provision of the AC and AT-KR feedback were effective in improvement of some compression and ventilation skills of CPR. Consistent with the current study findings regarding positive effects of AC and AT-KR feedback on CPR skill acquisition, other studies on the effectiveness of various types of feedback have also reported improved CPR performance (Buleon et al., 2013; Cason, Trowbridge, Baxley, & Ricard, 2011; Spooner, Fallaha, Kocierz, Smith, Smith, & Perkins, 2007). Surprisingly, the two types of feedback had no effect on the students' performance of ventilation volume. The most recent resuscitation guidelines recommend a tidal volume of 500-600 ml and breathing over about one second, rising chest wall, and avoiding rapid and forceful breaths, as a simple way to deliver acceptable tidal volume during adult CPR (Nolan et al., 2010). Students' average ventilation volume in the current study was excessive, but not more than 700 ml. This result may be explained by the fact that even with different types of feedback provided, the exact amount of ventilation volume is very hard for someone to measure and apply during CPR. The number of too fast ventilations, on the other hand, decreased in AC and AT-KR feedback group. This finding suggests that, unlike the amount of ventilation, feedback may be effective in preventing too quick ventilation delivery during CPR. In accordance with these results, previous studies have demonstrated a problem of poor ventilation during CPR and they have suggested various types of feedback could effectively be used to solve this problem (Wenzel, Lehmkuhl, Kubilis, Idris, & Pichlmayr, 1997; Wik, Myklebust, Auestad, & Steen, 2005; Wik, Myklebust, Auestad, & Steen, 2002; Wik, Thowsen, & Steen, 2001). In addition to the positive effects of AC and AT-KR on the number and percent of correct chest compressions, these two types of feedback also improved the number of too shallow chest compressions and wrong hand positions during CPR. In relation to the performance of participants in the control group, it is possible to suggest that these improvements might be due to the two different types of feedback provided to participants. Many studies reported the problem of shallow (< 38 mm) chest compressions and incorrect hand placement by laypeople, even by healthcare professionals, following CPR training (Grzeskowiak, Bartkowska-Sniatkowska,

Rosada-Kurasinska, & Pulinska, 2008; Russo et al., 2011; Skorning et al., 2010; Wiese, Wilke, Bahr, & Graf, 2008; Woollard et al., 2012; Wyss et al., 2010). In addition, there have been a number of studies that revealed the effectiveness of different feedback approaches (e.g. video self-instruction, real-time audiovisual feedback, and augmented feedback) over the traditional means of instructor feedback (Braslow et al., 1997; Hostler et al., 2011; Sarac, 2006; Todd et al., 1998; Zapletal et al., 2013).

A number of important limitations need to be considered in evaluating the results. First, variables such as age, height, weight, body mass index (BMI), and even physical fitness level were not considered while evaluating results. However, several studies revealed effects of these variables on CPR performance (Krikscionaitiene et al., 2013; Ock et al., 2011). Second, the participants were required to perform ten sets of CPR. Longer periods of CPR performance could affect the results of the study. Training manikins (Resusci® Anne Basic) and evaluation manikins (Resusci Anne® SkillReporter™) were different. Compression characteristics of various manikins and feedback devices were reported as not uniform, which may then affect the CPR performance. Due to excessive usage of training manikins, the stiffness of the chest might be different compared to the evaluation manikin. Another limitation of this study was that the number of students was relatively small. However, the sample size was determined based on the number of students allowed to register for the course.

In the current study, the effects of two types of feedback on CPR skill acquisition were investigated by experimental method. The findings implied that traditional way of teaching CPR skills alone did not provide a maximum learning environment for university level learners. Skill decay was observed in all three groups of students after the instruction. In this sense, this finding is very important to be able to understand the weaknesses of and possible reasons for ineffectiveness of CPR training programs. Accordingly, policy-makers and implementers should work on eliminating barriers to provide maximum learning experiences for all learners, and they should also develop standard, structured, and well-organized training programs and refresher workshops to cope with skill decay in CPR skills.

Another important implication of this study is that participants' CPR ventilation and compression skills were increased because of receiving both AC and AT-KR feedback. Taken as a whole, regardless of the type of feedback (concurrent or terminal) participants received, their CPR skills improved significantly. As continuously pointed out in the literature, feedback was found to be an essential part of CPR skill acquisition. In addition to this, directive feedback devices, which provide information about what performers are actually doing, was found to be successful in helping participants improve their learning on components of CPR skills. These devices should be used as a part of CPR training programs to improve skills; and accordingly, to save lives of cardiac arrest patients. The results from the current study provided support for the effectiveness of two types of feedback in sustaining CPR skill acquisition; however, it also implies that additional research is necessary to investigate possible factors that affect performance improvement.

Replication of this study using larger samples is needed to determine whether similar results would be obtained with the same feedback types. While AC and AT/KR feedback were selected due to the characteristics of the feedback provider device that was used for the training, different types of feedback should also be evaluated.

References

Ashton, A., McCluskey, A., Gwinnutt, C. L., & Keenan, A. M. (2002). Effect of rescuer fatigue on performance of continuous external chest compressions over 3 min. *Resuscitation, 55*(2), 151-155.

Barrow, H. M., & Brown, J. P. (1988). *Man and movement: Principles of physical education* (4th ed.). Philadelphia: Lea & Febiger.

Baubin, M., Schirmer, M., Nogler, M., Semenitz, B., Falk, M., Kroesen, G., ... & Gilly, H. (1996). Rescuer's work capacity and duration of cardiopulmonary resuscitation. *Resuscitation*, *33*(2), 135-139.

Brennan, R. T., & Braslow, A. (1995). Skill mastery in cardiopulmonary resuscitation training classes. *The American Journal of Emergency Medicine*, *13*(5), 505-508.

Brennan, R. T., & Braslow, A. (1998). Skill mastery in public CPR classes. *The American Journal of Emergency Medicine*, *16*(7), 653-657.

Braslow, A., Brennan, R. T., Newman, M. M., Bircher, N. G., Batcheller, A. M., & Kaye, W. (1997). CPR training without an instructor: development and evaluation of a video self-instructional system for effective performance of cardiopulmonary resuscitation. *Resuscitation*, *34*(3), 207-220.

Buleon, C., Parienti, J. J., Halbout, L., Arrot, X., Regent, H. D. F., Chelarescu, D., ... Hanouz, J. L. (2013). Improvement in chest compression quality using a feedback device (CPRmeter): A simulation randomized crossover study. *The American Journal of Emergency Medicine*, *31*(10), 1457-1461.

Cason, C. L., Trowbridge, C., Baxley, S. M., & Ricard, M. D. (2011). A counterbalanced cross-over study of the effects of visual, auditory and no feedback on performance measures in a simulated cardiopulmonary resuscitation. *BMC Nursing*, *10*(1), 15.

Chamberlain, D. A., Hazinski, M. F., European Resuscitation Council, & American Heart Association (2003). Education in resuscitation. *Resuscitation*, *59*(1), 11-43.

Couper, K., & Finn, J. (2013). Real-time feedback during basic life support training: does it prevent skill decay? *Resuscitation, 84*(8), 1005-1006.

Deo, R., & Albert, C. M. (2012). Epidemiology and genetics of sudden cardiac death. *Circulation*, *125*(4), 620-637.

George, A. L. (2013). Molecular and genetic basis of sudden cardiac death. *The Journal of Clinical Investigation*, *123*(1), 75-83.

Grzeskowiak, M., Bartkowska-Sniatkowska, A., Rosada-Kurasinska, J., & Puklinska, K. (2008). A survey of basic resuscitation knowledge among medical personnel of a paediatric hospital. *Anestezjologia İntensywna Terapia*, *41*(3), 155-158.

Hightower, D., Thomas, S. H., Stone, C. K., Dunn, K., & March, J. A. (1995). Decay in quality of closed-chest compressions over time. *Annals of Emergency Medicine*, *26*(3), 300-303.

Hong, D. Y., Park, S. O., Lee, K. R., Baek, K. J., & Shin, D. H. (2012). A different rescuer changing strategy between 30: 2 cardiopulmonary resuscitation and hands-only cardiopulmonary resuscitation that considers rescuer factors: a randomised cross-over simulation study with a time-dependent analysis. *Resuscitation, 83*(3), 353-359.

Hostler, D., Everson-Stewart, S., Rea, T. D., Stiel, I. G., Callaway C. W., Kudenchuk, P. J., … Nichol, G. (2011). Effect of real-time feedback during cardiopulmonary resuscitation outside hospital: prospective, cluster-randomised trial. *BMJ, 342,* d512.

Josephson, M., & Wellens, H. J. (2004). Implantable defibrillators and sudden cardiac death. *Circulation*, *109*(22), 2685-2691.

Kaye, W., Rallis, S. F., Mancini, M. E., Linhares, K. C., Angell, M. L., Donovan, D. S., Finger, J. A. (1991). The problem of poor retention of cardiopulmonary resuscitation skills may lie with the instructor, not the learner or the curriculum. *Resuscitation*, *21*(1), 67-87.

Krikscionaitiene, A., Stasaitis, K., Dambrauskiene, M., Dambrauskas, Z., Vaitkaitiene, E., Dobozinskas, P., & Vaitkaitis, D. (2013). Can lightweight rescuers adequately perform CPR according to 2010 resuscitation guideline requirements? *Emergency Medicine Journal*, *30*(2), 159-160.

Lucia, A., Jose, F., Perez, M., Elvira, J. C., Carvajal, A., Alvarez, A. J., & Chicharro, J. L. (1999). The importance of physical fitness in the performance of adequate cardiopulmonary resuscitation. *Chest*, *115*(1), 158-164.

Magill, R. A. (2004). Magill, R. A. (2004). *Motor control and learning: Concepts and applications* (7th ed.). Dubuque, IA: McGraw-Hill.

McDonald, C. H., Heggie, J., Jones, C. M., Thorne, C. J., & Hulme, J. (2012). Rescuer fatigue under the 2010 ERC guidelines, and its effect on cardiopulmonary resuscitation (CPR) performance. *Emergency Medicine Journal, 30*(8), 623-627.

Meissner, T. M., Kloppe, C., & Hanefeld, C. (2012). Basic life support skills of high school students before and after cardiopulmonary resuscitation training: a longitudinal investigation. *Scandinavian Journal of Trauma, Resuscitation, and Emergency Medicine, 20*(1), 31.

Miyadahira, A. M. (2001). Motor capacities involved in the psychomotor skills of the cardiopulmonary resuscitation technique: recommendations for the teaching-learning process. *Revista da Escola de Enfermagem da USP*, *35*(4), 366-373.

Nolan, J. P., Soar, J., Zideman, D. A., Biarent, D., Bossaert, L. L., Deakin, C., ... Böttiger, B. (2010). European resuscitation council guidelines for resuscitation 2010 section 1. Executive summary. *Resuscitation*, *81*(10), 1219-1276.

Ock, S. M., Kim, Y. M., hye Chung, J., & Kim, S. H. (2011). Influence of physical fitness on the performance of 5-minute continuous chest compression. *European Journal of Emergency Medicine*, *18*(5), 251-256.

Ochoa, F. J., Ramalle-Gomara, E., Lisa, V., & Saralegui, I. (1998). The effect of rescuer fatigue on the quality of chest compressions. *Resuscitation*, *37*(3), 149-152.

O'Rourke, M. F. (2005). Reality of out of hospital cardiac arrest. *Heart*, *91*(12), 1505-1506.

Parnell, M. M., & Larsen, P. D. (2007). Poor quality teaching in lay person CPR courses. *Resuscitation*, *73*(2), 271-278.

Peberdy, M. A., Silver, A., & Ornato, J. P. (2009). Effect of caregiver gender, age, and feedback prompts on chest compression rate and depth. *Resuscitation, 80*(10), 1169-1174.

Pierce, E. F., Eastman, M. W., McGowan, R. W., & Legnola, M. L. (1992). Metabolic demands and perceived exertion during cardiopulmonary resuscitation. *Perceptual and Motor Skills*, *74*(1), 323-328.

Roppolo, L. P., Wigginton, J. G., & Pepe, P. E. (2009). Revolving back to the basics in cardiopulmonary resuscitation. *Minerva Anestesiologica*, *75*(5), 301-305.

Russo, S. G., Neumann, P., Reinhardt, S., Timmermann, A., Niklas, A., Quintel, M., & Eich, C. B. (2011). Impact of physical fitness and biometric data on the quality of external chest compression: A randomised, crossover trial. *BMC Emergency Medicine*, *11*(1), 20.

Sage, G. H. (1984). *Motor learning and control: A neuropsychological approach.* Dubuque, Iowa: W.C. Brown.

Sarac, L. (2006). Effects of augmented feedback on cardiopulmonary resuscittation skill acquisition and retention. Proceedings from the *9th International Sports Sciences Congress.* Muğla, Turkey.

Sayee, N., & McCluskey, D. (2012). Factors influencing performance of cardiopulmonary resuscitation (CPR) by Foundation Year 1 hospital doctors. *The Ulster Medical Journal, 81*(1), 14-18.

Schmidt, R. A., & Lee, T. D. (2011). *Motor control and learning: A behavioral emphasis* (5th ed.). Champaign, IL: Human Kinetics.

Schmidt, R. A., & Wrisberg, C. A. (2000). *Motor learning and performance: A problem-based learning approach* (2nd ed.). Champaign, IL: Human Kinetics.

Skorning, M., Beckers, S. K., Brokmann, J. C., Rörtgen, D., Bergrath, S., Veiser, T., ... Rossaint, R. (2010). New visual feedback device improves performance of chest compressions by professionals in simulated cardiac arrest. *Resuscitation*, *81*(1), 53-58.

Soar, J., Mancini, M. E., Bhanji, F., Billi, J. E., Dennett, J., Finn, J., ... Morley, P. T. (2010). International consensus on cardiopulmonary resuscitation and emergency cardiovascular care science with treatment recommendations. Part 12: education, implementation, and teams. *Resuscitation*, *81*(1), e288-e332.

Spooner, B. B., Fallaha, J. F., Kocierz, L., Smith, C. M., Smith, S. C., & Perkins, G. D. (2007). An evaluation of objective feedback in basic life support (BLS) training. *Resuscitation*, *73*(3), 417-424.

Sutton, R. M., Nadkarni, V., & Abella, B. S. (2012). "Putting it all together" to improve resuscitation quality. *Emergency Medicine Clinics of North America*, *30*(1), 105-122.

Tekelioglu, B. K., Cakici, M., Tansu, Y., Hayrioglu, N., & Buyukyilmaz, Y. (2010). Survey study: To evaluate initial BLS/AED provider courses candidates background knowledge and social demographical distribution at initial BLS/AED and first aid training. *Resuscitation, 81*(2), S90-S91.

Valenzuela, T. D., Roe, D. J., Nichol, G., Clark, L. L., Spaite, D. W., & Hardman, R. G. (2000). Outcomes of rapid defibrillation by security officers after cardiac arrest in casinos. *New England Journal of Medicine, 343*(17), 1206-1209.

Terzioglu F., Boztepe H., Duygulu S., Tuna Z., Kapucu S, & Ozdemir L. (2013). Simulasyon egitiminin onemli bir bileseni: Cozumleme [An important component of simulation training: Debriefing]. *Cumhuriyet Nursing Journal, 2*(2), 57-63.

Todd, K. H., Braslow, A., Brennan, R. T., Lowery, D. W., Cox, R. J., Lipscomb, L. E., & Kellermann, A. L. (1998). Randomized, controlled trial of video self-instruction versus traditional CPR training. *Annals of Emergency Medicine*, *31*(3), 364-369.

Tomlinson, A. E., Nysaether, J., Kramer-Johansen, J., Steen, P. A., & Dorph, E. (2007). Compression force–depth relationship during out-of-hospital cardiopulmonary resuscitation. *Resuscitation, 72*(3), 364-370.

Trowbridge, C., Parekh, J. N., Ricard, M. D., Potts, J., Patrickson, W. C., & Cason, C. L. (2009). A randomized cross-over study of the quality of cardiopulmonary resuscitation among females performing 30:2 and hands-only cardiopulmonary resuscitation. *BMC Nursing*, *8*(1), 6.

Tucker, K. J., Larson, J. L., Idris, A., & Curtis, A. B. (1995). Advanced cardiac life support: update on recent guidelines and a look at the future. *Clinical Cardiology, 18*(9), 497-504.

Wellens, H. J., Gorgels, A. P., & de Munter, H. (2003). Cardiac arrest outside of a hospital: how can we improve results of resuscitation?. *Circulation*, *107*(15), 1948-1950.

Wenzel, V., Idris, A. H., Banner, M. J., Fuerst, R. S., & Tucker, K. J. (1994). The composition of gas given by mouth-to-mouth ventilation during CPR. *Chest, 106*(6), 1806-1810.

Wenzel, V., Lehmkuhl, P., Kubilis, P. S., Idris, A. H., & Pichlmayr, I. (1997). Poor correlation of mouth-to-mouth ventilation skills after basic life support training and 6 months later. *Resuscitation*, *35*(2), 129-134.

Wiese, C. H., Wilke, H., Bahr, J., & Graf, B. M. (2008). Practical examination of bystanders performing Basic Life Support in Germany: a prospective manikin study. *BMC Emergency Medicine*, *8*(1), 14.

Wik, L., Myklebust, H., Auestad, B. H., & Steen, P. A. (2005). Twelve-month retention of CPR skills with automatic correcting verbal feedback. *Resuscitation*, *66*(1), 27-30.

Wik, L., Myklebust, H., Auestad, B. H., & Steen, P. A. (2002). Retention of basic life support skills 6 months after training with an automated voice advisory manikin system without instructor involvement. *Resuscitation*, *52*(3), 273-279.

Wik, L., Thowsen, J., & Steen, P. A. (2001). An automated voice advisory manikin system for training in basic life support without an instructor. A novel approach to CPR training. *Resuscitation*, *50*(2), 167-172.

Woollard, M., Poposki, J., McWhinnie, B., Rawlins, L., Munro, G., & O'Meara, P. (2012). Achy breaky makey wakey heart? A randomised crossover trial of musical prompts. *Emergency Medicine Journal*, *29*(4), 290-294.

Wyss, C. A., Fox, J., Franzeck, F., Moccetti, M., Scherrer, A., Hellermann, J. P., & Lüscher, T. F. (2010). Mechanical versus manual chest compression during CPR in a cardiac catherisation setting. *Cardivascular Medicine*, *13*(3), 92-96.

Yeung, J., Meeks, R., Edelson, D., Gao, F., Soar, J., & Perkins, G. D. (2009). The use of CPR feedback/prompt devices during training and CPR performance: a systematic review. *Resuscitation*, *80*(7), 743-751.

Young, D. E., Schmidt, R.A., & Lee, T. D. (2001). Skill learning: Augmented feedback. In W. Karwowski (Ed.), *International encyclopedia of ergonomics and human factors* (pp. 558-561). London: Taylor and Francis.

Zapletal, B., Greif, R., Stumpf, D., Nierscher, F. J., Frantal, S., Haugk, M., ... Fischer, H. (2013). Comparing three CPR feedback devices and standard BLS in a

single rescuer scenario: a randomised simulation study. *Resuscitation, 85*(4), 560-566.

Dışsal Geribildirimin Kardiyopulmonar Resustasyon Beceri Kazanımına Etkisi: Eşzamanlı ve Nihai

Atıf:

Sarac, L. (2017). Effects of augmented feedback on cardiopulmonary resuscitation skill acquisition: Concurrent versus terminal. *Eurasian Journal of Educational Research*, 72, 83-106, DOI: 10.14689/ejer.2017.72.5

Özet

Problem Durumu: Çeşitli nedenlere bağlı olarak yaşanan kalp durması, özellikle zamanında ve yeterli müdahale yapılmadığında, insan yaşamını tehdit eden ciddi sağlık sorunlarından biri halini almaktadır. Kalp durması vakalarında, 30 kalp masajı ve 2 suni solunum içeren kardiyopulmonar resustasyon (KPR) uygulanabilecek ilk ve en önemli müdahaledir. Yaralının beyin hasarı ve ölümünü geciktirmek ya da engellemek amacı ile uygulanan KPR, yasamsal fonksiyonların sürdürülmesi için gereksinim duyulan kanın ve oksijenin hayati organlara ulaştırılmasını amaçlar. Kalp durması vakalarında çağırılan ambulansın olay yerine ulaşması zaman aldığından, olay yerinde bulunanların vakit kaybetmeden KPR uygulamasına geçmesi önemlidir. Bu yüzden toplumda KPR uygulaması konusunda bilgi ve beceri açısından donanımlı bireylerin sayısının ve uygulanacak KPR'nin niteliğini arttırılmasına yönelik eğitimler ve bilimsel araştırmalar gün geçtikçe yaygınlaşmaktadır. Ancak araştırmalar, KPR'nin nicel ve nitel özelliklerinin arttırılmasına yönelik yapılan eğitimlerin amacına ulaşmadığını ortaya koymuştur. Bu duruma neden olarak da; alıştırma için ayrılan süre ve düzeltici geribildirimin yetersiz, değerlendirmenin verimsiz, eğitmen ve öğretim yöntemlerinin etkinliğinin düşük olması gibi durumlar gösterilmiştir. Araştırmacılar tarafından özellikleri incelenerek, KPR'nin dokuz algısal-devinişsel, sekiz fiziksel yeterlik ve özellikle de uzun süre uygulandığında fiziksel uygunluk (fitnes) gerektiren karmaşık bir beceri olduğu ortaya konmuştur. Beceri öğreniminde önemi ve yeri pek çok araştırma ile ortaya koyulan geribildirimin, özellikle KPR öğreniminde eğitmen ya da geliştirilmiş araçlar tarafından sağlanan geribildirimin beceri öğrenimini arttırdığı da vurgulanmıştır. Geribildirim genel olarak içsel ve dışsal olarak gruplandırılmaktadır. İçsel geribildirim performansın kendisinden ortaya çıkan duyusal bilgi; dışsal geribildirim ise harekete yönelik dış kaynaklardan sağlanan bilgi olarak tanımlanmaktadır. Dışsal geribildirimin de çeşitleri olmakla birlikte, bu çalışmada eşzamanlı (DE) ve nihai sonuç bilgisi (DN/SB) içeren geribildirim türleri üzerinde durulmuştur. KPR becerisinin karmaşık ve fiziksel uygunluk gerektiren yapısından ötürü içsel geribildirimin tek başına yeterli olmayacağı düşünülmüş ve bu çalışma kapsamında

KPR beceri öğreniminde 2 farklı dışsal geribildirimin (DE, DN/SB) etkisi incelenmiştir.

Araştırmanın Amacı: Bu çalışmanın amacı iki farklı geribildirim türünün KPR becerileri üzerindeki etkisinin incelenmesidir.

Araştırmanın Yöntemi: Araştırma kapsamında, üniversite 2. sınıfta öğrenim gören ve İlkyardım dersini seçmeli olarak alan 80 öğrenci kolayda örnekleme yöntemi ile seçilmiş, 1 öğrenci özellikleri uygun olmadığı için örnekleme dahil edilmemiş ve 3 öğrenci de çalışmaya devam etmediği için çalışmadan çıkarılmıştır. Katılımcıların yaş aralığı 18-24 arasında iken, yaş ortalaması da 21.33±1.44'tür. Araştırmada katılımcılara 4 saatlik (haftada 2 saat) KPR eğitimi verilmiş ve eğitimden 1 hafta sonra da ön-test yapılmıştır. Ön-test, solunum ve göğüs basısının birlikte uygulandığı 10 setlik (1 set= 30 göğüs basısı + 2 nefes) KPR uygulamasını içermiştir. Ön-test sonunda katılımcılar performansları ve cinsiyetleri göz önünde bulundurularak homojen bir dağılım gösterecek biçimde amaçlı olarak kontrol, DE ve DN/SB gruplarına atanmıştır. Ön-testten 4 hafta sonra son-test kapsamında, 3 gruptaki katılımcılardan 10 setlik KPR uygulamasını tekrarlaması istenmiştir. Son-test öncesinde, DE grubundaki katılımcılar KPR maketi tarafından sağlanan görsel eşzamanlı geribildirim eşliğinde 10 set KPR uygulamışlar; DN/SB grubundaki öğrenciler yine KPR maketi tarafından sağlanan ön-test performanslarına yönelik yazılı bilgi içeren nihai geribildirim almışlar ve sonrasında 10 set KPR uygulamışlar; kontrol grubundaki öğrenciler ise herhangi bir geribildirim almadan 10 set KPR uygulamışlardır. On setlik KPR uygulaması sonrasında tüm katılımcılara 5 dakika dinlenme süresi verilmiş ve 10 setlik KPR içeren son-test uygulanmıştır.

Araştırmanın Bulguları: Cinsiyet (kadın, erkek) X Grup (kontrol, DE, DN/SB) X Test (ön-test, son-test) karışık faktöriyel ANOVA sonuçları, KPR performansının 4 saatlik KPR eğitimi sonrasında düşük düzeyde olduğunu ortaya koymuştur. Bağımlı değişkenlerden göğüs basısı performansı 9 ayrı beceri dikkate alınarak ayrı incelendiğinde ise, bazı değişkenlerde kadın ve erkekler arasında fark bulunmazken, fark yaratan bağımsız değişkenin katılımcılara sunulan geribildirim olduğu ortaya çıkmıştır. Ek olarak, kontrol grubuna kıyasla, DE ve DN/SB grubundaki öğrencilerin kurtarıcı nefes performansları bazı kurtarıcı nefes değişkenlerinde daha başarılı düzeyde bulunmuştur. Benzer şekilde 11 ayrı beceriden oluşan göğüs basısı becerilerinin bir kısmında cinsiyetin etkisi gözlenmezken, her iki geribildirim grubundaki katılımcıların performansları kontrol grubundakilere oranla daha başarılı bulunmuştur. Araştırmada ayrıca, nefes hacmi gibi bazı parametrelerde sağlanan iki farklı geribildirimin etkisinin olmadığı da ortaya konmuştur.

Araştırmanın Sonuçları ve Önerileri: KPR eğitimi sonrasında performansın istenen düzeyde olmaması literatürde desteklenen bir bulgudur. Bu çalışmadaki benzer bulgunun nedeni olarak da, KPR gibi karmaşık bir becerinin, geleneksel yöntemle ve eğitmen tarafından yönetilen eğitimle kazandırılması gösterilebilir. KPR eğitimlerinde uygulama esnasında sağlanması gereken geribildirimin, beceriyi çıplak gözle izleyen eğitmen tarafından verilmesinin olumsuz yanları araştırmalarla ortaya konmuştur. KPR eğitimlerinde eğitmen yerine, geribildirimin özel olarak geliştirilmiş

çeşitli teknolojik araçlar tarafından sağlanmasının kazanımı arttırdığı da çeşitli araştırmalarda ortaya çıkmıştır. Benzer biçimde bu çalışmada, eğitim boyunca olmasa da, yalnızca eğitim sonrasında gelişmiş teknolojik araçlarla sağlanan görsel eşzamanlı ve nihai geribildirimin performansı arttırdığı bulunmuştur. Araştırma kapsamında ortaya çıkan ve 2 farklı geribildirimin etkisinin olmadığı değişkenlerden biri nefes hacmidir. Yaşam kurtarmada etkili olması için 500-600 ml. olarak belirlenen nefes hacminin uygulayıcı tarafından belirlenmesinin zorluğundan ötürü geribildirimin etkisinin gözlenmediği düşünülmektedir. Araştırmalarda göğüs basısı uygulamasında, sağlık personeli tarafından uygulandığında bile, sıklıkla görülen problemler basının sığ uygulanması ve ellerin göğüs kafesinde yanlış yerleştirilmesi olduğu bulunmuştur. Bu araştırmada kullanılan 2 farklı geribildirimin bu iki sorunu ortadan kaldırmakta etkili olduğu görülmüştür. Sonuç olarak bu çalışmada DE ve DN/SB geribildirimlerinin KPR kurtarıcı nefes ve göğüs basısı becerisinin kazanımında etkili olduğu bulunmuştur. Buradan hareketle, KPR eğitimlerinde geribildirimleri sağlayan teknolojik araçların, geleneksel eğitmen merkezli uygulamalara alternatif olarak kullanılması önerilmektedir.

Anahtar Sözcükler: Motor öğrenme, beceri kazanımı, KPR, temel yaşam desteği, ilkyardım.

Eurasian Journal of Educational Research 72 (2017) 107-128

Eurasian Journal of Educational Research
www.ejer.com.tr

The Relationship among Metacognitive Awareness, Self-Efficacy toward the Teaching Profession and the Problem-Solving Skills of Teacher Candidates*

Mehmet BARS[1] Behcet ORAL[2]

ARTICLE INFO

Article History:
Received: 24 Jan. 2017
Received in revised form: 09 June 2017
Accepted: 21 Nov. 2017
DOI: 10.14689/ejer.2017.72.6

Keywords
Metacognition, self-efficacy, problem solving, teacher candidates, teaching profession

ABSTRACT

Purpose: This research is conducted for the purpose of examining the perceptions of teacher candidates regarding their metacognitive awareness, self-efficacy for the teaching profession and problem-solving skills. **Method:** The research has been conducted using a correlational research design. The sample group of the study comprised 1,475 teacher candidates randomly selected from the participants in a pedagogical formation program and senior students of Ziya Gokalp Faculty of Education in the spring semester of the academic year 2014-2015. In the research, a personal information form, a metacognitive awareness inventory, a teacher self-efficacy scale and a problem-solving inventory were used as the data collection tools.

Findings: It was found that the metacognitive awareness of teacher candidates is a significant predictor of their self-efficacy perception regarding the teaching profession. It was concluded that the metacognitive awareness of teacher candidates has significantly predicted their perception levels regarding their problem-solving skills. It was further determined that the perceptions of teacher candidates regarding their problem-solving skills have significantly predicted their perception levels regarding the teaching profession.

Implications for Research and Practice: The result of the research affirms the following suggestions. First, activities developing metacognitive awareness should be included in teacher training programs so that the metacognitive awareness of teacher candidates can be developed further. In this way, they will be able to comprehend the importance of metacognitive awareness. Second, instructors should use methods and techniques that will improve the metacognitive awareness of teacher candidates in their courses.

* This article has been produced from Mehmet Bars's PhD thesis

[1] Corresponding author: Dicle University, TURKEY, mehmetbars21@gmail.com, ORCID: orcid.org/0000-0002-8695-2648

[2] Dicle University, TURKEY, oralbehcet@gmail.com, ORCID: orcid.org/0000-0002-6885-1683

Introduction

Developments in daily life and their accompanying changes cause individuals to feel the necessity for a new type of learning. Since the term of education in school is limited to a certain time in order to meet the requirements of their future work, individuals are in need of lifelong learning to gain the knowledge and skills that they need in every part of their lives. The need for lifelong learning also creates the requisite for the individuals to gain the skill of learning how to learn. Individuals who are able to learn have the knowledge of accessing information, they are aware of learning activities, and by directing these activities they control the learning process. In this regard, it is extremely important to be able to educate individuals so they learn how to learn.

The individual's awareness and orientation of their learning skills can lead to easy and permanent learning. This situation increases the importance of metacognition that comprises phases such as the learning process of learners as well as watching, controlling and evaluating themselves during this process. Metacognition induces students to learn how to learn. Flavell (1979) defined metacognition as "knowledge and cognition about cognitive phenomena" and conceptualized this term as the knowledge a student possesses about his cognition (p.906-911). Metacognition is considered important due to its effects on acquisition, comprehension, retaining and recalling the learned material as well as learning efficiency, critical thinking and problem-solving (Hartman, 1998).

Metacognition affects a learner by helping him not only to focus on the learning material but also to recognize his cognitive power and weaknesses while deciding how to study. It makes the learner aware of his own thinking style (Celikoz, Erisen & Sahin, 2012). Metacognition comprises two interrelated types of information. The first type describes the knowledge a person should possess about what kind of source and tactics a duty requires. The second type of information refers to the knowledge a person should have about how and when to use these skills, this source and these tactics to achieve the duty with success (Schunk, 2009). It can be said that the cognitive skills of individuals who have these two types of information will develop and therefore they will confidently be able to solve the problems they face at a high level. From this aspect, we can see that the terms metacognition and self-efficacy are related to each other. In support of this suggestion, Yavuz (2009) states that there is a moderate relationship between metacognition and self-efficacy.

Self-efficacy is the key concept of social cognitive theory (Wood & Bandura, 1989), which states that people should first have self-confidence in the field before they can effectively use their existing skills. Bandura and Adams (1977) point out that as one's self-efficacy strengthens, the ability to cope with difficulties becomes stronger. The perception of the individual regarding self-efficacy affects the effort he expends on his activities, the amount of patience he shows to solve the problems that arise and the level of his trust and anxiety (Aydin & Demir, 2014). Korkmaz (2013) states that individuals whose self-efficacy is high can overcome their problems. In

that case, it is seen that individuals' self-efficacy and their problem-solving skills are related to each other.

Problem solving is the effort to reach the goal when there is no automated solution. It can be said that we are in a struggle to solve problems in almost every aspect of our lives when the effort and time spent to solve the difficulties in daily life are accepted as problem-solving efforts. It is thought that one's problem-solving skills can be improved, regardless of his intelligence and socioeconomic position (Duman, 2012). Referred to by Miller & Nunn (2003) it has been said that problem solving is learned from childhood and problem-solving skills are developed during the school years (as cited in Cam & Tumkaya, 2008, p.4).

Problem solving means how the individual feels, what he thinks, how he behaves and how he overcomes the daily problems he faces (Heppner, 1987). Shewchuck, Johnson and Elliott (2000) define problem-solving skills as the cognitive and affective-borne behaviors people show in order to accommodate changes in their social life. Problem-solving skill is the ability to comprehend and understand a problem one encounters, choosing a suitable strategy for a solution, using the chosen solution and interpreting the results thereof. Briefly, this can be called "reasoning" (Altun, 2005).

Referred to by Flavell (1987) as "metacognitive development nests", good schools provide a self-conscious learning environment (as cited in Akin & Abaci, 2011, p.26). This notion indicates the importance of teachers being qualified to create such learning environments in the schools. The teaching profession plays an important role in establishing the quality of educational services. It is an everlasting adage that the better the quality of the teacher, the better the quality of the education service (Mahiroglu, 2012), as teachers have a crucial impact on the developmental characteristics of learners. However, teachers must first develop their own metacognitive awareness and problem-solving skills so they can help their students with theirs. It can be said that teachers with high metacognitive awareness, improved problem-solving skills and high self-efficacy regarding their perception of the teaching profession can contribute to the development of metacognitive awareness and problem-solving skills in their students. Therefore, it is very important for the teachers to develop themselves within these aspects.

Gunstone and Northfield (1994) state that the education of teachers should be centered on metacognition training. Since teacher candidates have an important role in the future as well, the perceptions of this group should be examined from various perspectives. This study aims to examine the perception of teacher candidates with a focus on their problem-solving skills, self-efficacy levels for the teaching profession and their metacognitive awareness. This study focuses on the relationship among these variables. As a result, it is important to increase metacognitive awareness, to determine the self-efficacy level for the teaching profession and the perception levels of developing problem-solving skills. In this regard, the perceptions about metacognitive awareness of teacher candidates, their problem-solving skills and

teaching profession self-efficacy levels are examined according to some variables. For this purpose, responses were sought for the following research questions:

1. What is the level of teacher candidates' self-efficacy toward metacognitive awareness, the teaching profession and their perception in relation to problem-solving skills?
2. Does teacher candidates' metacognitive awareness significantly predict the level of their self-efficacy toward the teaching profession?
3. Does teacher candidates' cognitive awareness significantly predict their perception regarding problem-solving skills?
4. Do teacher candidates' metacognitive awareness and their perception regarding problem-solving skills together significantly predict their self-efficacy toward the teaching profession?
5. Do teacher candidates' perceptions regarding problem-solving skills significantly predict their self-efficacy perception level toward the teaching profession?

Method

Research Design

A correlational research design model was used in this study. Correlational research design is a research model that aims to determine the existence and/or degree of covariance between two or more variables (Karasar, 2009).

Research Sample

The universe of the research consisted of 2,883 teacher candidates enrolled in the Ziya Gokalp Education Faculty of Dicle University in spring semester of 2014-2015. Of this total, 1,115 were senior class students and 1,768 were candidates in the teaching certification program. The sample set of the research, chosen randomly from these two groups, consisted of 1,475 teacher candidates, with 871 of them (59%) female and 604 (41%) male.

Data Collection

In the research, a 52-item cognitive awareness inventory, which was transcribed by Akin et al. (2007) into Turkish, was used to identify the level of teacher candidates' cognitive awareness. Akin et al. (2007) calculated the compliance validity of the scale as .95 and said that after item analysis, item-test correlations of subscales varied between .35 and .65. In addition, internal consistency and test-retest reliability coefficients of the inventory were calculated as .95. In our present research, reliability coefficients in relation to all scale and subscales are given in Table 1.

Table 1

Reliability Coefficients Calculated with Cognitive Awareness Scale by the Internal Consistency Method

Subscales	Internal Consistency (Cronbach's alpha)
Explanatory information	.68
Procedural information	.55
Situational information	.60
Planning	.66
Watching	.70
Evaluating	.62
Debugging	.59
Managing information	.68
For the total scale	.93

In Table 1, it is seen that the overall reliability coefficient for the scale is .93 and the subscale reliability coefficient varies between .55 and .70. In general, scales with a reliability coefficient of .70 and over are accepted as reliable (Leech, Barrett & Morgan, 2005; Domino & Domino, 2006; Fraenkel, Wallen & Hyun, 2012). But it is determined that reliable coefficients over .50 can be a criterion for scales that have few items (Nunnaly & Bernstein, 1994; Raines-Eudy, 2000). In this direction, although the reliability coefficient of the scale consisting of 52 items at full dimension is calculated as .93, the reliability coefficient of the procedural information subdimension consisting of four items is .55 and the reliability coefficient of the debugging subdimension consisting of five items is .59. The main reason for this result can be that the number of items is less in these subdimensions. Therefore, it can be said that all values obtained from reliability studies either at overall dimensions of the cognitive awareness scale or within its subdimensions are acceptably reliable considering the criteria of the reliability coefficient.

The self-efficacy scale toward the teaching profession was developed by using confirmatory factor analysis (CFA). Because having the knowledge of the underlying latent variable structure of self-efficacy toward the teaching profession (Byrne, 1989), CFA was used to confirm the theoretically driven item set of self-efficacy of the teaching profession. The self-efficacy scale toward the teaching profession was applied as 25 items with a 5-point Likert-type gradation. The applied scale consisted of three subdimensions. These subdimensions were "class management", "providing student participation" and "teaching strategies". In light of the analysis made after the application, 4 items of the scale with high error rates have been removed, so that the final scale consisted of 21 items. The factor loads and subdimensions are indicated in Figure 1.

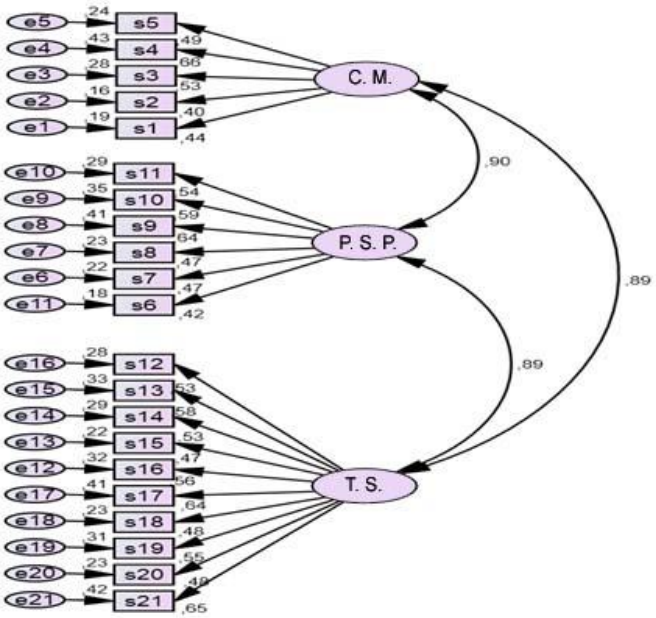

Figure 1. *Conformatory Factor Analysis of the Self-Efficacy Scale toward the Teaching Profession*

According to the cut-off values indicated in the literature (Meydan ve Sesen, 2011), CFA yielded indications of a good fit for the proposed model CFA (X2=356.953, df=186, X2/df=1.91, GFI=0.92 AGFI=0.91, IFI=0.92, RMSEA=0.46).

To put forth compliance validity of the self-efficacy scale toward the teaching profession, the teacher self-efficacy perception scale developed by Tschannen-Moran and Woolfolk-Hoy (1998) and the reliability and validity studies conducted by Kose (2007) have been used. Two scales were applied at the same time to 129 students of the teaching certification program in Ziya Gokalp Education Faculty of Dicle University, in the first semester of academic year 2014-2015. According to the subsequent findings of Pearson's Product Moment Correlation, a powerful and significant relation (r=.80) was found between the two scales (p<.01). The reliability of self-efficacy toward the teaching profession was calculated using internal consistency and test-retest methods. The developed scale was administered two weeks apart to the same 129 students. In light of the data obtained, the test-retest and internal consistency (Cronbach's alpha) reliability coefficient of the scale was calculated. The results toward the studies in relation to the overall scale and its subdimensions are given in Table 2.

Table 2

Reliability Coefficients of the Self-Efficacy Scale toward the Teaching Profession Calculated by the Internal Consistency and Test-Retest Methods

Subscales	Internal Consistency (Cronbach's alpha)	Test-Retest
Classroom management	.62	.71
Providing student participation	.69	.78
Teaching strategies	.81	.76
For the total scale	.88	.83

According to data obtained as a result of Pearson's Product Moment Correlation ($r=.80$ ($p<0.1$)), a powerful and significant relation was determined for compliance validity of the self-efficacy scale toward the teaching profession. Factor loads were included within the scope of item discrimination of the scale. It was determined that factor loads of the scale items were between .40 and .66 at primary level CFA. As a result of all of these analyses, it was concluded that the self-efficacy scale toward the teaching profession is a highly reliable and valid measurement tool.

The values obtained from the reliability studies conducted for this research on collected data of the self-efficacy scale toward the teaching profession are given in Table 3.

Table 3

Reliability Coefficients of Self-Efficacy toward the Teaching Profession Calculated by the Internal Consistency Method

Subscales	Internal Consistency (Cronbach's alpha)
Classroom management	.79
Providing student participation	.86
Teaching strategies	.90
For the total scale	.94

As can be seen in Table 3, the findings obtained with the self-efficacy scale toward the teaching profession were found to be reliable for both the overall scale and the subscales.

To determine the perceptions of the teacher candidates regarding their problem-solving skills, a problem-solving inventory (Sahin, Sahin & Heppner, 1993) was used. The scale consists of 6 subdimensions. In this research, Cronbach's alpha coefficients obtained for the overall scale of problem solving and for subdimensions are given in Table 4.

Table 4

The Reliability Coefficient of Problem-Solving Inventory Calculated by the Internal Consistency (Cronbach's alpha) Method

Subscales	Internal Consistency (Cronbach's alpha)
Hasty approach	.79
Thoughtful approach	.80
Avoiding approach	.76
Evaluating approach	.76
Self-Confident approach	.75
Planned approach	.76
For the total scale	.89

When Table 4 is reviewed, it is seen that the results obtained from the overall scale of problem solving and the subscales thereof are found reliable in this research.

Data Analysis

Regression analysis was used for data analysis. The Metacognitive Awareness Inventory is a 5-point Likert-type scale. It consists of these five options: strongly agree, agree, partly agree, disagree and strongly disagree. Scale span was found as 5-1=4, 4/5=0.80. The option limits of the scale are as follows: 1.00-1.80: very low; 1.81-2.60: low; 2.61-3.40: medium; 3.41-4.20: high; 4.21-5.00: very high.

A second data collecting tool, the Self-Efficacy Scale toward the Teaching Profession, is also a 5-point Likert-type scale and consists of these five options: never, rarely, frequently, often and always. Scale span was found as 5-1=4, 4/5=0.80. The option limits of the scale are as follows: 1.00-1.80: very low; 1.81-2.60: low; 2.61-3.40: medium; 3.41-4.20: high; 4.21-5.00: very high.

A third data collecting tool, Problem-Solving Inventory, is a 6-point ikert-type scale and consists of these six options: always, often, frequently, sometimes, rarely and never. Scale span was found as 6-1=5, 5/5=1. The option limits of the scale are as follows: very low:1.00-2; low:2.01-3; medium:3.01-4; high:4.01-5; very high:5.01-6

When option limits regarding the problem-solving inventory are considered, it is seen that the low score obtained from this inventory indicates that the perception regarding problem-solving skills is high.

Results

The level of teacher candidates' self-efficacy toward metacognitive awareness, the teaching profession and their perception in relation to problem-solving skills are showed in Table 5.

Table 5

Average and Standard Deviation Values Regarding Total and Subdimension Scores of Teacher Candidates' Metacognitive Awareness, Self-Efficacy toward the Teaching Profession and Problem-Solving Skills

		n	M	Sd
Metacognitive awareness	Explanatory information	1475	3.85	.52
	Procedural information	1475	3.52	.65
	Situational information	1475	3.83	.58
	Planning	1475	3.64	.60
	Watching	1475	3.58	.59
	Evaluating	1475	3.66	.60
	Debugging	1475	3.69	.66
	Information management	1475	3.75	.54
	Total	1475	3.70	.46
Self-efficacy toward teaching profession	Classroom management	1475	3.95	.65
	Providing student participation	1475	4.09	.67
	Teaching strategies	1475	4.07	.64
	Total	1475	4.05	.59
Problem-solving inventory	Hasty approach	1475	3.96	.93
	Thoughtful approach	1475	2.54	.99
	Avoiding approach	1475	4.56	1.12
	Evaluating approach	1475	2.65	1.13
	Self-confident approach	1475	2.56	.92
	Planned approach	1475	2.50	1.03
	Total	1475	2.70	.67

In Table 5, it is seen that the highest score obtained from the total scale and subdimensions is at the "explanatory information" subdimension, while the lowest one is at the "procedural information" subdimension. All total and subdimension score averages are between 3.52 and 3.85. These values show that the total and subdimension scores of teacher candidates' metacognitive awareness are "high".

When Table 5 is examined, it can be seen that the total and subdimension scores regarding teacher candidates' self-efficacy toward the teaching profession are between 3.95 and 4.09. This situation indicates that teacher candidates' self-efficacy perception toward the profession is high for both the overall scale and the subdimensions.

In the same table, teacher candidates' perceptions regarding problem solving and the averages regarding total and subdimension scores vary between 2.50 and 4.55. Among these subdimensions, "planned approach" is the subdimension with the lowest average score, whereas "avoiding approach" has the highest score. When the scoring form of the problem-solving scale is considered, an increase of the average score means a decrease of the perception in the related subdimension. Therefore, among the perceptions of these subdimensions regarding problem-solving skills,

"avoiding approach" has the lowest score and "planned approach" has the highest score.

The analysis results about prediction of teacher candidates' metacognitive awareness to the level of their self-efficacy toward the teaching profession are depicted in Table 6.

Table 6

Regression Analysis Results Regarding Predicting the Level of Self-Efficacy toward the Teaching Profession

	B	Standard Error $_B$	β	t	p
Fixed	2.119	.112	-	18.853	.000
Metacognitive Awareness	.522	.030	.411	17.318	.000

R=.411 R^2=.169
$F_{(1,1473)}$=299.908 p=.000

When Table 6 is examined, it is seen that the correlation value between metacognitive awareness scores and self-efficacy scores of teacher candidates is .411. That value suggests a significant relation between these two variables in a positive direction.

In Table 7 the correlation between metacognition and problem-solving skills was determined as -.410. This means problem-solving skills scores decrease while metacognitive awareness scores are increasing. However, the decrease of problem-solving skills scores means the increase of perception regarding problem-solving skills. Therefore, it can be suggested that the increase in the level of metacognitive awareness also increases the perception regarding problem-solving skills.

Table 7

Regression Analysis Results about Predicting the Perception Level of Problem-Solving Skills

	B	Standard Error B	β	t	p
Fixed	4.876	.127	-	38.263	.000
Metacognitive Awareness	-.590	.034	-.410	17.254	.000

R=.410 R^2=.168
F(1,1473)=297.718 p=.000

In another analysis whether the teacher candidates' metacognitive awareness and their perception regarding problem-solving skills together significantly predict their self-efficacy toward the teaching profession is examined in Table 8.

Table 8

Standard Multiple Regression Analysis Results about Predicting the Level of Self-Efficacy toward the Teaching Profession with Metacognitive Awareness and Problem-Solving Skills

	B	Standard Error B	β	t	p	rBinary	rPartial
Fixed	3.442	.151	-	22.790	.000	-	-
Metacognitive awareness	.362	.031	.285	11.506	.000	.411	.287
Problem-solving skills	-.271	.022	-.308	12.410	.000	-.425	-.308
R=.498	R2=.248						
F(2,1472)=242.538	p=.000						

When Table 8 is examined, it is seen that metacognitive awareness and problem-solving skills together become an important predictor for self-efficacy perception. Finally the correlation between problem-solving skills and self-efficacy perception level of the teacher candidates is examined in the Table 9.

Table 9

Regression Analysis Results about Predicting the Level of Self-Efficacy toward the Teaching Profession

	B	Standard Error B	β	t	p
Fixed	5.060	.058	-	87.562	.000
Problem-solving skills	-.375	.021	-.425	-17.994	.000
R=.425	R^2=.180				
$F_{(1,1473)}$=323.794	p=.000				

When table 9 is examined, the correlation between problem-solving skills and self-efficacy perception level is determined as -.425. This situation shows that the self-efficacy score increases when the problem-solving skill score decreases.

Discussion and Conclusion

Let us return to the first question asked in this research: What is the level of teacher candidates' self-efficacy toward metacognitive awareness, teaching profession and their perception regarding problem-solving skills? When the results of the analysis were examined, it was determined that teacher candidates had a high level of metacognitive awareness both in the total score and in the subdimensions. Akin et al. (2007) and Yavuz (2009) determined in their own studies that the total and subdimension points of metacognitive awareness of teacher candidates reached a

high level. The results of that research parallel the results of this research. It can be said that the education and major training courses taken by the teacher candidates make their level of metacognitive awareness high. It was found that the average of the procedural information subdimension is lower in comparison to other subdimensions although the metacognitive awareness of teacher candidates is high in general. Procedural information is defined as knowing the answer to "how" questions about something and the information about doing something (Kyllonen & Woltz, 1989). It is most likely that the average for the procedural subdimension is lower because the teacher candidates' awareness about choosing the best strategy for themselves during their studying and learning process did not develop as much as the other facets of awareness regarding metacognition. When the results of the perceptions of teacher candidates regarding self-efficacy toward the teaching profession are examined, it is seen that the levels of both the total score and the subdimension scores are high. Another study supports this result: Mutlu Bozkurt (2013) determined that the self-efficacy level of teacher candidates is high. Similarly, in their study, Tschannen-Moran and Woolfolk Hoy (2001) determined that teachers perceived themselves highly sufficient in the subdimensions of efficiency in student participation, educational strategies and classroom management of the general self-efficacy dimension. This can be interpreted as saying the teaching education given to teacher candidates improves their self-efficacy regarding their profession. Nevertheless, the average scores obtained from the total scale and subdimensions are at the "high" level, so these should possibly be accelerated toward the "very high" level. This is because the self-efficacy perception of people who perform a profession like teaching, which can direct the development of a community, should be as high as possible. "Classroom management" was determined as the subdimension with the lowest average among all the subdimensions. This situation probably originates from the lack of classroom management practice during teaching education.

The findings about the perceptions regarding the problem-solving skills of teacher candidates show that the scores for the subdimensions of "thoughtful approach", "evaluating approach", "self-confident approach" and "planned approach" are high, "hasty approach" is medium, and "avoiding approach" is low. Among these findings, "hasty approach" should be explained at more length. When the behaviors of this subdimension are considered, it is seen that items like "When I think about solutions for a problem, I can't find very many options" are included. Due to the average level of this subdimension being medium, it can be interpreted as saying that teacher candidates prefer to use familiar solutions when they face a problem instead of generating a number of possible ideas to solve that problem. When this situation is considered, teacher candidates should face more situations in their training where they can generate more ideas and alternatives. However, we have said that the perception level of teacher candidates regarding problem-solving skills was determined to be high, so the perception score 2,69 should be pushed up to the "1-2" range which is expressed as a very high level.

Turning to the second question of the research, teacher candidates' metacognitive awareness is found to be a significant predictor for self-efficacy perception toward

the teaching profession. In addition, it was determined that there is a medium-level correlation between the perception regarding metacognitive awareness and the perception toward the teaching profession in a positive direction. This reveals that the self-efficacy perception level regarding the teaching profession increases when the perception regarding metacognitive awareness level also increases. Therefore, the perception level regarding metacognitive awareness enables making estimations about the self-efficacy perception level regarding the teaching profession. It is believed that metacognition enables thinking strategically while a duty is being fulfilled and this increases the trust to fulfill the relevant duty. This can also be the reason for the positive correlation between metacognition and self-efficacy. Yavuz (2009) determined that there is a positive relation at medium level between the levels of general self-efficacy and general metacognitive awareness. Cikrikci (2012) determined that there is a significant positive correlation between metacognitive awareness and its subdimensions, self-efficacy and life satisfaction. Furthermore, in the same study, metacognitive awareness levels were determined to be an important predictor for self-efficacy perceptions. Vadhan and Stander (1994) determined that the more university students' metacognitive skills increase, the more realistic their expectations. It is thought that an individual's realistic expectations are related to his awareness regarding self-efficacy. In this regard, it can be said that there is a positive correlation between metacognitive skills and self-efficacy. Landine and Stewart (1998) determined that there is a positive correlation between metacognition and self-efficacy. All of these results support the results obtained in this research.

Our fourth question was this: Does teacher candidates' cognitive awareness significantly predict their perception regarding problem-solving skills? Considering the regression analysis about perceptions regarding teacher candidates' metacognitive awareness and problem-solving skills, it is seen that the correlation value between metacognition and problem-solving skills are in contrary directions and at a medium level. This means that the perception score regarding problem-solving skills decreases when the metacognitive awareness score increases. However, based upon the format of scale scoring, the decrease of problem-solving skills perception score means that the perception level regarding problem-solving skills will increase. In this regard, it can be said that the correlation between the perception level regarding metacognitive awareness and the perception level regarding problem-solving skills is in a positive direction and at a medium level. Moreover, it was determined that metacognitive awareness is a significant predictor of problem-solving skills. When these are taken into consideration, the perception level of problem-solving skills will increase when metacognitive awareness increases; additionally, it can be suggested that the perception level regarding metacognitive awareness will enable us to predict the perception level regarding problem-solving skills. It is thought that metacognition effects problem solving in terms of providing means to get knowledge, to preserve it and to use it when needed. In parallel with this thought, Guss and Wiley (2007) determined that metacognition has an important role for all approaches to problem solving, envisaging the problem with its various aspects, forming the new combinations of substantial knowledge, comparative thinking, generating new ideas and producing a special way toward a solution.

Kiskir (2011) determined that there is a negative correlation between teacher candidates' metacognitive awareness and problem-solving skills. He found that the score increase from the problem-solving inventory will mean a decrease of the perception due to the format of the problem-solving skill inventory. This means, that in Kiskir's research, the two perception levels – metacognitive awareness and problem-solving skills – show a change in the same direction, thus supporting the results of this study. Teong (2003) determined that knowing how and when to use metacognitive strategies is an important determinant for successful problem-solving skills. Yildirim (2010) said there is a stronger relation between problem types requiring more skill for the solution and the metacognitive awareness level compared to the problem types solving require less skill for the solution. Kiremitci (2012) determined that the use of the problem-solving method will be conducive to the development of the metacognitive awareness level.

Reaching the fourth question – Do teacher candidates' metacognitive awareness and their perception regarding problem-solving skills significantly predict their self-efficacy toward the teaching profession?, it was determined that the answer was a strong affirmative. Altogether metacognitive awareness and problem-solving skills have explained approximately one-fourth of the total variance in the perception regarding self-efficacy level. When Korkmaz (2013) sorts the characteristics of the individuals who have high self-efficacy, he highlights that they can also overcome complex cases and problems. It is thought that metacognitive awareness is very important to be able to overcome complex cases. Therefore, Korkmaz's emphasis on the metacognitive awareness and problem-solving skills of the individuals who have high self-efficacy overlap with the results of this research. This also suggests that the development of teacher candidates' metacognitive awareness and problem-solving skills boosts their self-efficacy regarding the teaching profession, too.

The analysis also determined that the fifth research question – Do teacher candidates' perceptions regarding problem-solving skills significantly predict their self-efficacy perception level toward the teaching profession? – was answered positively. Besides, it was determined that there is a negative correlation between the problem-solving skills score and the self-efficacy perception score at a medium level. When the problem-solving inventory is considered, it is seen that the high score obtained from this inventory indicates low-level problem-solving skills. Therefore, the problem-solving skill level and the self-efficacy perception level toward the teaching profession display a change in the same direction, which means the increase in the level of problem-solving skills is accompanied by the increase of self-efficacy level at the same time. Similarly, a decrease in the level of problem-solving skills causes a decrease in the self-efficacy level toward the teaching profession. Bayraktar (2014) determined that there is a positive significant correlation between problem-solving skills, teaching profession knowledge and total scores of the self-efficacy trust level at a medium level toward general cultural knowledge. Similarly, Donmez (2010) found a positive and significant correlation between teacher candidates' self-efficacy and problem-solving skills in his research. The results of his study and the current research parallel each other. When all these results are considered, it can be

said that the teaching profession is not just a matter of organizing teaching activities. It also requires teachers to overcome the problems they face during the teaching process.

In conclusion, the process of preparing teacher candidates should involve them in more cases where they will need to generate ideas and alternatives to improve their problem-solving skills. The ability of teacher candidates to find alternative solutions can be improved by using such techniques as problem solving, brainstorming, and de Bono's six thinking hats during their training. One way or the other, teacher training programs should bring applications based on developing teacher candidates' problem-solving skills to the forefront.

References

Akin, A. & Abaci, R. (2011). *Bilis otesi.* Ankara: Nobel Yay.

Akin, A., Abaci, R., & Cetin, B. (2007). The validity and reliability study of the Turkish version of the Metacognitive Awareness Inventory. *Educational Science: Theory & Practice,* 7 (2), 655-680.

Altun, M. (2005*). İlkogretim ikinci kademede (6,7 ve 8. siniflarda) matematik ogretimi* (4. Baski). Bursa: Aktuel Yay.

Aydin, S. & Demir, T. (2014). *Oz-duzenlemeli ogrenme.* Ankara: Pegem Akademi Yay.

Bandura, A. & Adams, E.N. (1977). Analysis of self-efficacy theory of behavioral change. *Cognitive Therapy and Research, 1 (4),* 287-310

Bayraktar, A. (2014). *İlahiyat egitiminin ogrencilerin ogretmenlik meslegine yonelik oz yeterlik inanc duzeyleri ve problem cozme becerilerine katkisi*. [The contribution of theology education to the self-efficacy belief levels of students towards the teaching profession and the skills of problem solving]. Yayimlanmamis Yuksek Lisans Tezi. Ataturk Universitesi. Egitim Bilimleri Enstitusu. Retrieved from https://tez.yok.gov.tr/UlusalTezMerkezi/

Byrne, B. M. (1989). *A primer of LISREL:Basic applications and programming for confirmatory factor analytic models.* New York: Springer-Verlag.

Cam, S., & Tumkaya, S. (2008). Kisiler arasi problem cozme envanteri lise ogrencileri formu'nun gecerlik ve guvenirlik calismasi [Development of interpersonal problem solving inventory for high school students: The validity and reliability process]. *Uluslararasi İnsan Bilimleri Dergisi,* 5 (2), 1-17

Celikoz, N., Erisen,Y., & Sahin, M. (2012). Bilissel ogrenme kuramlari. In Kaya, Z. (Ed.), *Ogrenme ve ogretme kuramlar, yaklasimlar, modeller* (pp. 49-74). Ankara: Pegem Akademi Yay.

Cikrikci, O. (2012). *Ustun yetenekli ogrencilerin bilis otesi farkindalik duzeyleri ile oz yeterlik algilarinin yasam doyumunu yordama gucu.* [The predictive strength of metacognitive awareness and self efficacy beliefs on life satisfaction among gifted students].Yayimlanmamis Yuksek Lisans Tezi. Karadeniz Teknik Universitesi. Egitim Bilimleri Enstitusu. Retrieved from https://tez.yok.gov.tr/UlusalTezMerkezi/

Domino, G., & Domino, M. L. (2006). *Psychological testing: An introduction.* Cambridge: Cambridge University Press.

Donmez, K.H. (2010*). Beden egitimi ve spor ogretmenligi bolumu ogrencilerinin (1., 2., 3., ve 4. sinif) sosyal oz yeterlikleri ile problem cozme becerileri arasindaki iliskinin incelenmesi.* [relationship between social efficacy and problem solving abilities of students in Department of Physical Education and Sports Teaching.(1st,2nd,3rd and 4 th grades)]. Yayimlanmamis Doktora Tezi. Gazi Universitesi Egitim Bilimleri Enstitusu. Retrieved from https://tez.yok.gov.tr/UlusalTezMerkezi/

Duman, B. (2012). *Neden beyin temelli ogrenme. (3.Baski).* Ankara: Pegem Akademi Yay.

Flavell, J.H. (1979). Metacognitive and cogntive monitoring: A new area of cogniive-developmental ınquiry. *American Psychologyst,* 34 (10), 906-911.

Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2012*). How to design and evaluate research in education.* New York: McGraw Hill.

Gunstone, R. F. & Northfield, J. (1994). Metacognition and learning to teach. *International Journal of Science Education, 16* (*5*), 523-537.

Guss, C.D., & Wiley, B. (2007). Matacognition of problem-solving strategies in Brazil, India, and the United States. *Journal of Cognition and Culture,* 7, 1-25.

Hartman, J. H. (1998). Metacognition in teaching and learning: *An introduction. Instructional Science,* 26, 1–3,

Heppner, P.P. (1987). Introduction: Broadening the conceptualization of problem solving within career planning. *Journal of Career Development,* 14(1), 3-7.

Karasar, N. (2009). *Bilimsel arastirma yontemi* (20. Baski). Ankara: Nobel Yayin Dagitim.

Kiskir, G. (2011*). Ogretmen adaylarinin bilis otesi farkindalik duzeyleri ile problem cozme becerileri arasindaki iliskinin incelenmesi.* [Investigation of the relationship betwen metacognitive awareness levels and problem solving skills of prospective teachers]. Yayimlanmamis Yuksek Lisans Tezi. Ataturk Universitesi. Egitim Bilimleri Enstitusu. Retrieved from https://tez.yok.gov.tr/UlusalTezMerkezi/

Kiremitci, O. (2012). *Problem cozme yontemiyle duzenlenmis beden egitimi derslerinin problem cozme becerilerine etkisi ve ustbilissel farkindalik duzeyleriyle ilişkisi.*

[The effects of physical educations classes designed with problem solving method on problem solving abilities and its relationship with the levels of meta-cognitive awareness]. Yayimlanmamis Yuksek Lisans Tezi. Ege Universitesi Saglik Bilimleri Enstitusu. Retrieved from https://tez.yok.gov.tr/UlusalTezMerkezi/

Korkmaz, I. (2013). Sosyal ogrenme kurami. In Yesilyaprak, B. (Ed.), *Egitim psikolojisi* (10.Baski) (pp. 246-269). Ankara: Pegem Akademi Yay.

Kose, I.A. (2007). *Ogretmen oz yeterlik algisi olceginin farkli gruplarda yapi gecerliginin* sinanmasi. [Investigating construct validity of teachers? sense of efficacy scale across common groups]. Yayimlanmamis Yuksek Lisans Tezi. Ankara Universitesi. Egitim Bilimleri Enstitusu. Retrieved from https://tez.yok.gov.tr/UlusalTezMerkezi/

Kyllonen, P. C., & Woltz, D. J. (1989). Role of cognitive factors in the acquisition of cognitive skill. In R. Kanfer, P. C. Ackerman, & R. Cudeck (Ed.), *Abilities, motivation, and methodology: The Minnesota Symposium on learning and individual differences* (pp. 239-280). Hillsdale, NJ: Lawrence Erlbaum.

Landine, J., & Stewart, J. (1998). Relationship between metacognition, motivation, locus of control, self-efficacy, and academic achievement. *Canadian Journal of Counselling,* 32 (3), 200-212.

Leech, N.L., Barrett, K.C., & Morgan, G.A. (2005). *SPSS for intermediate statistics; use and interpretation.* Mahwah, NJ: Lawrence Erlbaum Associates.

Mahiroglu, A. (2012). Ogretmenlik meslegi ve ogretmen yetistirmede gelismeler ve yenilikler. In Demirel, O. & Kaya, Z. (Ed.), *Egitim bilimine giris* (7.Baski) (pp. 373-419). Ankara: Pegem Akademi Yay

Meydan, C.H., & Sesen, H. (2011). *Yapisal esitlik modellemesi Amos uygulamalari.* Ankara: Detay Yay.

Mutlu Bozkurt, T. (2013). *Beden Egitimi ogretmeni adaylarinin ogretmenlik oz yeterliklerinin incelenmesi.* [investigation of physical education teacher candidates teaching self efficiency]. Yayimlanmis Yuksek Lisans Tezi. Gazi Universitesi. Egitim Bilimleri Enstitusu. Retrieved from https://tez.yok.gov.tr/UlusalTezMerkezi/

Nunnaly, J., & Bernstein, I. (1994). *Psychometric theory.* New York: McGraw-Hill.

Raines-Eudy, R. (2000). Using structural equation modeling to test for differential reliability and validity: An empirical demonstration. Structural Equation Modeling: *A Multidisciplinary Journal,* 7 (1), 124-141.

Schunk, H.D. (2009). *Ogrenme teorileri.* (Translate: Sahin, M.) Ankara: Nobel Yay.

Shewchuck, R.M., Johnson, M.O., & Elliott, T.R. (2000). Self-appraised social problem solving abilities, emotional reactions and actual problem solving performance. *Behaviour Research and Therapy*, 38, 727-740.

Sahin, N., Sahin, N. H., & Heppner, P. P. (1993) Psychometric properties of the problem solving inventory in a group of Turkish university students. *Cognitive Therapy and Research,* 17 (4), 379-396.

Teong, S. K. (2003). The effects of metacognitive training on mathematical word-problem solving. *Journal of Computer Assisted Learning,* 19, 46-55.

Tschannen-Moran, M., & Woolfolk Hoy, A. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and Teacher Education, 17,* 783–805.

Vadhan, V., & Stander, P. (1994). Metacognitive ability and test performance among college students. *The Journal of Psychology,* 128 (3), 307-309.

Wood, R., & Bandura, A., (1989). Social cognitive theory of organizational managenment. *Academy of Management Review, 14 (3),* 361-384.

Yavuz, D. (2009). *Ogretmen adaylarinin oz yeterlik algilari ve ustbilissel farkindaliklarinin cesitli degiskenler acisindan incelenmesi.* [Study on preservice teachers? self-efficacy perceptions and metacognitive awareness in terms of different variablesYayimlanmamis]. Yuksek Lisans Tezi. Karaelmas Universitesi. Sosyal Bilimler Enstitusu. Retrieved from https://tez.yok.gov.tr/UlusalTezMerkezi/

Yildirim, S (2010). *Universite ogrencilerinin bilis otesi farkindaliklari ile benzer matematiksel problemleri cozmeleri arasindaki iliski.* [The relationship between university students? metacognitive awereness and solving similar type of mathematical problems]. Yayimlanmamis Yuksek Lisans Tezi. Gaziosmanpasa Universitesi Sosyal Bilimler Enstitusu. Retrieved from https://tez.yok.gov.tr/UlusalTezMerkezi/

Öğretmen Adaylarının Üstbilişsel Farkındalıkları, Öğretmenlik Mesleğine Yönelik Öz Yeterlikleri ve Problem Çözme Becerileri Arasındaki İlişki

Atıf:

Bars, M. & Oral, B. (2017). The relationship among metacognitive awareness, self-efficacy toward the teaching proffession and the problem solving skills of teacher candidates. *Eurasian Journal of Educational Research*, 72, 107-128, DOI: 10.14689/ejer.2017.72.6

Özet

Problem Durumu: Günümüz dünyasında; gerek iş yaşamında, gerek kişiler arası ilişkilerde, gerekse bilim ve teknolojide hayata dair çok hızlı gelişmeler yaşanmaktadır. Bu gelişmeler beraberinde hızlı bir değişimi de meydana getirmektedir. Meydana gelen bu değişimlere uyum sağlayabilmek için yeni öğrenmelerin oluşması gerekmektedir. Okullarda gerçekleşen öğrenmeler zaman bakımından sınırlı olduğundan hayatın her evresinde gerek duyulan öğrenmeler yaşam boyu öğrenme ihtiyacını ön plana çıkarmaktadır. Bu ihtiyacın giderilebilmesi için öğrenmeyi öğrenme becerilerini kazanmak son derece önem taşımaktadır.

Öğrenmeyi öğrenme, bireyin bilgiye ulaşmayı öğrenmesi bakımından çok önemlidir. Birçok öğrenci bir göreve dair bilgi ve beceriye sahip olmasına rağmen ilgili bilgi ve beceriyi nasıl kullanacağını bilmediğinden söz konusu beceriler durağanlaşmaktadır (Akın & Abacı, 2011). Üstbilişsel becerilerin gelişmemesinin de bu durumun sebepleri arasında olduğu düşünülmektedir. Çünkü üstbilişsel becerileri gelişmiş bireyler nasıl öğrendiklerinin farkındadırlar ve öğrenme süreçlerini yönlendirerek daha kolay öğrenirler. Bu durum öğrenme süreçlerinde üstbilişin ne denli önemli olduğunu göstermektedir.

Öğrenmenin yaşam boyu devam ettiği göz önünde bulundurulduğunda, nasıl öğrendiğinin farkında olan, öz yeterlilik algısı yüksek ve problem çözme becerileri gelişmiş bireylerin yetişmesinin öğrenmeyi öğrenme açısından büyük önem taşıdığı söylenebilir.

Araştırmanın Amacı: Bu araştırma öğretmen adaylarının üstbilişsel farkındalıklarına, öğretmenlik mesleğine yönelik öz yeterliklerine ve problem çözme becerilerine ilişkin algılarını incelemek amacıyla yapılmıştır.

Bu amaç doğrultusunda yanıt aranan sorular şunlardır.

1- Öğretmen adaylarının öğretmenlik mesleğine yönelik öz yeterliklerine, üstbilişsel farkındalıklarına ve problem çözme becerilerine ilişkin algıları hangi düzeydedir?

2- Öğretmen adaylarının üstbilişsel farkındalıkları, öğretmenlik mesleğine yönelik öz yeterlik düzeylerini anlamlı bir şekilde yordamakta mıdır?

3- Öğretmen adaylarının üstbilişsel farkındalıkları, problem çözme becerilerine ilişkin algılarını anlamlı bir şekilde yordamakta mıdır?

4- Öğretmen adaylarının üstbilişsel farkındalıkları ve problem çözme becerilerine ilişkin algıları birlikte öğretmenlik mesleğine yönelik öz yeterlik düzeylerini anlamlı bir şekilde yordamakta mıdır?

5- Öğretmen adaylarının problem çözme becerilerine ilişkin algıları, öğretmenlik mesleğine yönelik öz yeterlik algı düzeylerini anlamlı bir şekilde yordamakta mıdır?

Araştırmanın Yöntemi: Araştırma, ilişkisel tarama modeli ile gerçekleştirilmiştir. Araştırmanın evreni Dicle Üniversitesi Ziya Gökalp Eğitim Fakültesinde 2014-2015 öğretim yılı bahar yarıyılında son sınıfta öğrenime devam eden öğrenciler ile aynı dönemde pedagojik formasyon sertifika programına devam eden 2883 öğretmen adayından, örneklemi ise bu öğretmen adaylarından seçkisiz örnekleme yöntemi ile belirlenen 1475 öğretmen adayından oluşmuştur. Araştırmada veri toplama aracı olarak "kişisel bilgi formu", "üstbilişsel farkındalık envanteri", "öğretmenlik mesleğine yönelik öz yeterlik ölçeği" ve "problem çözme envanteri" kullanılmıştır. Öğretmen adaylarının üstbilişsel farkındalık düzeylerini belirlemek amacıyla Akın, Abacı ve Çetin'in (2007) Türkçeye uyarladığı 52 maddeden oluşan "üstbilişsel farkındalık envanteri" kullanılmıştır. Öğretmenlik mesleğine yönelik öz yeterlik algılarını belirlemek amacıyla kullanılan ölçek, araştırmacı tarafından geliştirilmiştir. Öğretmen adaylarının problem çözme becerilerine ilişkin algılarının belirlenmesi amacıyla Türkçeye Şahin, Şahin ve Heppner'ın (1993) uyarladığı "problem çözme envanteri" kullanılmıştır.

Araştırmanın Bulguları: Araştırmada öğretmen adaylarının gerek üstbilişsel farkındalıklarının, gerek öğretmenlik mesleğine ilişkin öz yeterliklerinin ve gerekse problem çözme becerilerine dair algı düzeylerinin "yüksek" olduğu belirlenmiştir.

Öğretmen adaylarının üstbilişsel farkındalıklarının, öğretmenlik mesleğine yönelik öz yeterlik algısını anlamlı bir şekilde yordadığı bununla beraber üstbilişsel farkındalık düzeyine ilişkin algı ile öğretmenlik mesleğine yönelik algı düzeyi arasında pozitif yönde orta düzeyde bir ilişkinin olduğu belirlenmiştir. Öğretmen adaylarının üstbilişsel farkındalıklarının, problem çözme becerilerine ilişkin algı düzeyini anlamlı şekilde yordadığı, üstbilişsel farkındalığın artması durumunda, problem çözme becerileri algı düzeyinin de arttığı sonucuna varılmıştır. Öğretmen adaylarının problem çözme becerilerine ilişkin algılarının, öğretmenlik mesleğine yönelik öz yeterlik algı düzeyini anlamlı bir şekilde yordadığı saptanmıştır.

Araştırmanın Sonuçları ve Önerileri: Öğretmen adaylarının üstbilişsel farkındalık düzeylerinin ve problem çözme becerilerinin geliştirilmesi durumunda öğretmenlik mesleğine ilişkin öz yeterliklerinin de büyük ölçüde gelişeceği sonucuna varılmıştır.

Öğretmen adaylarının üstbilişsel farkındalıklarını geliştirmek amacıyla öğretim programlarında üstbilişsel becerilere dair etkinliklere yer verilmelidir. Öğretim programına düşünme becerilerini geliştirmeye yönelik bir ders eklenerek bu dersin içeriği kapsamında üstbilişsel becerileri geliştirmeye yönelik stratejilerin öğretimi

sağlanabilir. Bu durumun öğretmen adaylarının üstbilişsel becerilerini geliştirerek beraberinde mesleğe dair öz yeterlik algı düzeyini ve problem çözme becerilerine ilişkin algı düzeyini de yükselteceği öngörülmektedir.

Öğretmen adaylarının öğretmenlik mesleğine yönelik öz yeterlik algılarında "sınıf yönetimi" en düşük ortalamaya sahip alt boyut olarak belirlendiğinden, öğretmen adaylarının sınıf yönetimine dair deneyimleri artırılmalı ve genişletilmelidir. Bu amaç doğrultusunda öğretmen adaylarının dönem boyunca aynı okulda öğretmenlik uygulamalarını yapmaları yerine birden fazla okulda uygulama yaparak daha zengin deneyim kazanmaları sağlanmalıdır. Ayrıca öğretmenlik uygulaması için öğretmen adaylarının farklı sosyokültürel çevrelerden seçilen okullarda deneyim yaşamaları sağlanmalıdır.

Öğretmen adaylarının problem çözme becerilerini geliştirmek için daha çok fikir ve alternatif üretebilecekleri durumlarla karşılaşması gerektiği düşünülmektedir. Öğretim sürecinde problem çözme, beyin fırtınası ya da altı şapka gibi teknikler kullanılarak öğretmen adaylarının alternatif çözümler sunmalarına dair özellikleri geliştirilebilir. Ayrıca öğretmen yetiştirme programlarının, öğretmen adaylarının problem çözme becerilerini geliştirmeye yönelik uygulamaları özellikle ön plana çıkarması gerektiği düşünülmektedir.

Öğretmen yetiştiren kurumlarda görev yapan öğretim elemanları yürüttükleri derslerde üstbilişsel farkındalıkları geliştirecek uygulamalara yer vermelidir. Bu durum öğretmen adaylarının üstbilişsel farkındalıklarını geliştirebilir. Böylelikle öğretmen adayları öğretmenlik mesleğine başladıklarında mevcut deneyimlerini kendi sınıf ortamlarına da aktararak öğrencilerinin üstbilişsel farkındalıklarını geliştirmelereini sağlayabilirler. Tüm bu hususların üstbilişsel becerileri yüksek nesillerin yetişmesine katkı sunacağı düşünülmektedir.

Anahtar Kelimeler: Üstbiliş, öz yeterlik, problem çözme, öğretmen adayı, öğretmenlik mesleği

Eurasian Journal of Educational Research 72 (2017) 129-146

Eurasian Journal of Educational Research
www.ejer.com.tr

An Examination of Reading Comprehension and Learning Styles of 5th Grade Students*

M. Emir RUZGAR[1] Cem BABADOGAN[2]

ARTICLE INFO

Article History:
Received: 17 Mar. 2017
Received in revised form: 17 July 2017
Accepted: 30 Sept. 2017
DOI: 10.14689/ejer.2017.72.7

Keywords
Grasha-Reichmann Learning Styles Model,
PISA 2009,
Predictors of Comprehension

ABSTRACT

Purpose: International exam scores of Turkish students, specifically of Project for International Student Achievement, attest that the level of comprehension of Turkish students is not satisfactory. Learning styles can be of use to schools in designing reading programs and materials to help Turkish students to improve their reading achievement. Hence, the primary purpose of this study was to examine 5th graders' reading comprehension scores across some variables, and assess which variables predict their reading comprehension scores.

Research Methods: The participants of the study were 1307 fifth grade students from nine different middle schools of Ankara. Instruments of the study were the Reading Comprehension Test and the Grasha-Reichmann Learning Styles Inventory. We used descriptive statistics, the Kruskal-Wallis H Test, the Mann-Whitney U Test, and regression.

Findings: Comprehension scores of students who have a bookshelf at home are higher than those who do not. Moreover, those who have more books at home and who have read more books are more successful in comprehension. In addition, daily reading time and number of weekly reading exercises also have an impact on comprehension scores. The results of regression analysis show that only one type of learning style (dependent) significantly predicts comprehension scores. This prediction is slight and negative.

Implications for Research and Practice: We suggest that upcoming scholarship on similar topics focuses on conducting similar studies with a more diverse set of predictive variables and different grade levels than 5th grade. We recommend that parents have at least one bookshelf in the home environment since our results show that having a bookshelf significantly increases comprehension scores.

* This article is adapted from the Master of Arts thesis of the first (corresponding) author under the second author's advisement.

[1] Corresponding author. University of Illinois at Urbana-Champaign, College of Education, Curriculum and Instruction, ruzgar2@illinois.edu, ORCID: 0000-0001-6372-1233.

[2] Ankara University, Faculty of Educational Sciences, Curriculum and Instruction, Turkey, cem@ankara.edu.tr. ORCID: https://orcid.org/0000-0002-6796-5654.

Introduction

Reading comprehension is one of the most essential learning processes. All students need to master it through their formal education, since studies show that students who have poor comprehension abilities do poorly in school or even drop out and get low-income jobs in their adult lives (Kutner *et al*., 2007 cited in Williams, 2010). It is also believed that individuals without a strong comprehension level negatively affect the whole society socially, economically, and intellectually (Littin, 2001). Thus, comprehension is an important area of study for scholars of education, and it encompasses a wide area in education literature.

The National Reading Panel (NRP) of the United States referred to comprehension as "a multidimensional activity consisting of the context of the message, the reader and the text starting as an inner process leading to an external process" (p. 114, cited in Eastman, 2010, p. 43). In light of this, it can be said that comprehension is an act of constructing meaning from written sources that affects readers throughout all stages of their lives. Hence, it should be an essential and inseparable part of their education. Schools should strive to help students master this vital ability.

In the Programme for International Student Assessment (PISA) 2003, Turkish students achieved an average of 441 in reading literacy, lagging behind the Organization for Economic Co-operation and Development (OECD) average of 494, ranking 28th of 29 OECD countries (EARGED, 2005; Yıldırım, 2012). Similarly, on the PISA 2006, Turkish students had an average score of 447 in literacy, again lower than the OECD average of 492; this time, Turkish students were 29th out of 30 OECD countries (EARGED, 2007; Yıldırım, 2012). Likewise, on the PISA 2009, Turkey had an average literacy score of 464. This score ranked Turkey 39th of the 65 participating countries in the project and 31st of OECD countries (EARGED, 2010). These figures indicate that there is a significant need to improve the comprehension level of students in Turkey.

Reading comprehension is a complex process; hence, there is not a single strategy, instructional method, or solution that can be employed to help all students (Beers, 2003, cited in Williams, 2010). From this, it emerges that we need to take individual differences of students into consideration so that we can help them improve their comprehension. In addition, comprehension literature indicates that time spent reading (individually) is an important factor in student achievement in comprehension (Brozo, Shiel, & Topping, 2007). In this manner, learning styles have an important potential, which can help educators respect individual differences and interests so that they can design school environments to boost students' comprehension by taking these differences and interests into account.

Educators should enhance traditional educational environments and design more individualized environments that consider these differences and interests to help students to improve their comprehension levels (Brozo *et al*., 2007; Eastman, 2010; Maltzman, 2008). Learning styles, the idea of taking students' individual differences and preferences as one of the bases of instructional design, is a worthy concept of

investigation. By studying students' learning styles, educators can help them improve their comprehension. Therefore, there is a need to identify the variables that predict students' comprehension levels. In addition, the NRP (2000) reported that most comprehension studies are concentrated between Grade 3 and 6. In this range, 4th and 5th grades take the lion's share, since studies below 3rd grade are experimental studies for finding new methods, and those above 6th grade are for students who are in need of extra help. Hence, it may be concluded that 4th and 5th grades are the most important grades for reading comprehension.

In this context, the primary purpose of this study is to examine 5th graders' reading comprehension scores across different variables, and assess which variables predict their reading comprehension scores in relation to their learning styles. To achieve this purpose, we strived to answer these specific questions in this study:

1. How do reading comprehension scores of participants differ in relation to their: (a) gender, (b) whether or not they have a bookshelf at home, (c) the number of books they have at home, (d) the number of books they had read by the beginning of the study, (e) the amount of daily time they devote to reading, and (f) the number of reading exercises they do weekly?
2. Which variables predict comprehension scores of participants in terms of (a) characteristics in the first research question, and (b) their learning style dimensions?

Theoretical Background

The first dimension of this study is reading comprehension, which the RAND Reading Study Group (RRSG, 2002) defined as "the process of simultaneously extracting and constructing meaning through interaction and involvement with written language" (p. xiii). In this process, there are three interrelated essential elements that occur in a larger sociocultural context. These three elements, which are both shaped by the reader and shape the reader, are: (a) the reader, (b) the text, and (c) the activity (the purpose of reading).

According to the RRSG (2002), the reader brings some personal attributes to the act of reading, such as cognitive capabilities, motivation, knowledge, and experience. Each reader has different and distinctive characteristics among these attributes. In addition, these attributes even change within the individual herself for different texts and activities (purposes). Hence, it can be easily concluded that the reader is one of the most important elements in the process of comprehension and that every reader constitutes a unique case of comprehension.

It is not surprising that comprehension of a highly technical academic article or essay is considerably different than comprehension of a romantic novel that is read for recreational purposes. Thus, the second element of the act of comprehension is the text. The RRSG discussed that during reading, the reader constructs various representations, such as the surface code, the text base, and the mental models that are embedded in the text.

The activity is the third element of process of comprehension. This element refers to the purpose(s) of reading. As the RRSG (2002) wrote, the initial purpose of reading may change as the reader continues reading. In an educational context, the activity is mainly related to classroom reading that engages students to learn various subject matter in addition to learning to read. This purposeful nature of comprehension also pertains to the outcomes of learning.

The second dimension of this study is learning styles, the most basic proposition of which is that individuals learn in different ways (Pashler, McDaniel, Rohrer, & Bjork, 2008). In this milieu, a good instructional environment is one in which students' learning styles are identified and the learning environment is designed according to the identified styles (Kirschner & van Merriënboer, 2013). Yet, there is no agreement among researchers on the definition and dimensions of learning styles. In fact, Cassidy (2004) discussed that there are as many definitions of learning styles as there are theorists in the area (p. 440). One of the theorists is Grasha (2002) for whom learning style "refers to those personal qualities that influence a student's ability to acquire information, to interact with peers and the teacher, and otherwise participate in learning experiences" (p. 41). Using this definition as the base, Grasha, in collaboration with Reichmann, presented a learning styles model as well as a learning styles inventory for it. The Grasha-Reichmann Learning Styles Inventory includes six learning styles: (a) independent, (b) dependent, (c) competitive, (d) collaborative, (e) participant, and (f) avoidant.

Literature Review

Atchison (1988) conducted a study to determine if there was a relationship between students' learning styles and their reading achievement in the state of Alabama, USA, and she found that a positive relationship did exist. Overall, the study concluded that there was a statistically significant relationship between learning styles and the comprehension levels of participating students.

Likewise, Gary (1990) aimed to identify whether there were significant relationships between learning styles of low-, average-, and high-achieving 6th- and 8th-grade students. He reported that there were significant differences in terms of students' comprehension level and their learning styles. Similarly, Chen (2006) conducted a study to investigate the learning style preferences of 704 students and to determine whether their learning styles were correlated with their mathematics or reading scores in terms of age, gender, and socio-economic status (SES). Statistical tests for the study revealed a significant relationship between all predictor variables and students' achievement scores in mathematics and reading. The results of his study showed that learning styles were significantly related to comprehension scores. Similar to Chen's study, Williams (2010) investigated whether there was a relation between 7th-grade students' comprehension and learning styles and concluded that learning styles affected the comprehension levels of students who participated in the study.

Erginer (2014) aimed to determine whether the learning styles of 4th graders were related to their comprehension levels. The study suggested that there was a slight

correlation between the learning styles and comprehension of 71 participating students. Hence, he concluded that no learning style has a significant effect on reading comprehension.

Method

Research Design

The model for this study is survey research. Fraenkel, Wallen, and Hyun (2012) discussed that there are two types of survey research: cross-sectional and longitudinal. In cross-sectional research, the researchers collect data at one point in time; whereas in longitudinal, researchers collect data from their participants in more than one setting, leaving some time between settings. Since the information for this study was collected at one point in time, this study employed a cross-sectional survey research.

Research Sample

We employed convenience sampling, foreseeing that it would provide two major advantages to us as researchers. First, convenience sampling allowed us to reach a larger group of students than we would have using another sampling technique. Second, it allowed us to reach our participants in a shorter period of time. In this regard, participants of this study were 1307 fifth grade students in nine different middle schools in Ankara. We chose three schools from each of the Mamak, Altındağ, and Çankaya districts of Ankara, for a total of nine schools to represent different SESs of the city. Of the 1307 participants, 49.6% were male students (n=648) while 50.4% were females (n=659).

Research Instruments and Procedures

Two different data collection tools were used in this study. The first of these is the Reading Comprehension Test (RCT), developed by Kutlu, Yıldırım, Bilican & Kumandaş (2011). The second is the Grasha-Reichmann Learning Styles Inventory (GRLSI), designed by Grasha and Reichmann in 1974.

Kutlu *et al*. (2011) conducted a study to identify the importance level of the variables effective in predicting the success of 5th graders' reading comprehension skills. For this study, the researchers designed and developed the RCT which consists of a narrative and informative text by Afet İnan entitled *İlk Köylü Kadın Milletvekili: Satı Kadın (The First Woman Parliamentarian from a Rural Area: Satı Kadın)*. The researchers reported that they took 5th graders' developmental-, age- and grade-levels into consideration while choosing this text for their instrument. Participants were supposed to read this text and then answer five open-ended questions. The researchers developed the questions by using the International Association for the Evaluation of Educational Achievement's (IEA) framework that was employed in the Progress in International Reading Literacy Study (PIRLS) as the theoretical base for the questions. The researchers also obtained feedback from subject specialists in

curriculum development, evaluation, and language to ensure clarity and appropriateness of the questions to the 5th graders' levels of development. Moreover, in the same manner, they designed a rubric to grade students' responses to the test (Kutlu *et al*., 2011). In addition to the text and questions, the first page of the RCT includes directions for students and demographic information for them to complete.

The GRLSI is an inventory of 60 questions, 10 for each learning style: (a) independent, (b) dependent, (c) competitive, (d) collaborative, (e) participant, and (f) avoidant. Hruska and Grasha (1982) reported a reliability value of .76 for the inventory by using the test-retest method (cited in Lang, Stinson, Kavanagh, Liu, & Basile, 1999). Similarly, Snyder (1997) reported a reliability value of .64—.89 for this inventory (including its subdimensions) (cited in Baykul *et al*., 2010). The GRLSI was adapted to Turkish in 2011 by Kılıç. In the adaptation process, the original form was translated to Turkish first; then, it was re-translated to its original language by different language experts. The resulting forms were presented for the scrutiny of experts in the field. After the translation process, Kılıç (2011) conducted a pilot study of the inventory to test it for reliability. The pilot study (N=46) resulted in these reliability values for each sub-dimension of the inventory: independent: .91, dependent: .92, competitive: .93, collaborative: .90, participant: .89, and avoidant: .92 while the reliability value for the total inventory was .91. In order to ensure face and content validity, Kılıç obtained expert opinions on the inventory, the result of which was that initial problems with the inventory were removed. For the construct validity of the inventory, Kılıç conducted a factor analysis on the inventory (KMO=.88, χ^2=8488.42, df=1770 and p=.00). The results of the principal components analysis showed that the adapted inventory, indeed, included six dimensions (learning styles) and the inventory included ten items for each dimension as was the case in the original inventory.

Data Analysis

After the data collection process, we graded the participants' RCTs by using the rubric. In order to ensure a fair and robust grading process, two PhD students in the field of curriculum and instruction also graded the same tests. The intraclass correlation coefficient for the three graders was .98.

After constructing the dataset, we checked the normality distribution in order to choose the correct statistical method(s) for data analysis. Based on normality test results, we decided to use the Kruskal-Wallis H Test and the Mann-Whitney U Test. We also examined the data to see whether they met the assumptions of regression. Our examination revealed that tolerance values were between .50 and .99 (>.20), Variance inflation factor (VIF) values were between 1.005 and 1.971 (<10), and confidence interval (CI) values were between 1 and 24.548 (<30), satisfying the demands of the regression method. Finally, we dummy coded the variables with more than two subgroups to put them into the regression model.

Results

In this study, we aimed at examining reading comprehension scores and learning styles of 5th grade students. Table 1 presents reading comprehension scores of the sample in relation to their gender and whether or not they have a bookshelf at home.

Table 1

Mann-Whitney U Test Results for Reading Comprehension Scores According to Gender and Having a Bookshelf at Home

Gender	**n**	**Mean Rank**	**Sum of Ranks**	U	p
Boy	648	597.67	387289.50	177013.50	.000
Girl	659	709.39	467488.50		
Bookshelf	**n**	**Mean Rank**	**Sum of Ranks**	U	p
Yes	1037	676.55	701586.50	116606.50	.000
No	270	567.38	153191.50		

Table 1 shows that girls' reading comprehension achievement scores were significantly higher than those of boys (U=177013.50, p<.05). This result indicates that 5th-grade girls are better at reading (comprehension) than 5th-grade boys. Table 1 also shows that 1037 participants had bookshelves in their homes while 270 did not. Similarly, the comprehension scores of students who had bookshelves at home were significantly higher than those who did not (U=116606.50, p<.05). In a similar manner, Table 2 includes data on the relation between reading comprehension and number of books at home.

Table 2

Kruskal-Wallis H Test Results for Reading Comprehension by Number of Books at Home

Number of Books at Home	**n**	**Mean Rank**	**df**	χ^2	**p**
0-25	392	565.50			
26-50	302	617.39			
51-75	195	667.28	4	56.60	.000
76-100	195	745.13			
101 or more	223	767.85			

As can be seen in Table 2, as the number of the books in students' homes increases, so do the students' comprehension scores. This is to say that the number of books that students have at home significantly and positively affect their comprehension scores ($\chi^2_{(4,\ 1307)}$=56.60, p<.05). In order to see which groups significantly differ on this variable, we conducted Mann-Whitney U Tests between groups, the results of which indicate that those students who had 101 or more books at home had significantly better comprehension scores than those who had 51-75, 26-50, and 0-25 books (U=18247.00, p=.004; U=26014.50, p=.000; U=30371.50, p=.000, respectively). In addition, students who had 76-100 books tended to significantly perform better than those who had 51-75 books (U=16617.50, p=.031). Table 3 is a display of the change in reading comprehension scores of the sample regarding the number of books they had read.

Table 3

Kruskal-Wallis H Test Results for Reading Comprehension Scores by Number of the Books Students Had Read

Number of Books Students Had Read	n	Mean Rank	df	χ^2	P
0-25	339	506.72			
26-50	312	624.15			
51-75	222	677.42	4	109.64	.000
76-100	217	729.30			
101 or more	217	827.75			

The results shown in Table 3 indicate that the number of books the students had read tended to significantly increase their comprehension scores, since mean rank increases as the number of books read increases ($\chi^2_{(4,\ 1307)}$=109.64, p<.05). The results of the Mann-Whitney U Tests for group differences reveal that reading comprehension scores of students who had read 101 or more books scored significantly higher than those who had read 76-100, 51-75, 26-50, and 0-25 books (U=19808.50, p=.004; U=18121.00, p=.000; U=23308.50, p=.000; U=19332.50, p=.000, respectively). Similarly, the analysis has revealed that daily reading time also influences reading comprehension scores (see Table 4).

Table 4

Kruskal-Wallis H Test Results for Reading Comprehension Scores by Daily Reading Time

Daily Reading Time	n	Mean Rank	df	χ^2	p
Never	24	551.38			
Less Than an Hour	294	595.60			
1-2 Hour(s)	720	688.46			
2-3 Hours	164	702.50	6	30.862	.000
3-4 Hours	45	579.52			
4-5 Hours	28	515.55			
More Than 5 Hours	32	469.42			

It can be seen in Table 4 that 720 of all participants read daily between one and two hours. Moreover, the participants who read between two and three hours had the highest comprehension scores (mean rank=702.50, $\chi^2_{(6,\ 1307)}$=30.862, p<.05). Post-Kruskal-Wallis analyses for between-group differences yielded that students with daily reading time of two to three hours had significantly better comprehension scores than those who read daily for a period of more than five hours or less than one hour (U=1653.00, p=.001; U=20126.00, p=.003, respectively). Results also show that students who read daily for a period of one to two hours had significantly better comprehension scores than those who read more than five hours or less than one hour (U=7793.50, p=.002; U=90745.00, p=.000, respectively). It seems that there is an optimum level of daily reading time (i.e., two to three hours) that increases students' comprehension scores since any time period exceeding or below two to three hours led to lower comprehension scores. A similar situation is also the case between reading comprehension and number of weekly reading exercises (see Table 5).

Table 5

Kruskal-Wallis H Test Results for Reading Comprehension Scores by Number of Weekly Reading Exercises

Number of Weekly Reading Exercises	n	Mean Rank	df	χ^2	p
0-2	167	666.41			
2-4	477	696.92			
4-6	340	635.66	3	13.01	.005
6 and more	323	603.50			

In Table 5, we can see that number of weekly reading exercises significantly affected the participants' reading comprehension. Likewise, participants who did

two to four reading exercises had the highest reading comprehension scores (mean rank=696.92, $\chi^2_{(3,\ 1307)}$=13.01, p<.05). Mann-Whitney U Test results reveal that students who did two to four reading exercises per week had significantly better comprehension scores than those who did four to six or more than six (U=73420.50, p=.021; U=66056.50, p=.001, respectively). Similar to daily reading time, here again, there seems to be an optimum number of weekly reading exercises, two to four, since results show that these students had higher comprehension scores than those who did fewer or more. In the last step of the analysis, we investigated the factors that predict reading comprehension scores. We present results of the analysis of these factors in Table 6.

Table 6

Regression Results for Factors that Predict Reading Comprehension Scores

Variable	B	R	ΔR^2	β	β^2	t	p	Binary r	Partial r
Constant	55.852					10.313	.000		
Number of Books Read (1)	-21.048	.230	.053	-.373	.139	-10.310	.000	-.230	-.275
Gender	7.191	.268	.019	.145	.021	5.575	.000	.152	.153
Number of Books Read (2)	-13.666	.296	.015	-.236	.056	-6.649	.000	-.047	-.182
Number of Exercises (2)	7.041	.317	.014	.137	.019	4.974	.000	.085	.137
Number of Books Read (3)	-10.052	.332	.009	-.153	.023	-4.548	.000	.026	-.125
Number of Exercises (1)	6.409	.342	.007	.086	.007	3.169	.002	.014	.088
Bookshelf	4.753	.351	.006	.078	.006	2.968	.003	.119	.082
Dependent	-.338	.358	.005	-.071	.005	-2.767	.006	-.070	-.077
Daily Reading Time (6)	-12.376	.365	.005	-.072	.005	-2.776	.006	-.050	-.077
Number of Books Read (4)	-5.393	.370	.004	-.081	.007	-2.433	.015	.092	-.067
Daily Reading Time (5)	-8.032	.375	.003	-.059	.003	-2.268	.023	-.036	-.063
R=0.375, R^2=0.140, F=19.22, df=11.1295, p=.000									

Table 6 presents variables that significantly predict reading comprehension scores of the participants. The results of the regression model show that 11 predictive variables are significant yet only slightly related to the reading comprehension scores of this study's participants. These 11 variables explain 14% of the total variance

($R=.375$, $R^2=.140$, $p=.000$). When we examine these 11 predictive variables in terms of their contribution to the explained variance (ΔR^2), we see that the number of books read (1) constitutes 37.86% of the explained variance. Similarly, gender constitutes 13.57% of the explained variance; the number of books read (2) constitutes 10.71% of the explained variance; the number of exercises (2) constitutes 10% of the explained variance; the number of books read (3) constitutes 6.43% of the explained variance; the number of exercises (1) constitutes 5% of the explained variance; bookshelf constitutes 4.29% of the explained variance; dependent and daily reading time (6) (each) constitutes 3.57% of the explained variance; the number of books read (4) constitutes 2.86% of the explained variance; and daily reading time (5) constitutes 2.14% of the explained variance. In light of the results of the regression model, we may conclude that the reading comprehension scores of students who read more books, girls, students who have bookshelves at home, students whose learning style is not dependent, and students who do not read for more than three hours daily tend to score higher than others.

Discussion and Conclusion

There is a vast area of scholarship in the literacy literature on the effect of gender on reading comprehension. This study contributes to the literature that girls perform better than boys in comprehension (Bleakley, Westerberg, & Hopkins, 1988). Likewise, Brown (1991) conducted a study in which he investigated the effect of gender and SES on reading and mathematics achievement and concluded that, similar to this study, girls are better at reading than boys. However, it should also be borne in mind that there are other studies where there were no significant differences between the performances of girls and boys in reading (e.g., Knickerbocker, 1989; McGregor, 1989). Therefore, we conclude this issue by pointing to the need for additional studies on the subject.

The results of this study yield that students who have bookshelves at home tend to perform better in terms of comprehension than those who do not have bookshelves. Similarly, Izzo (2010) argues that a bookshelf at home significantly contributes to the reading culture at home and, hence, the student's comprehension. In another study, Ngorosho (2011) discussed that not having a bookshelf at home is a significant contributor to low literacy. Furthermore, in this study, we discuss that the number of books in the students' houses significantly and positively affects their comprehension scores. Kennedy and Trong (2010) discuss that number of books at home is a significant factor that affects reading achievement. Similar points have also been discussed in other studies (McQuillan, 2006; Romeo, 2002).

In addition, we purport that the number of books students have read positively influences their comprehension. In their study of 2nd and 5th graders, Anderson, Wilson, and Fielding (1988) write that the best predictor of reading achievement is the number of the books readers have read. Additionally, we claim that students' daily reading time is a significant factor in their comprehension scores in that our results reveal that there is an ideal period of daily reading, two to three hours. The

students who reported that that they read two to three hours daily had the highest comprehension scores of all participants in our study. Watkins and Edwards (1992) argued that a monthly reading time of 79 minutes is a significant predictor of 3rd-, 4th-, 5th-, and 6th-grade students' reading comprehension scores. Similarly, Wu and Samuels (2004) conclude that daily reading time is a significant factor on comprehension. Finally, we report through our analysis of the data that doing two to four reading exercises weekly positively influences students' comprehension scores. Block, Parris, Reed, Whiteley, and Cleveland (2009) discussed that doing reading exercises is an effective means of improving comprehension.

Our regression analysis reveals that only the dependent learning style of the Grasha-Reichmann Learning Style model predicts the comprehension scores of participants. We also note that this prediction is low and negative (ΔR^2=.005, r= -.07). In this sense, despite the various reporting of scholars on the high and significant correlation and prediction between comprehension and learning styles, we report that learning styles are not highly and completely related to comprehension scores of students since independent, competitive, collaborative, participant, and avoidant learning styles do not take place in the results of our regression analysis, whereas only the dependent learning style is a statistically significant yet negative predictor. Hence, we conclude this issue by arguing that learning style is slightly related to comprehension. Erginer (2014) also indicated that comprehension is not significantly affected by learning styles.

Finally, we encourage upcoming scholars who may conduct studies on the same or similar issues to consider the gender factor in comprehension and exert more effort to shed light on this point whether or not there are significant differences between performances of girls and boys in comprehension. Moreover, there may be more variables in predicting students' reading comprehension scores. Thus, we suggest that upcoming scholarship on similar topics focus on conducting similar studies with a more diverse set of predictive variables and different grade levels than 5th grade. In addition, we advise that future studies involve more research to determine whether our finding that there is an ideal amount of daily reading time and weekly reading exercises for better comprehension holds true for their participants. Equally, we suggest that parents have at least one bookshelf in the home environment since our results show that having a bookshelf significantly increases comprehension scores. Similarly, we make the point that the number of books at home is a significant factor increasing students' comprehension scores. Hence, we encourage families and schools to have more books in their environment so that students may benefit from them. As we discussed, the number of books students read is a significant predictor of comprehension. Therefore, educational caretakers and parents should find ways to encourage students to read more books.

References

Anderson, R. C., Wilson, P. T., & Fielding, L. G. (1988). Growth in reading and how children spend their time outside of school. *Reading Research Quarterly, 23*(3), 285-303.

Atchison, M. K. (1988). *The relationship between the learning styles and reading achievement of sixth-grade students in the state of Alabama*. (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (Order No. 8821790).

Baykul, Y., Gürsel, M., Sulak, H., Ertekin, E., Yazıcı, E., Dülger, O., Aslan, Y., & Büyükkarcı, K. (2010). A validity and reliability study of Grasha-Reichmann Student Learning Style Scale. *International Journal of Human and Social Sciences, 5*(3), 177-184.

Bleakley, M. E., Westerberg, V., & Hopkins, K. D. (1988). The effect of character sex on story interest and comprehension in children. *American Educational Research Journal, 25*(1), 145-155.

Block, C. C., Parris, S. R., Reed, K. L., Whiteley, C. S., & Cleveland, M. D. (2009). Instructional approaches that significantly increase reading comprehension. *Journal of Educational Psychology*, *101*(2), 262-281.

Brown, B. W. (1991). How gender and socioeconomic status affect reading and mathematics achievement. *Economics of Education Review, 10*(4), 343-357.

Brozo, W. G., Shiel, G., & Topping, K. (2007). Engagement in reading: Lessons learned from three PISA countries. *Journal of Adolescent and Adult Literacy, 51*(4), 304-315.

Cassidy, S. (2004). Learning styles: An overview of theories, models and measures. *Educational Psychology, 24*(4), 420-436.

Chen, H. (2006). *Taiwanese adolescent students' achievement in reading and mathematics by age, gender, learning style and socio-economic status*. (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (Order No. 3196297).

EARGED (Eğitim Araştırma ve Geliştirme Dairesi Başkanlığı [Departmant of Research and Development of Education, Ministry of National Education of Turkey (MoNE)]. (2005). *PISA 2003 Projesi-Ulusal Nihai Rapor [PISA 2003-National Final Report]*. Ankara: MEB Eğitimi Araştırma ve Geliştirme Dairesi Başkanlığı [MoNE: Departmant of Research and Development of Education].

EARGED (Eğitim Araştırma ve Geliştirme Dairesi Başkanlığı [Departmant of Research and Development of Education, Ministry of National Education of Turkey (MoNE)]. (2007). *PISA 2006 uluslararası öğrenci değerlendirme programı, ulusal ön rapor [PISA 2006-National Preliminary Report]*. Ankara:

MEB Eğitimi Araştırma ve Geliştirme Dairesi Başkanlığı [MoNE: Departmant of Research and Development of Education].

EARGED (Eğitim Araştırma ve Geliştirme Dairesi Başkanlığı [Departmant of Research and Development of Education, Ministry of National Education of Turkey (MoNE)]. (2010). *Uluslararası Öğrenci Değerlendirme Programı PISA 2009 Ulusal Ön Raporu [PISA 2009-National Preliminary Report]*. Ankara: MEB Eğitimi Araştırma ve Geliştirme Dairesi Başkanlığı [MoNE: Departmant of Research and Development of Education].

Eastman, V. L. (2010). *Small group instruction: Reading instruction utilizing learning style preferences and the reading achievement of first grade students.* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (Order No. 3403223).

Erginer, E. (2014). A study of the correlation between primary school students' reading comprehension performance and the learning styles based on memory modeling. *Education and Science, 39*(173), 66-81.

Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2012). *How to design and evaluate research in education* (8th Ed.). New York, NY: McGrawHill.

Gary, C. M. (1990). *A comparison of the learning styles of low, average, and high reading achievers in the sixth and eighth grades in a small school system in Alabama: Implications for instructional leadership*. (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (Order No. 9105955).

Grasha, A. F. (2002). *Teaching with style*. San Bernadino, CA: Alliance Publishers.

Izzo, M. (2010). *The home literacy environment and kindergarten literacy skills: A case study*. Unpublished master of sciences thesis. St. John Fisher College, School of Arts and Sciences, Rochester, MN.

Keer, H. V. (2004). Fostering reading comprehension in fifth grade by explicit instruction in reading strategies and peer tutoring. *British Journal of Educational Psychology. 74*(1), 37-70.

Kennedy, A. M., & Trong, K. L. (2010). Influence of the home literacy environment on reading motivation and reading comprehension. *International Association for the Evaluation of Educational Achievement.* Retrieved from http://www.iea.nl/fileadmin/user_upload/IRC/IRC_2010/Papers/IRC2010_Kennedy_Trong.pdf

Kirschner, P. A., & van Merriënboer, J. J. G. (2013). Do learners really know best? Urban legends in education. *Educational Psychologist, 48*(3), 169-183.

Kılıç, G. (2011). *Ilköğretim 6. Sınıf Öğrencilerinin Öğrenme Biçemleri ile Ilköğretim Okullarında Görevli Ingilizce Öğretmenlerinin Öğrenme ve Öğretme Biçemlerinin Belirlenmesi* [Determination of the learning modalities of sixth grade students and the learning and teaching modalities of the English teachers at primary schools] (Master thesis, Ankara University, Ankara, Turkey).

Knickerbocker, J. L. (1989). Sex differences in reading achievement: A review of recent research. *Ohio Reading Teacher, 24*(2), 33-42.

Kutlu, Ö., Yıldırım, Ö., Bilican, S. & Kumandaş, H. (2011). Ilköğretim 5. sınıf öğrencilerinin okuduğunu anlamada başarılı olup-olmama durumlarının kestirilmesinde etkili olan değişkenlerin incelenmesi [Investigation of Factors That Affect 5th Graders' Success in Reading Comprehension]. *Eğitimde ve Psikolojide Ölçme ve Değerlendirme Dergisi [Journal of Measurement and Evaluation in Education and Psychology], 2*(1), 132-139.

Lang, H. G., Stinson, M. S., Kavanagh, F., Liu, Y., & Basile, M. L. (1999). Learning styles of deaf college students and instructors' teaching emphases. *Journal of Deaf Studies and Deaf Education, 4*(1), 16-27.

Littin, R. M. (2001). *Relationship(s) between and among an urban elementary school's grades three through five students' learning styles, cognitive styles, reading achievement, hemispheric preference, and gender.* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (Order No. 3034485).

Maltzman, R. (2008). *Effects of traditional versus learning-style instructional strategies on community-college students' achievement in and attitudes toward developmental reading and writing.* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (Order No. 3340565).

McGregor, A. K. (1989). The effect of word frequency and social class on children's reading comprehension. *Reading, 23*(2), 105-115.

McQuillan, J. (2006). The effects of print access and print exposure on English vocabulary acquisition of language minority students. *The Reading Matrix, 6*(1), 41-51.

National Reading Panel. (2000, April). *Report of the National Reading Panel: Teaching children to read: An Evidence-based assessment of the scientific research literature on reading and its implications for reading instruction*. Washington, DC: National Institute of Child Health and Human Development, National Institutes of Health, U.S. Department of Health and Human Services. Retrieved from http://www.nichd.nih.gov/publications/pubs/nrp/documents/report.pdf

Ngorosho, D. L. (2011). *Literacy skills of Kiswahili speaking children in rural Tanzania: The role of home environment*. Unpublished doctoral dissertation, Abo Akademi University, Vasa.

Pashler, H., McDaniel, M., Rohrer, D., & Bjork, R. (2008). Learning styles concepts and evidence. *Psychological Science in the Public Interest, 9*(3), 105-119.

RAND Reading Study Group. (2002). *Reading for understanding: Toward an R&D program in reading comprehension*. Santa Monica, CA: RAND.

Romeo, L. (2002). At-risk students: Learning to break through comprehension barriers. In C. Collins Block, L. B. Gambrell, & M. Pressley (Eds), *Improving comprehension instruction: Rethinking research, theory, and classroom practice (*pp. 354-370*)*. San Francisco, CA: Jossey-Bass.

Saracaloğlu, A. S., & Karasakaloğlu, N. (2011). Sınıf öğretmeni adaylarının okuduğunu anlama düzeyleri ile çalışma ve öğrenme stratejilerinin çeşitli değişkenler açısından incelenmesi [An investigation of prospective teachers' reading comprehension levels and study and learning strategies related to some variables]. *Eğitim ve Bilim, 36*(16), 98-115.

Watkins, M. W., & Edwards, V. A. (1992). Extracurricular reading and reading achievement: The rich stay rich and the poor don't read. *Reading Improvement, 29*(4), 236-242.

Williams, J. (2010). *Reading comprehension, learning styles, and seventh grade students.* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (Order No. 3397106).

Wu, Y- C., & Samuels, S. J. (2004, May). *How the amount of time spent on independent reading affects reading achievement: A response to the National Reading Panel*. Paper presented at the International Reading Association (IRA) Conference, Reno, NV, USA.

Yıldırım, Ö. (2012). *Öğrencilerin Okuduğunu Anlama Başarılarını Etkileyen Faktörlerin Aşamalı Doğrusal Modellemeyle Belirlenmesi (PISA 2009 Hollanda, Kore ve Türkiye Karşılaştırması)* [Determination of factors relating reading comprehension achievement with hierarchical linear models (PISA 2009 comparison of the Netherlands, Korea and Turkey)]. Unpublished doctoral dissertation, Ankara University, Institute of Educational Sciences, Ankara, Turkey.

Beşinci Sınıf Öğrencilerinin Okuduğunu Anlama Düzeyleri ile Öğrenme Stillerinin İncelenmesi

Atıf:

Ruzgar, M. E. & Babadogan, C. (2017). An examination of reading comprehension and learning styles of 5th grade students. *Eurasian Journal of Educational Research,* 72, 129-146, DOI: 10.14689/ejer.2017.72.7

Özet

Problem Durumu: Okulların öğrencilerin okuduğunu anlama düzeylerini geliştirmesine yardımcı olması gerekir çünkü öğrencilerin okuduğunu anlama düzeylerinin düşük olması yalnızca kendi yaşamlarını değil, bireyler birbirine bağımlı olduğundan toplumun bütününü de etkilemektedir. Ayrıca okuma,

öğrencilerin eğitimlerini tamamlayıp iş dünyasında başarılı olabilmeleri için ön koşuldur. Okuryazarlık düzeyi düşük öğrencilerin okuldan ayrılıp statü ve kazanç açısından daha düşük işlerde mesai sarf ettikleri bilinmektedir. Okuduğunu anlama düzeyi yüksek olan bireyler ise daha nitelikli işler bulabilir ve böylece yaşam doyumlarını arttırabilirler. Öte yandan bilgi patlamasının yaşandığı günümüzde öğrencilerin kendilerini sürekli geliştirmeleri önem kazanmaktadır. Dolayısıyla yaşam boyu öğrenme kavramı giderek daha önemli duruma gelmektedir. Okuma, yaşam boyu öğrenme becerisi için de çok önemlidir. Ancak Türkiye'nin Uluslararası Öğrenci Başarısını Belirleme Programı (PISA) başta olmak üzere uluslararası düzey belirleme çalışmalarındaki okuma erişi puanları tatmin edici düzeyde değildir. Bu sorunun çözümünde öğrenme stillerinin eğitimcilere yararı olabilir. Çünkü alanyazında okuduğunu anlama erişisini arttırmada öğrencilerin bireysel tercihlerinin eğitimde göz önüne alınmasının etkili olacağı tartışılmıştır. Öğrenme stillerinin temel beliti de değinilen doğrultudadır: Öğrencilere program ve materyal hazırlarken öğrencilerin kişilik özellikleri ve seçimleri dikkate alınmalıdır. Böylece öğrenme stilleri dikkate alınarak hazırlanan program ve materyaller, Türkiye'nin okuduğunu anlama konusunda yaşadığı sorunların giderilmesine katkı sağlayabilir.

Araştırmanın Amacı: Bu araştırmanın temel amacı, beşinci sınıf öğrencilerinin okuduğunu anlama puanlarını belirli değişkenler açısından incelemek ve bu değişkenlerle ilişki içinde hangi değişkenlerin öğrencilerin okuduğunu anlama puanlarını yordadığını belirlemektir. Bu amaç doğrultusunda şu iki araştırma sorusuna yanıt aranmıştır:

1. Katılımcıların okuduğunu anlama puanları (a) cinsiyet, (b) evde kitaplık bulunma durumu, (c) evde bulunan kitap sayısı, (d) bugüne kadar okunan kitap sayısı, (e) günlük kitap okuma süresi ve (f) okumaya dayalı ödev yapma sayısı değişkenlerine göre nasıl değişim göstermektedir?
2. Katılımcıların okuduğunu anlama puanlarını (a) birinci araştırma sorusunda sayılan değişkenlerin hangileri, (b) öğrenme stili boyutlarından hangileri yordamaktadır?

Araştırmanın Yöntemi: Araştırma kesitsel tarama modelinde desenlenmiştir, zira bu modelin çalışmaya iki değişken arasında ilişki olup olmadığını belirlemeye olanak sağlama, farklı ölçme araçları yoluyla veri edinme gibi katkıları olacağı öngörülmüştür. Sözü edilen modelin araştırmada okuduğunu anlama ve öğrenme stilleri olmak üzere iki temel boyut bulunması nedeniyle araştırmaya uygun olduğu düşünülmüştür. Araştırmada zaman ve erişilebilirlik göz önüne alınarak örneklem seçimi yerine araştırma grubu tercih edilmiştir. Araştırmanın katılımcıları 1307 beşinci sınıf öğrencisidir. Bu öğrencilere; Altındağ, Mamak ve Çankaya olmak üzere Ankara'nın üç ilçesindeki ortaokullardan ulaşılmıştır. Bu üç ilçenin seçilmesinde amaç, farklı sosyoekonomik düzeyleri temsil eden bölgelerin araştırmada yansıtılmasını sağlamak olmuştur. Araştırmada kullanılan veri toplama araçları, Okuduğunu Anlama Testi ile Grasha-Reichmann Öğrenme Stilleri Ölçeğidir. Veri toplama sürecinde veri toplanan sınıfların öğretmenleri kendi sınıflarındaki süreci yönetirken araştırmacılar birden fazla sınıfta veri toplanması nedeniyle sürecin

bütününün sorunsuz devam etmesini sağlamaya çalışmıştır. Toplanan verileri çözümlemede betimsel istatistikler, Kruskal-Wallis H Testi, Mann-Whitney U Testi ve regresyon kullanılmıştır.

Araştırmanın Bulguları: Gerçekleştirilen çözümlemeler sonucunda; okuduğunu anlama açısından kız öğrencilerin erkek öğrencilerden, evinde kitaplık bulunan öğrencilerin bulunmayanlardan, evinde daha fazla kitap bulunan öğrencilerin az kitap bulunanlardan, bugüne kadar okuduğu kitap sayısı fazla olan öğrencilerin daha az kitap okuyanlardan daha erişili olduğu görülmüştür. Benzer şekilde regresyon modelinde içerilen değişkenlerden 11'inin okuduğunu anlama puanlarını yordadığı görülmüştür. Bu 11 değişken toplam varyansın %14'ünü açıklamaktadır (R=.375, R2=.140, p=.000). Regresyon çözümlemesi sonucunda daha fazla kitap okuyan, kadın, evinde kitaplık bulunan öğrencilerin okuduğunu anlamada daha erişili olduğu gözlenmiştir. Öte yandan öğrenme stilleri boyutlarından yalnızca Bağımlı'nın okuduğunu anlamayı anlamlı olarak yordadığı belirlenmiştir. Bağımlı boyutunun okuduğunu anlama puanlarını yordaması düşük düzeyde ve olumsuz yöndedir.

Araştırmanın Sonuçları ve Önerileri: Çalışma sonucunda kadın öğrencilerin erkek öğrencilerden, evinde kitaplık bulunan öğrencilerin bulunmayanlardan, evinde daha fazla kitap bulunan öğrencilerin az kitap bulunanlardan, bugüne kadar okuduğu kitap sayısı fazla olan öğrencilerin az olanlardan daha başarılı olduğu sonuçlarına varılmıştır. Alanyazında cinsiyetin okuduğunu anlama erişisi üzerine genel geçer olarak etkili olup olmadığının tartışmalı olması nedeniyle bu bulguya dikkatle yaklaşılmasına dikkat çekilmiştir. Ayrıca Grasha-Reichmann öğrenme stilleri modelinin altı farklı boyutundan sadece Bağımlı boyutunun okuduğunu anlamayı yordadığı bulgusundan hareketle öğrenme stillerinin okuduğunu anlama üzerinde anlamlı olarak çok da etkili olmadığı sonucu vurgulanmıştır. Bağımlı boyutunun okuduğunu anlamayı olumsuz yönde ve düşük düzeyde yordadığı sonucuna da çalışma sonucunda erişilmiştir. Çalışma bu ve benzeri konuları inceleyecek araştırmacılara, cinsiyetin okuduğunu anlama üzerine etkisinin genellenebilirliliğine ilişkin çalışmalar düzenlemeleri ve okuduğunu anlamayı yordayan değişkenleri incelerken burada içerilen değişkenlerden farklı değişkenleri de göz önüne almaları önerilmiştir. Araştırma sonuçları temel alınarak ailelere evlerinde kitaplık bulundurmaları ve bu kitaplıktaki kitap sayısını artırmaları çağrısında bulunulmuştur. Genel olarak eğitim sistemini oluşturan bütün paydaşlara, okunan kitap sayısının okuduğunu anlama erişisini anlamlı olarak olumlu yönde etkilemesi nedeniyle öğrencilerin daha fazla kitap okumasını sağlamaya çalışmaları önerilmiştir.

Anahtar Sözcükler: Grasha-Reichmann Öğrenme Stilleri Modeli, PISA 2009, Okuduğunu Anlamanın Yordayıcıları.

Eurasian Journal of Educational Research 72 (2017) 147-166

Eurasian Journal of Educational Research
www.ejer.com.tr

New Barriers to Technology Integration [1, 2]

Ozden SAHIN IZMIRLI [3], Omer KIRMACI [4]

ARTICLE INFO

Article History:

Received: 28 Mar. 2017

Received in revised form: 31 May 2017

Accepted: 23 Sept. 2017

DOI: 10.14689/ejer.2017.72.8

Keywords:
obstacles in technology integration,
in-service teacher training,
limitations of techology use

ABSTRACT

Purpose of the Study: Although there are many reasons to use technology in the classroom (to enhance student achievement, motivation, and process productivity; diversity offers teachers new alternatives for instruction and supports self-learning), various barriers hinder technology integration. Technology integration in the education field is a multidimensional process, and its success depends on many variables. Therefore, it is necessary to re-examine the barriers under several changing conditions (the improvement of infrastructure possibilities, professional development activities, etc.). This study discusses the problems related to the integration of a newly introduced web system with educational activities, "Tracking and Evaluation System for Book Reading Activities" (KITaS), that would be included in a public school system, in addition to the integration of teachers in the course of promoting and implementing it in Kırklareli. In the process of implementing KITaS, the aim was to determine the barriers present, which were based on teachers' considerations of barriers regarding the integration process. The profiles of the changing barriers in the literature were compared. **Research Method:** In this qualitative research conducted during the 2015–2016 school term, data were collected through observations, interviews, and open-ended question forms. The research participants were seven teachers from a government secondary school in Kırklareli. **Results:** The primary findings of this research are as follows: (A) there is a need to accept that there are always some barriers to technology integration; (B) it is believed that the administrative unit of an institution where teachers work decides whether to engage in the process of technology integration, and (C) there is not a need to integrate technology in test-centered approaches, which focus on students' success on exams. **Implications for Research and Practice:** Within the scope of this research, the barriers similar to those in the literature are established, in addition to an additional barrier that does not directly correspond to those in the literature. Depending on the changing conditions, it seems that new barriers to technology integration (believing that the top unit of an institution at which teachers work decides whether to engage in the process of technology integration, and accepting that there are several barriers to technology integration at all times) emerge and other barriers (lack of technology resources) are found to decrease.

[1] This study was presented at the 10th International Computer & Instructional Technologies Symposium held by Recep Tayyip Erdoğan University Faculty of Education between 16–18 May 2016

[2] This study product of TUBITAK Project number of SOBAG 114K977

[3] Çanakkale Onsekiz Mart University, Department of Computer & Instructional Technology Education, TURKEY ORCID: orcid.org/0000-0003-2595-7266

[4] Kırklareli University, Distance Learning Research & Implementation Center, TURKEY ORCID: orcid.org/0000-0002-0954-1263

Introduction

There are many reasons to use technology as an educational tool. Pedagogically, technology has been attracting much attention as a valuable element for enhancing student achievement, motivation, and process productivity (Roblyer & Doering, 2010). In addition to its benefits for students, teachers have also been found to increase their skills regarding the use of technology and its contributions to their expertise in their fields (Cennamo, Ross, & Ertmer, 2010; Minor, Losike-Sedimo, Reglin, & Royster, 2013; Xu & Pershing, 2010). In addition to these benefits, diversity offers teachers new alternatives for teaching methods and techniques, providing them with opportunities to act out their roles in teaching (Cennamo, Ross, & Ertmer, 2010, Matzen & Edmund, 2007). A continuing set of limitations is also mentioned because the integration of technology education depends on different dimensions, sources, and variables (Inan & Lowther, 2010; Mazman & Koçak Usluel, 2011).

Kaya and Koçak Usluel (2011) stated that barriers to the integration of technology could be overcome by working on infrastructure, tools, pedagogical beliefs, self-efficacy, skills, ICT use, innovation, and professional development. In the literature, various teachers have been found to avoid using technology because their knowledge about its integration is very limited (Koçak Usluel & Demiraslan, 2005). Others avoid technology in an attitudinal way, although the necessary technical infrastructure is provided and their access to it is possible. In addition, Becker (2000) argued that teachers and students must be able to access technological resources without any problems in order for technology to be effective in education. In other words, the technological infrastructure of the schools and access to this technology are crucial elements in the integration process (Bingimlas, 2009; Vanderlinde & Van Braak, 2010). Ertmer (1999) defined technology integration barriers as "*first order (external barriers),*" referring to those stemming from external causes, such as a lack of adequate infrastructure and relevant knowledge, and "*second order (internal barriers),*" meaning those stemming from individuals' attitudes and beliefs. Along with these barriers, teachers' lack of design-thinking skills has also been discussed as the third order (Tsai & Chai, 2012). How teachers perceive instructional practices is closely related to how they understand teaching (Kember, 2009; Prosser & Trigwell, 1999). At this point, it is impossible to ignore some of the internal or external barriers. As the integration of education is a multidimensional process and its success depends on many variables, it is necessary to re-examine these barriers under several changing conditions (improving infrastructure possibilities, professional development activities, etc.).

Purpose of the Study

This study discussed problems related to the integration of a newly introduced web system with educational activities that would be included in a public school system and the integration of teachers in a course to introduce and implement it in Kırklareli. This web system is called the "Tracking and Evaluation System for Book Reading Activities" (KITaS) and enables the online evaluation of secondary school students' book-reading activities. In the process of applying this new system, the aim was to determine the challenges present based on teachers' barriers regarding the integration process, and the profiles of changing barriers in the literature were compared.

In this regard, the research questions were designed as follows:

- What barriers are faced by teachers in integrating KITaS into their teaching activities?
- What other barriers do teachers experience in this process differently from the relevant literature?

Literature Review

When studies conducted in the field regarding barriers to technology integration are investigated, it is revealed that various general issues must be managed. Within the realm of this study, deficiencies in knowledge and skills regarding teachers' efficient use of technology and opportunities to access technology highlight the primary and secondary barriers to the integration of technology. When recent studies are examined, the relationships among these barriers can be observed (e.g., Hur, Shannon, & Wolf, 2016). In addition, Tsai and Chai (2012) pointed out that external and internal barriers as well as the barriers stemming from deficits in teachers' design-thinking skills in relation to technology for adapting various contexts, groups, and instructional needs can be considered a third barrier. In other words, it is necessary to prepare courses, content, methods, and approaches as a whole for technology integration in the relevant process.

As the importance of technology integration (TI) in educational activities is frequently mentioned, it is seen that units or teachers focus on what kinds of problems are involved in the process and how these can be overcome. These limitations have been categorized in a number of studies and gathered under certain headings. The common features of the limiting conditions collected under each heading have been examined in an attempt to overcome them. However, researchers have stated that various restrictive conditions have started to change (e.g., Ertmer et al., 2012). The barriers that stand out in this regard are as follows: limited access to technology (Clark, 2006; Hew & Brush, 2007); crowded classrooms; deficiencies in both hardware and software (Çakır & Yıldırım, 2009); insufficient time in classrooms where technology has been integrated; negative attitudes of teachers toward technology (Hermans, Tondeur, Valcke, & Van Braak, 2006); low levels of knowledge regarding technology (Bauer & Kenton, 2005; Çakır & Yıldırım, 2009); not believing that technology plays a useful role in education (Ertmer et al., 2012; Hur, Shannon, & Wolf, 2016); being unaware of the contributions related to using technology in the classroom (Chen, 2008); lack of management support; lack of self-confidence regarding technology use; lack of in-service training (Hsu, 2016); insufficient time for the TI preparation process; lack of sufficient training for TI; and a lack of technical support (Çakır & Yıldırım, 2009; Hur, Shannon, & Wolf, 2016; Sang, Valcke, Braak, & Tondeur, 2010; Teo, 2009; Vanderlinde & van Braak, 2010).

Method

Research Design

This study was designed as a qualitative study. The research was conducted in the fall and spring terms of the 2015–2016 academic year.

Participants

This research was conducted with seven teachers from various subject specialties working at Kırklareli Merkez Atatürk Secondary School. KITaS was developed primarily to help classroom guidance teachers who are responsible for reading activities in the classroom and field experts in Turkish language education to follow and evaluate students' reading activities. Information regarding the research participants is presented in Table 1.

Table 1

List of Participants

Number of Teachers	Teachers	Gender	Branch	Experience (Years)
1	Feza	Female	Math	10
2	Şaban	Male	Turkish	16
3	Övgü	Female	English	12
4	Osman	Male	English	6
5	Şermin	Female	Turkish	18
6	Yelda	Female	Turkish	13
7	Burak	Male	Math	35

Scope

To determine the setting for this research, a school with an average socioeconomic level and a library in the provincial center was selected from the most highly populated schools in the province of Kırklareli. There are 38 teachers at the research school. After receiving the relevant authorization for the research, KITaS and research information forms were distributed to the teachers at the school two times in two weeks. Control over the level of students' reading cannot be achieved by the teachers at this school for several reasons including the following: difficulties being aware of every book that every student reads; a lack of time to determine students' reading progress; having too many students to control the process of recommending, monitoring, and assessing each one's reading progress; and inadequate course time (Arıcan, 2010; Balajthy, 2007; Türk Çocuk Vakfı, 2009; Uyar, Yıldırım & Ateş, 2011). Nevertheless, there is a need for an environment for students to discover new books to read (Doğan, 2011; Guthrie & Wigfield, 2005; Okur, 2007; Ülper, 2011) or a system

that aims to encourage students to read, motivates them to read more, informs teachers and parents, and tracks students' progress (Balajthy, 2007; Borman & Dowling, 2004; Deci, Vallerand, Pelletier, & Ryan, 1991; Magnolia Consulting, 2010; Topping & Fisher, 2003; Yıldız & Akyol, 2011). Based on these needs, researchers have started with the "100 Temel Eser – 100 Basic Books" that the Ministry of National Education (Milli Eğitim Bakanlığı, MEB) recommends that all secondary school students read. Using the KITaS, whether these books have been read can be determined and reading progress (information such as when a student started and completed a book and the number of books she or he has read) can be monitored by teachers, students, and parents. The process of introducing and actively using KITaS in a school is considered to be a technology integration process. In this context, in posters distributed at the school, the research process was introduced as well as what KITaS is, why it is important, what it accomplishes, and what kind of tool it can be.

Next, the research participants were invited to a KITaS introductory meeting. A new account was opened in KITaS for every teacher, and classes and student assignments were allocated. Each teacher logged into the KITaS interface through his or her own account. Following this, educational activities were organized according to how teachers should use KITaS and integrate it into their educational activities. These training activities were meant to be conducted in a group, but smaller groups and individual sessions were held because the teachers did not have a single shared time in common. Training for teachers was planned in two sessions. The first session focused on how teachers could use the KITaS; other activities within the scope of the session focused on how they could include KITaS in their educational activities and the role of KITaS. In the process, teachers accessed KITaS on computers in their classrooms or on their personal computers. After introducing it to teachers, KITaS was also introduced to the eighth-grade students, and they were all signed up to the system in the guidance course. As the other classes did not have guidance courses for conducting the same procedure, students were informed in computer labs, along with class guidance teachers, during long breaks and computer classes, and their accounts were activated for access to KITaS. After this phase, tasks related to the process were transferred to teachers and students. Approximately every three weeks, a researcher visited the school and checked the progress of the work by interacting with the teachers.

Research Instruments for Data Collection

Within the scope of the research, semi-structured interviews were conducted with each teacher indiviually, and every teacher completed the open-ended question form and the observation form a total of five times. All research data were collected by the same researcher, and the researchers met each week during the study period. At these meetings, researchers gathered information about the process and the situations that were encountered, and they made decisions about the necessary situations. These decisions determined the data-gathering process and the frequency of observation.

Semi-structured interview form. This included questions about the emergence of the elements mentioned in the text as barriers to the process of technology integration and other potential barriers that participants may have noticed during their observations. The form comprises 10 questions, such as, "When you consider your process of using

KITaS, is there anything that you believe would have increased your productivity when utilizing this technology?" If the answer was in the affirmative, the teacher was asked, "Could you explain, please?" The duration of the interviews conducted with the participants at the end of the application was between 35 and 55 minutes.

Open-ended questionnaire form. This questionnaire was designed to be used in the middle period of the research study. Thus, it was administered three weeks after KITaS had begun to be actively used. In this way, it was possible to understand what participants were experiencing before they had become fully accustomed to the process. The form comprises four items, such as "Have you encountered any situation that made the process difficult since you started using KITaS?" and "If so, could you explain, please?"

Observation form. A structured observation form was used to attempt to understand the situations that threatened the whole progress within the scope of the study rather than catching them through routine holistic observations. The investigating researcher attempted to understand the potential barriers as well as new barriers indicated in the literature regarding the institutional and teacher perspectives. Five observational forms were completed in this process.

Data Analysis

The analysis of the data was performed by content analysis. The researcher frequently checked to determine whether the data from the open-ended questionnaire supported the data obtained from the other forms. Research findings were directly supported by quotations. Within the scope of the research, the main symptoms of the upper theme were attempted to be determined, and the obtained themes connected to the overlying theme were examined through detailed analysis. That is, if any teacher mentioned a barrier to technology integration, he or she was directed to the following question: "Do you mean to say that the TI process will take place if the situation you are talking about is corrected?" If the teacher's answer was "Yes," then this barrier was considered to be the main theme. If the response was "No, this is not going to be enough," the researcher attempted to understand the upper theme from the responses given to the relevant sub-themes.

Validity and Reliability

Data collection instruments include direct inquiries to assist in reaching the research aims. Observations conducted within the scope of the research focused on diversity in regard to days, hours, and teachers. In addition to the diversity in the data collection tools, the tools were designed to complement each other (Morse, 1991). During the observation period, no intervention was executed regarding the subjects or individuals (Bailey, 1982). Participants were continuously kept informed and were communicated with throughout the process. The aim was to change their beliefs regarding the researchers and the continuity of the process. Within the scope of the research, the findings were directly supported by the responses of the participants.

Results

To create the themes and sub-themes, the researchers attempted to determine what barriers were seen under what causes.

Table 2

Themes and Sub-themes

	Count of Teachers ***(n)***	**Supported Themes**	**Teacher submitted with open-ended questions** ***(n)***
A) Acceptance of barriers to TI		+	
1. Lack of equipment	6	+	7
B) We conduct if MEB approves		+	
1. Considering TI as a tool rather than a process	3	+	4
2. Lack of relevant preparation			
2.1. Lack of material stock	2		2
2.2. Teachers are alone during the TI process			
- Teachers are too busy	4		5
- Numbers of students in classes are not appropriate for TI	2	+	4
- Intensity of school curricula	1		3
- Investment in TI is not continuous enough	2	+	1
- Lack of TI leader	2		
C) TI as an area of adventure on the way to the aim		+	
1. Does not support the aim of the present system	3		5
2. Not moving from the top administrator to the lowest-level practitioner, not moving from the smallest piece to the whole.	2		4

*TI: Technology Integration; MEB: Ministery of National Education (Milli Eğitim Bakanlığı)

As seen in Table 2, it was determined that the teachers experienced three main factors in the TI process. These are (A) accepting that there will continually be a number of barriers to the TI process; (B) the idea that the TI process will start with the decision of the senior official overseeing the teachers and institutions; and finally, (C) there is no reason for TI in an exam-centered approach or methodologies based on success on exams.

A) Accepting that there are some barriers in the integrations of TI

In the first meeting with the teachers, it was observed that some teachers mentioned that they did not have "computers in every class" (Observation Report [OR] 1) or in the ongoing process. "My computer at home is broken; we can access KITaS only at school..." (OR 3). Several teachers revealed their concerns regarding the issue. "It is not necessary for us to have access to the e-school application in classes, but access to KITaS requires a computer in the classroom environment. We do not have computers in every class..." (Question form; teacher: Yelda). Other teachers shared a similar sentiment:

> *… I do not know if there are general computer laboratories in every school ... We do not have computers in every class. We have smart boards in classrooms, but we cannot show the KITaS process without computers in classrooms. This is only true for the eighth grade. There are no guidance classes in other classes .*" (Interview; teacher: Şaban)

These statements reveal that teachers consider the lack of necessary equipment as a barrier to TI.

B) We obey if MEB approves

During the meetings organized by the teachers from time to time during the process, statements such as "... we are in e-school; now you are introducing KITaS. We are using it better and better every other day" (OR, 3) reveal that they interpret TI as a tool or practice, not a process. In a similar way, beliefs such as, "This training on KITaS is good. However, when we started to use KITaS, we had difficulty with it..." (Question form; teacher: Şermin), make it clear that teachers perceive TI as a transition of their organization to a program rather than taking a holistic view of TI. Interviews also support this.

> *... Now we hear that smart boards are available in some schools and so on. ...That is nice, but who is going to use the new tool? The tool will be introduced by nature and we will participate in the introduction sessions. Then 'Is there any problem regarding the e-school now?' No.…* (Interview; teacher: Burak)

It was seen that some teachers stated that "lack of preparations for TI" prevented the process, which resulted in a barrier to the TI process. Some teachers mentioned that the lack of a material warehouse caused them to struggle. "The visual and audio materials prepared with the guidebooks that are given to teachers at the beginning of the year should include the CDs" (Question form; teacher: Övgü). One of the teachers stated the following:

> *Producing materials is a separate field of expertise, and using the prepared material is a separate field of expertise. We can be offered necessary material diversity and then get a series of ongoing training sessions…* (Interview; teacher: Osman)

In the category "There is no preparation for TI," several participants stated that "teachers are lonely in the process." In this regard, some teachers emphasized their intense workloads, saying, for example, "This situation has loaded a new responsibility on our shoulders" (Question form; teacher: Saban) " and "We already have a heavy workload at the school. Every new step that comes unscheduled reduces our productivity" (Interview; teacher: Feza).

Several teachers stated that the number of students in their classrooms is too high to manage the TI process and that their school curricula should be revised with a clear plan for the inclusion of TI. "I have a busy teaching schedule and 30 students to teach in the classroom. The duration is 40 minutes. I am not ready to use resources..." (Question form; teacher: Şermin). "Yes, it would be better if the class sizes were reduced and the program's intensity could extend to the process" (Interview; teacher: Osman), explaining that the intensity of the program and the crowded classrooms are not suitable for TI.

It has turned out that a lack of continuity in the investments made for TI is a barrier to TI. "... We have a low level of dynamism for TI at school. Clearly, TI is not on the agenda. It does not seem to come to mind in such a busy schedule... " (OR, 5).

This statement regarding the situation: "It is like a fashion. It was on the agenda very much at some point ... The smart board process, for example ..." (Interview; teacher: Övgü) suggests that TI investments are not continual, which is understood as a barrier to the continuity of the process.

It was also stated that there was no one at their school to ask for help when they had difficulties in TI, which they claimed to be a barrier for them. "We are here for KITaS now. We are trying to do something. We are having difficulties" (Interview; teacher: Yelda). Another teacher stated, "Now look, you have energized us. You are telling us that we can do it, and we are doing it, too, are we not?" (Interview; teacher: Burak).

These expressions make it clear that teachers need a TI leader within their organization to facilitate the process and keep it going.

C) TI as an area of adventure on the way to the aim

Some of the participants emphasized that TI did not serve as an exam-centric perspective. "There is an intense and important exam like TEOG ahead. The TI process will not be realistic for the students" (Question form: teacher: Yelda). Another teacher said, "Let's be realistic now ... Will we do it to say that we are also doing technology integration? ... That does not reflect the reality that we are in. We are a TEOG school ..." (Interview; teacher: Şaban).

Some participants noted that TI and other transitions need to be presented to them from the senior management, including management and planning. Likewise, all the missing parts need to be completed first and then teachers have to be assigned new

tasks regarding the needed environment and program preparations. "If everything is ready for technology integration except me, then I will get ready for it, too" (Question form; teacher: Şaban). "Things are starting in the middle, and we are responsible for the rest, and we are the cause of the disruption" (Interview; teacher: Övgü).

Finally, it was stated that a lack of corporate culture impeded the TI process. The researchers took some notes in the process as follows: "We believe in this process, but we could not contact all the teachers. In the process, there was something lacking to motivate them… the inheritance of the institution, the continuity of success, making of their names and valuing individuals' commitments to their organizations that they have brought about for years" (OR, 5). Teachers took the following notes regarding this issue: "We do not have anyone who puts these into practice; I do not know" (Interview; teacher: Osman).

When the literature was examined, it was seen that the research findings aligned with those in the relevant literature. However, it was also seen that some findings in the context of the sources mentioned in the relevant literature could represent new barriers. These are listed in Table 3.

Table 3

Newly Claimed Barriers to TI

	Count of Teachers *(n)*	**Supported Themes**	**Teacher submitted with open-ended questions *(n)***
A) Accepting that there are some barriers in the integration of TI		+	
B) We conduct if MEB approves		+	
C) TI as an area of adventure on the way to the aim		+	
1. It does not serve the aim of the present system	3		5
2. Moving from the senior management to the lowest-level practitioner; from the smallest piece to the whole	2		4

*TI: Technology Integration; MEB: Ministery of National Education (Milli Eğitim Bakanlığı)

When the TI topic is the issue for discussion, it is clear that "lack of tools" has become a widely accepted issue. Although the lack of tools and equipment was mentioned as a barrier to TI, the participants cautioned the researchers by saying, "Yes, that is true, but there is also…" when they were offered current data and were

reminded of what they had at their school, which was found by the researchers to be very remarkable. The researchers took notes regarding this issue as follows:

> *It was understood that the situations which the teachers referred to as a lack of equipment did not originate from equipment that they needed and did not have in their classrooms.* (OR 5)

Furthermore, the teachers stated that the main responsibilities for TI execution belonged to the Ministry of National Education, which is the highest unit in Turkey where schools and teachers are affiliated. Researchers took the following note regarding this issue, "Teachers are performing the education and training process within the limits set by the MEB" (OR 4).

Finally, researchers concluded regarding the theme of "TI as an area of adventure on the way to the aim" as follows: "The TEOG examinations are mentioned in a way in the conversations with teachers... They seem to claim that we build a connection between TEOG and TI..." and "TEOG reality is very clear for them. They are constantly feeling this from parents, school administrators, and students ... " (OR 5). The other sub-themes are not stated again here, as mentioned above. However, it can be said that some studies related to the findings of C2 and C3 in the literature have been shown as barriers. However, the reason they were taken as a newly stated situation is that they are explained in generic terms, as the process may change depending on conventions or cultural differences. However, in this study, "not moving from the senior management to the lowest practitioner; not going from the smallest piece to the whole" appeared to be a barrier.

Discussion and Conclusion

When the relevant literature is examined, it is seen that a lack of technological resources hinders the TI process (Becker, 2000; Bingimlas, 2009; Çakır & Yıldırım 2009; Hew & Brush, 2007). The findings of this study are parallel to those of previous studies. When teachers were asked what tool they needed or what tools their organizations lacked related to technology integration, their responses regarding how they would use the technological tools in their classroom activities were found to be unclear. At this point, it is thought that researchers considered that "lack of tools for the TI process" became a commonly accepted statement. Tsai and Chai (2012) noted that, in addition to the internal and external barriers, the teachers' design-thinking skills should also be discussed. Accordingly, the ability of teachers to integrate technology into various contexts should be considered separately and holistically from internal and external barriers. Tsai and Chai also incorporated a pedagogical approach that includes internal and external barriers to current integration barrier debates. Actively using the right technology with the right strategies in teaching design and teaching process can be said to be a barrier that must be overcome by teachers and course designers (Englund, Olofsson, & Price, 2017; Pittman & Gaines, 2015; Tondeur, Krug & Zhu, 2015).

The most critical data within the scope of the research is related to the fact that the TI process can be achieved through the MEB's plans and procedures; if there is

a barrier, the MEB should be responsible for overcoming it. Teachers emphasized that their institutions are connected to the MEB; their course content, sources, and lesson plans are determined by the MEB, and the TI process is also stated as being planned by MEB. They also stated that problems such as not being provided with relevant technologies, teachers' workloads, crowded classrooms, and the fact that the educational programs are not compatible with the TI process should be resolved by the MEB. In the literature, barriers such as teachers' workloads, crowded classrooms, and the fact that the curriculum is not organized within the scope of TI have also been demonstrated (Bingimlas, 2009, Çakır & Yıldırım, 2009; Hermans, Tondeur, Valcke, & Van Braak, 2006; Hew & Brush, 2007; Vanderlinde & Van Braak, 2010). This study revealed similar findings. In some studies, it is stated that the TI process will not be completed without internalization, even though the external barriers are addressed (Kopcha, 2012; Roblyer & Doering, 2010). At this point, as no data regarding attitudes, self-confidence, and the level of relevant knowledge have been gathered, internal barriers may not have been mentioned.

Teachers stated that the results of the national tests were important for the students and for themselves as well, so students could not dedicate time to these kinds of implementations. They also stated that the TI process was unnecessary because it lacked a role related to exams. Although TI is suggested to have a pedagogically increasing role in student achievement, motivation, and process efficiency (Roblyer & Doering, 2010), the responses taken from the participant teachers seem to contradict this viewpoint. The main issue that teachers have addressed regarding this position is that students have to cope with frequent and copious testing and problem-solving activities.

Apart from these concerns, the teachers also stated that the TI process started in a reversed manner and that the arrows were directed at them. In this process, they had already agreed with the decisions made but had not made the necessary preparations for the process. They stated that the process should have a two-way direction. The first is that decisions are made by senior officials; relevant preparations are established; and then teachers are instructed to perform the rest. The second path is that relevant materials and other sources for TI are prepared, and then the teachers are given relevant teacher training and instructed to integrate the newly learned technology into their educational activities. Teachers stated that the process could function effectively in this way.

When the relevant literature was examined, it was found that several barriers to the TI process were not mentioned or mentioned rarely, although most of them were found to be quite similar to those revealed by the present study. The reason for this may be the lack of data collection tools for the internal dimension within the limitation of this research. The fact that no data were gathered regarding the teachers' knowledge, skills, attitudes, and self-efficacy for technology and technology integration may be interpreted as there being no deficiency in this regard. However, data were not collected separately according to internal and external barriers within the scope of the research. Participants themselves indicated this situation. In addition, the preparation of the teachers for the process within the scope of the research may have alleviated the effects of these barriers. However, different studies should be designed to clarify this situation.

Within the scope of this research, the barriers similar to those found in the literature have been established, as well as the barrier that does not directly correspond to those in the literature. Depending on changing conditions, it seems that new barriers to technology integration (believing that the top unit of an institution at which teachers work decides whether to enter the process of technology integration, and accepting that there are always some barriers to technology integration) emerge, while others barriers (deficiency in technology resources) are found to decrease. In this process, the context should also be considered. When we examine these barriers, we can interpret that these are caused by systematic, cultural, and structural features. Further research can be designed to examine to what extent these barriers are prevalent across the country. In addition, studies can be conducted to determine the situation before and after professional development activities. Thus, the influence of professional development activities can be examined. In addition, the areas of education that teachers need can be identified. In the process of integrating technology into teaching environments, policymakers can attach importance to the development of material warehouses. How the same curriculum can be maintained with alternative methods and materials can be investigated. In this case, examples of applications can be created.

References

Arıcan, S. (2010). *100 Temel Eser Uygulamasının Öğrencilerin Okuma Alışkanlıklarına Etkileri Konusunda Öğretmen Görüşleri [Effects of 100 Essential Readings in Students' Reading Habits, Unpublished Master's Thesis], Yayımlanmamış Yüksek Lisans Tezi*, Hacettepe Üniversitesi Sosyal Bilimler Enstitüsü, Ankara.

Bailey, K. D. (1982). *Methods of social research* (2. bs.). New York: The Free Press.

Balajthy, E. (2007). Technology and current reading/literacy assessment strategies. *The Reading Teacher*, *61*(3), 240-247.

Bauer, J., & Kenton, J. (2005). Toward technology ıntegration in the schools: Why it isn't happening. *Journal of Technology and Teacher Education, 13*(4), 519–546.

Becker, H. J. (2000). Findings from the teaching, learning, and computing survey. *Education policy analysis archives*, *8*, 51.

Bingimlas, K. (2009). Barriers to the successful integration of ICT in teaching and learning environments: A review of the literature. *Eurasia Journal of Mathematics, Science & Technology Education, 5(3), 235-245.*

Borman, G. D., & Dowling, N. M. (2004). Testing the Reading Renaissance Program Theory. Retrieved from http://doc.renlearn.com/KMNet/R00405242EE3BD7A.pdf

Cennamo, K. S., Ross, J. D., Ertmer, P. A. (2010). *Technology Integration for Meaningful Classroom Use: A Standards-Based Approach*. Wadsworth, Cengage Learning, CA

Chen, C.-H. (2008). Why do teachers not practice what they believe regarding technology integration? *Journal of Educational Research, 102* (1), 65-75.

Clark, K. (2006). Practices for the use of technology in high schools: A Delphi study. *Journal of Technology and Teacher Education*, *14*(3), 481-499.

Çakır, R., & Yıldırım, S. (2009). Bilgisayar öğretmenleri okullardaki teknoloji entegrasyonu hakkında ne düşünürler? *İlköğretim Online*, *8*(3).

Deci, E. L., Vallerand, R. J., Pelletier, L.G., and Ryan, R. M. (1991). Motivation and education: The self-determination perspective. *Educational Psychologist, 26, 325–346.*

Doğan, B., (2011*). 100 temel eserde 6, 7 ve 8. Sınıflar için önerilen ortak kitaplar üzerine bir araştırma (Yayımlanmamış Yüksek Lisans Tezi) [A Research on common books suggested for the 6th, 7th and 8th classes ın the 100 basıc Works (Unpublished Master's Thesis)]*. İnönü Üniversitesi Eğitim Bilimleri Enstitüsü, Malatya.

Englund, C., Olofsson, A. D., & Price, L. (2017). Teaching with technology in higher education: understanding conceptual change and development in practice. *Higher Education Research & Development*, *36*(1), 73-87.

Ertmer, P. A. (1999). Addressing first-and second-order barriers to change: Strategies for technology integration. *Educational Technology Research and Development*, *47*(4), 47-61.

Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers & Education, 59*(2), 423-435.

Guthrie, J. T., & Wigfield, A. (2005). Roles of motivation and engagement in reading comprehension assessment. *Children's reading comprehension and assessment, 187-213.*

Hermans, R., Tondeur, J., Valcke, M. M., & Van Braak, J. (2006). Educational beliefs as predictors of ICT use in the classroom. In *convention of the American Educational Research Association, San Francisco, CA*.

Hew, K. F. ve Brush, T. (2007). Integrating technology into K-12 teaching and learning: Current knowledge gaps and recommendations for future research. *Educational Technology Research and Development, 55*(3), 223-252.

Hur, J. W., Shannon, D., & Wolf, S. (2016). An investigation of relationships between internal and external factors affecting technology integration in classrooms. *Journal of Digital Learning in Teacher Education, 32(3), 105-114*.

Hsu, P. S. (2016). Examining current beliefs, practices and barriers about technology integration: *A Case Study. TechTrends, 60*(1), 30-40.

Inan, F. A., & Lowther, D. L. (2010). Factors affecting technology integration in K-12 classrooms: A path model. *Educational Technology Research and Development, 58*(2), 137-154.

Kaya, G., & Koçak Usluel, Y. (2011). Öğrenme-öğretme süreçlerinde BİT entegrasyonunu etkileyen faktörlere yönelik içerik analizi [Content analysis of factors affecting ICT integration in teaching-learning process]. *Buca Eğitim Fakültesi Dergisi,* (31), 48-67.

Kember, D. (2009). Promoting student-centred forms of learning across an entire university. *Higher Education, 58*(1), 1–13.

Koçak Usluel, Y., & Demiraslan, Y. (2005). A framework to investigate ICT integration into teachinglearning process: Activity Theory. *HU Journal of Education, 28*(1), 134-142.

Kopcha, T. J. (2012). Teachers' perceptions of the barriers to technology integration and practices with technology under situated professional development. *Computers & Education, 59*(4), 1109-1121.

Magnolia Consulting. (2010). A final report for the evaluation of Renaissance Learning's Accelerated Reader program Charlottesville, Retrieved from https://magnoliaconsulting.org/AR%20Final%20Report%202010.pdf

Matzen, N. J., & Edmunds, J. A. (2007). Technology as a catalyst for change: The role of professional development. *Journal of Research on Technology in Education, 39*(4), 417-430.

Mazman, S. G., & Koçak Usluel, Y. (2011). Bilgi ve iletişim teknolojilerinin öğrenme-öğretme süreçlerine entegrasyonu: modeller ve göstergeler [ICT integration into learning-teaching process: models and indicators]. *Eğitim Teknolojisi Kuram ve Uygulama, 1*(1), 62-79.

Minor, M., Losike-Sedimo, N., Reglin, G., & Royster, O. (2013). Teacher Technology Integration Professional Development Model (SMART Board), *Pre-Algebra Achievement, and Smart Board Proficiency Scores. SAGE Open, 3(2)*. DOI: 10.1177/2158244013486994

Morse, J. M. (1991). *Qualitative nursing research*. Newbury Park, CA: Sage.

Okur, A. (2007). *Serbest okuma etkinliğinin sözcük hazinesi ve kavram gelişimine etkisi (MEB tarafından ilköğretim II. kademe öğrencilerine önerilen 100 temel eser örneğinde) (Yayımlanmamış doktora tezi) [Effects of free reading activity to word knowledge and concept development (It is in the example of 100 main works which are recommended to second grade primary school students by ministry of education) (Unpublished Dissertation)].* Marmara Üniversitesi, Eğitim Bilimleri Enstitüsü, İstanbul.

Pittman, T., & Gaines, T. (2015). Technology integration in third, fourth and fifth grade classrooms in a Florida school district. *Educational Technology Research and Development*, *63*(4), 539-554.

Prosser, M., & Trigwell, K. (1999). *Understanding learning and teaching: The experience in higher education*. Buckingham: Society for Research into Higher Education & Open University Press.

Robyler, M. D. ve Doering, Aaron H. (2010). *Integrating educational technology into teaching (5. Ed)*. Pearson Education. Boston: MA

Sang, G., Valcke, M., Braak, J. & Tondeur, J. (2010). Student teachers' thinking processes and ICT integration: Predictors of prospective teaching behaviors with educational technology. *Computers & Education 54* (1) 103–112.

Sessoms, D.D., (2007). From transmission to transformative learning: How elementary teachers use the interactive board to transform the teaching and learning process (Doctoral dissertation, University of Virginia, Virginia). Retrieved from http://sunzi.lib.hku.hk/ER/detail/hkul/4351435.

Teo, T. (2009). Modelling technology acceptance in education: A study of pre-service teachers. *Computers & Education, 52* (2), 302-312.

Tondeur, J., Krug, D., Bill, M., Smulders, M., & Zhu, C. (2015). Integrating ICT in Kenyan secondary schools: an exploratory case study of a professional development programme. *Technology, Pedagogy and Education*, *24*(5), 565-584.

Topping, K. J., & Fisher, A. M. (2003). Computerised formative assessment of reading comprehension: field trials in the UK. *Journal of research in reading,26(3)*, 267-279.

Tsai, C. C., & Chai, C. S. (2012). The "third"–order barrier for technology-integration instruction: Implications for teacher education. *Australasian Journal of Educational Technology 2012, 28(Special issue, 6),* 1057-1060.

Türk Çocuk Vakfı, (2009). 100 Temel Eser Raporu [100 Basic Works Report]. Retrieved From http://www.cocukvakfi.org.tr/rapor/100temeleser.pdf Last Access: 25.05.2015.

Uyar, Y., & Ateş, K. Y. S. (2011). Okuma uzmanlığının Türkiye'deki üniversitelerde lisansüstü bir program olarak yapılandırılması [Organizing Reading Specialization as a Graduate Program in Universities in Turkey]. *Uşak Üniversitesi Sosyal Bilimler Dergisi*, *2011*(7).

Vanderlinde, R., & Van Braak, J. (2010). The e-capacity of primary schools: Development of a conceptual model and scale construction from a school improvement perspective. *Computers & Education, 55*(2), 541-553.

Xu, F., & Pershing, J. A. (2010). A Move towards the Integration between Education and Technology. *Frontiers of Education in China, 5(1)*, 3-3.

Yıldız, M., & Akyol, H. (2011). İlköğretim 5. sınıf öğrencilerinin okuduğunu anlama, okuma motivasyonu ve okuma alışkanlıkları arasındaki ilişki [The relationship between 5th graders' reading comprehension, reading motivation and reading habits]. *Gazi Eğitim Fakültesi Dergisi, 31(3).*

Teknoloji Entegrasyonu Önündeki Yeni Engeller

Atıf:

Şahin İzmirli, Ö. & Kırmacı, Ö. (2017). New Barriers to Technology Integration. *Eurasian Journal of Educational Research, 72,* 147-166, DOI: 10.14689/ejer.2017.72.8

Özet

Problem Durumu: Eğitsel araç olarak teknolojinin eğitimde tercih edilmesinin bir çok nedeni bulunmaktadır. Öğretimsel açıdan teknolojinin öğrenci başarısını, motivasyonunu ve süreç verimliliğini artırıcı rol oynaması nedenleriyle değerli bir unsur olarak dikkat çekmektedir. Öğrenci boyutuna ek olarak öğretmenlerin de teknoloji kullanım becerilerini artırdığı ve alan uzmanlıklarına katkı sağladığı belirtilmektedir. Tüm bunların yanı sıra öğretim yöntem ve tekniklerinde çeşitlilik alternatifleri de sunup, eğitmenin yönlendirici, öğrencinin ise aktif öğrenen rollerinin etkili bir şekilde uygulanması için fırsatlar sunmaktadır. Teknolojinin eğitime entegrasyonunun farklı boyut, kaynak ve değişkenlere bağlı olması nedenlerden dolayı sürecin bir takım sınırlılıklarından da bahsedilmektedir. Bu çerçevede öne çıkan engeller teknolojiye sınırlı erişim, kalabalık sınıflar, donanım ve yazılım eksikliği, teknoloji entegre edilmiş derslerin uygulamasındaki zamanın yetersizliği, öğretmenlerin teknolojiye karşı olan tutumlarının olumsuz olması, teknolojiye ilişkin bilgi eksikliği, teknoloji kullanım becerilerinin düşüklüğü, teknolojinin rolüne inanmama, teknoloji kullanımının sağladığı katkının bilincinde olmama, yönetim desteğinin eksikliği, teknoloji kullanımına ilişkin özgüven eksikliği, hizmetiçi eğitim eksikleri, teknoloji entegrasyonu (TE) için ön hazırlık süreci için yeterli zaman tanımama, derslerde TI için yeterli sürenin kalmayışı ve teknik destek yetersizliğidir. Ancak geçen süreçte araştırmacılar bazı sınırlayıcı durumların da değişmeye başladığını belirtmiştir. Teknolojinin eğitime entegrasyonunun çok boyutlu bir süreç olması ve başarısının çok fazla değişkene bağlı olması nedeniyle bu engellerin değişen şartlar altında (alt yapı imkânlarının iyileştirilmesi, mesleki gelişim etkinlikleri vb.) yeniden incelenmesine ihtiyaç duyulmaktadır.

Araştırmanın Amacı: Bu çalışmada Kırklareli'nde bir devlet okuluna uygulamaya yeni dâhil edilecek bir Web sistemin eğitsel etkinlikler ile tanıtımı ve uygulanması aşamasında öğretmenlerin karşılaştıkları entegrasyona dayalı problemler tartışılmıştır. Bu Web sistemi, ortaokul öğrencilerin kitap okuma etkinliklerinin

çevrimiçi takip ve değerlendirmesine imkân veren "Kitap Okuma Etkinliklerinin Takip ve Değerlendirme Sistemi" (KİTaS) dir. Bu yeni sistemin uygulamaya geçmesi aşamasında öğretmenlerin karşılaştıkları engeller belirlenmeye çalışılmış ve alanyazınla karşılaştırılarak değişen engellerin profili ortaya koyulmuştur. Bu kapsamda araştırma soruları şu şekildedir;

- Öğretmenlerin KİTaS'ı öğretim etkinliklerine entegre etme sürecinde karşılaştıkları engeller nelerdir?
- Öğretmenlerin bu süreçte karşılaştıkları alanyazından farklı olarak diğer engeller nelerdir?

Araştırmanın Yöntemi: Araştırma nitel olarak desenlenmiştir. Araştırma 2015-2016 eğitim öğretim yılı güz ve bahar dönemlerinde Kırklareli'nde yedi öğretmen ile gerçekleştirilmiştir. Araştırma sorularının yanıtları görüşme, açık uçlu soru formu ve gözlem yoluyla elde edilmeye çalışılmıştır. Araştırma kapsamında her bir öğretmenle birer kez yarı yapılandırılmış görüşme gerçekleştirilmiş, her bir öğretmen açık uçlu soru formunu doldurmuş ve beş kere gözlem formu doldurulmuştur. Verilerin analizi içerik analizi ile gerçekleştirilmiştir.

Bulgular: Araştırmanın öne çıkan bulguları (A) Teknoloji entegrasyonu sürecinde devamlı bazı engellerin olacağını kabul etme, (B) Teknoloji entegrasyonu sürecine geçilebilmesine öğretmenin çalıştığı kurumun en üst birimin karar verebileceği düşüncesine sahip olma ve (C) sınav merkezli ve sınavda başarılı olma yaklaşımında, teknoloji entegrasyonuna gereksinim duymamadır. Alanyazın incelendiğinde araştırma verilerinin alanyazın ile büyük ölçüde örtüştüğü görülmektedir. Öte yandan araştırmacılarının alanyazında belirtilen kaynaklar çerçevesinde bazı bulguların yeni engel durumlar olarak belirtilebileceği anlaşılmaktadır. Bu bağlamda teknoloji entegrasyonunda engellerden konu açılınca "araç-gereç eksikliği" nin ifade edilmesi ve bunun tam dayanaklandırılamaması, artık bu durumun kabul edilmiş bir durum haline geldiğini göstermektedir. Öte yandan öğretmenler TE'ye ilişkin adımlarda esas sorumluluğun, Türkiye'de okulların ve öğretmenlerin bağlı olduğu en üst birim olan Milli Eğitim Bakanlığı'nda (MEB) olduğunu belirtmişlerdir. Bu çerçevede MEB'in bu süreci yönetmesi ve planlaması gerektiğini belirtmişlerdir. Bunların yanı sıra öğretmen, öğrenci ve veli odağında sınav telaşının bulunmasından dolayı, amaca yardımcı olmayan bir uğraşı olarak düşünüldüğünü belirtmişlerdir. Bu öne çıkan üç bulgunun yanı sıra alanyazında doğrudan belirtilmeyen ya da genel ifadelerle anlatıldığı için alanyazından farklılaşan diğer engeller de bulunmaktadır. Bunlar TE'nin Türkiye'de varolan sistemin yapısı ile örtüşmemesi nedeniyle kullanılmaması ve sürecin tamamen öğretmene bırakılmış olmasıdır. Bunlara benzer engeller alanyazında belirtilmesine rağmen farklı kültür ve sistem özellikleri çerçevesinde anlatıldığı için bu araştırma bulguları diğer bulgulardan farklılaşmaktadır. Öğretmen TE sürecinin merkezinde öğretmen yer almasına rağmen sürecin işlerliğinin esas kendilerinde olmadığını belirtmişlerdir. Bu sorumluluğun MEB'de olduğunu ve süreç için tüm hazırlıkların yapılması gerektiği ve sonrasında öğretmenlere bırakılması gerektiğini belirtmişlerdir.

Sonuç ve Öneriler: Araştırma kapsamında en yoğun veri, TE sürecinin MEB'in planlamaları ve işlemleri üzerinden sağlanabileceği ve eğer bir engel durum varsa

bunu MEB'in aşması gerektiğine ilişkindir. Öğretmenler kendilerinin ve kurumlarının MEB'e bağlı olduğunu, ders içeriklerinin, kaynaklarının, planlarının MEB üzerinden belirlendiğini vurgulayarak, TE sürecinin de MEB üzerinden planlanması gerektiğini belirttiler. TE sürecinde engel olarak belirttikleri teknolojik kaynakların sunulmaması, öğretmen yoğunlukları, sınıf mevcutlarının kalabalıklığı ve öğretim programlarının TE süreci ile uyumlu olmaması durumlarını da MEB'in çözmesi gerektiğini belirttiler. Araştırma kapsamında alanyazın ile benzer çıkan engellerin yanı sıra alanyazın ile doğrudan örtüşmeyen engeller de ortaya çıkmıştır. Değişen şartlara göre teknoloji entegrasyonu engellerinin bazılarının değiştiği (TE'ye ilişkin sorumlulukların sistem içerisindeki birimlere paylaştırılması, TE için dış engellerin var olacağı önyargısı), bazılarının etkisinin azaldığı (teknolojik kaynak yetersizliği) görülmektedir.

Anahtar Sözcükler: Teknoloji Entegrasyonu önündeki engeller, öğretmen eğitimi, Teknoloji Kullanımı Sınırlılıkları.

Eurasian Journal of Educational Research 72 (2017) 167-184

Eurasian Journal of Educational Research
www.ejer.com.tr

Pre-Service Science Teachers' Awareness of Technological Terms *

Sendil CAN[1] Guliz KAYMAKCI[2]

ARTICLE INFO

Article History:
Received: 17 Aug. 2016
Received in revised form: 10 Mar. 2017
Accepted: 21 Nov. 2017
DOI: 10.14689/ejer.2017.72.9

Keywords
family income level, technology, technological knowledge, science education

ABSTRACT

Purpose: To accomplish the goals of science education, it is essential that science teachers have technological literacy. Thus, we need to determine the awareness of pre-service science teachers expected to possess a basic working knowledge of technological terms. The aim of this study was to examine the candidates' awareness level of technological terms and to examine the effect of gender, grade level and family income on this awareness. **Research Methods**: The sample of the current study comprises 212 students. The collected quantitative data were analyzed by using frequencies, percentages and Chi-square test. In the study, the second part of the Questionnaire of Technological Terms Awareness and Knowledge Level was used to collect data. **Findings:** Results of the study revealed that pre-service science teachers having a medium level awareness of technological terms are generally familiar with popular technological terms. Both gender and grade level were found to have a significant influence on the students' technological terms awareness. On the other hand, the family income level was found to have no significant effect on the students' awareness levels of technological terms. **Implications for Research and Practice:** It was found in this study that the pre-service science teachers' technological terms awareness level is medium. It can be suggested that more space should be allocated for technology-related concepts, applications and terms in the curriculums of science teacher training programs.

* This study was partly presented at the 3rd International Eurasian Educational Research Congress in Mugla, 31 May–03 June, 2016.

[1] Corresponding author: Mugla Sitki Kocman University, Faculty of Education, Mugla, TURKEY, csendil@mu.edu.tr, ORCID: orcid.org/0000-0001-9313-7273

[2] Mugla Sitki Kocman University, Mugla, TURKEY, gulizkaymakci@gmail.com, ORCID: orcid.org/0000-0002-3428-5214

Introduction

The meaning of technology as a term refers to the knowledge or the action of the application of science, including production methods, equipment, tools and devices used during the application as well as the ways of using these methods and equipment (TDK, 2016). As a result of the rapid development of technology, it is of great importance to train individuals competent in the field of technology because technology is in fact "all the tools and equipment developed by humans to control and change their material environment and all the information produced about these tools and equipment" (TDK, 2016). When the power relations in the world are examined, it is seen that countries that can produce and market technology are also politically dominant in the world. In general, as technology is a concept closely intertwined with many disciplines, it has been classified in various ways in different disciplines. According to Web (2003), these classifications are as follows;

- technology as an object: tools, equipment, devices, weapons, machines
- technology as information: knowing about the development of technological innovations
- technology as an activity: skills, methods and interpretations of individuals
- technology as a method: need and analysis
- technology as a socio-technical system: combination of individuals and other objects, production and use of objects

For individuals to understand technology, they need to be technology literate. The characteristics of a technology literate individual are defined by the International Technology Education Association (ITEA) as follows.

- He/she knows what technology is, how it is produced and how it affects the society.
- He/she finds technology news on TV or read in a newspaper very interesting, and then acquires this information and reflects it into his/her behaviors and produces ideas on the basis of this information.
- He/she is impartial and comfortable in the use of technology. It is important for all individuals to understand why technology and its use are important for the country. (Canbaz, 2010)

The United Nations Educational, Scientific and Cultural Organization (UNESCO, 2008) defines the political objective of technology literacy as training students, citizens and the labor force to keep up with new technologies so as to promote social development and improve economic efficiency. The process in which these policies are passed on in the education system can be defined as technology education or instruction. Technology education aims to increase the knowledge level of students about technology and technological products and to give them the ability to use technology (Sade & Coll, 2003). While technology education is carried out by

classroom teachers in elementary education, it is given by branch teachers in secondary education (Rasinen, 2003). According to the ITEA, students need to know the basic concepts of technology to be able to understand and implement technology (ITEA, 2000). According to Yazar (2013), while the awareness of technological terms can be defined as having knowledge about and familiarity with the relevant terms, technological literacy can be defined as knowing the meaning of technological terms and in which technological products they are used.

As technology can be highly effective in providing products increasing the quality of life, it first interests the individual and then the communities. An individual who is technology literate can understand the structure of the society and thus can better adapt to it. On the other hand, an individual who is not technology literate may face social and academic disadvantages. Integration of technology into education in today's world both facilitates permanent learning by reifying abstract concepts for students and enables teachers to teach more effectively and thus enhances the quality of education.

In this regard, technology should be provided at different levels of education from elementary to higher needs to be integrated into the field of education, one of the most important determinants of development, considering the requirements of the age. Rapid developments experienced in every area of life and increasing investment in education in the late 20th century forced educators to revamp the education system (Bacanak, Karamustafaoglu & Kose, 2003). When teachers do not make use of suitable technologies in their instructional technologies, students may have greater difficulties in learning subjects and retaining information (Dogan et al., 2010). In today's world there is fierce competition in every aspect of life and the integration of technology into education might bring considerable competitive advantages to countries.

Familiarity with technological terms – most of which originated in English and are widely used in daily life and the internet – will help teachers use new technologies in their classes. Moreover, educational institutions, teachers and parents have to be able to assist students who use the computer and mobile phone every day in their daily lives, watch audiovisual broadcasting on digital platforms, conduct voice and data transfers and are familiar with an increasing number of new technologies (Aksoy, 2003). When the world education system is examined, we can see that, aside from classes solely aiming to teach the computer and technology, science classes are the classes where information is gained about technological devices and where technological concepts are frequently used. Therefore, governments are making changes in their science curricula so that they play an important role in the educational process and in the transfer of technological knowledge parallel to the changes taking place in the society, culture and common practices (Bacanak et al., 2003). Training technology-literate individuals and development of educational programs that can enable students to understand technological concepts are just as important as the use of technology in education.

At the end of the 1980s and early 1990s, during the process of shifting from an emphasis on handicrafts and vocational training to modern technology education, technology courses were largely taught by older technical teaching staff who were gradually replaced by science teachers in the following years (De Vries, 1994). To meet the objectives of technology teaching programs properly, these teachers were included in in-service training programs. One of the main tasks of the teachers, according to the technology curricula implemented in this period, was to get their students to prepare technology projects in groups. By the year 2000, the number of teachers having graduated from high-tech universities had increased, and they took the place of traditional teachers (Ginestie, 2005). Today, not only technology branch teachers but also all teachers are required to have knowledge and skills in technology. In France, one of the ten essential qualities of every teacher who graduates from the Institutes of Teacher Training – responsible for teacher training there – is mastery of Information and Communication Technology (Eurydice, 2007). According to Burkhardt et al. (2003), individuals should possess digital age literacy, creative thinking and effective communication skills as well as planning and management skills necessary for achieving higher efficiency.

In recent years, many technology-intensive scientific studies have been carried out, and, in particular, serious research on technology-assisted learning has been intensified. Research on technological term awareness has been found to be rather limited, while studies in the field have focused mainly on teachers' attitudes toward technology use in education, factors affecting the use of technology, and the effect of the use of technological tools on education. In one study, Ozsevgec and Yazar (2012) investigated technological term awareness of pre-service teachers from different programs of an educational faculty. The purpose of the current study is to determine the technical term awareness of the pre-service teachers only from the department of science education in our university and thus to offer some guidance for other researchers to conduct similar studies in different universities. In this way, it will be possible to make comparisons and to reach some generalizations about the subject.

In a study by Isman, Isbulan, Demir and Canan (2008), it was found that students are interested in the internet, but they experience some problems in understanding the language and new computer technologies. As time goes by, with the fast-paced changes in technology, the introduction of new products and upgrades of the features in these products, new concepts are constantly entering our life. For this reason, it is thought that if teachers cannot improve their skill and knowledge level to use technological products that are available under current conditions, they will encounter various difficulties in responding to the questions of students familiar with the technological contexts (Ozsevgec & Yazar, 2012). For teachers who are not g technologically savvy or who cannot integrate technology with their education, alienation from technology will be inevitable; thus, technology expected to benefit education can be detrimental to it. The science and technology curriculum in our country aims to educate all students regardless of their individual differences as science and technology literate (MEB, 2006). Parallel to this objective, during science classes, great emphasis should be put on the training of individuals who attach

desired importance to technology and are knowledgeable about it by making use of technology as well as talking about its importance in the classes.

As governments update their education systems, they follow developments in the field of technology and develop programs to train individuals who can master the challenges of this change. It is expected that the teachers who will train the individuals in these programs are those who have the information and technology that the age demands and can keep pace with the changes (Yilmaz, 2007). If the teacher has specialized knowledge in the field where the pedagogy intersects with the content, then the technology should be considered one of the inputs that shape this knowledge. The learners need to know the basic concepts of the technology to be certain they are "understanding the nature of technology" (Yazar, 2013). According to Archer and Roberts (1979), the use of technology in different lessons and at every stage of education is important in raising technology awareness by increasing the knowledge being acquired.

Technology plays an important role in teachers' selecting proper technologies to be used in their instructional activities, making students more active in classes, helping students learn subjects more easily and retain information longer and in providing concrete examples (Altun, Yigit & Adanur, 2011). The results of the Information, Communication and Technology (ICT) in Schools Survey conducted by the EU, with the participation of teachers and school directors, revealed that many students do not get the technological knowledge and practice they need at school and that teachers need more support and training (European Commission, 2013). Therefore, in the use of technology as an instructional tool, the related qualifications of teachers and pre-service teachers, particularly their technology skills, term awareness and term literacy are of special importance (Seferoglu, 2008). According to Hur, Cullen and Brush (2010), acquisition of technology knowledge and utilization skills during the undergraduate education by pre-service teachers will help them impart these skills to their students in their future career. In this respect, experts and authorities on teacher education policies and strategies emphasize that the integration of technology into learning environments can only be achieved through an effective reform of the pre-service teacher training process.

However, when the studies conducted on the use of technology in education are examined, it is seen that teachers are not familiar with technological terms during their undergraduate education and later they are hesitant about using technology in their classes. For instance, in a study conducted in 2003, it was found that many of nearly 3,000 novice teachers did not integrate technology into their instruction, contrary to what they stated in their syllabuses and they felt uncomfortable while using technology in class (Russell, Bebell, O'Dwyer & O'Connor, 2003). In this connection, the current study is thought to be original as the number of studies focusing on pre-service science teachers' level of knowing the meanings or usage areas of terms they encounter in their daily lives is quite limited. The information revealed by the current study may help us to determine how to train teachers better. We are living in the information age and in this age, familiarity of pre-service teachers with technological concepts might help them to train their students to be

technology literate and as individuals who can find solutions to the technology-related problems encountered in daily life. Constantly keeping pre-service teachers' awareness and knowledge levels up-to-date can clearly contribute to the training of digital learners of the future as more competent individuals.

Pre-service training received by pre-service teachers is of great importance for them to use technology in their professional lives at the desired level. However, studies conducted by researchers, such as Akkoyunlu and Kurbanoglu (2003), Arslan (2006), and Karal and Berigel (2006), show that pre-service teachers graduate from education faculties without acquiring the skills required for using technology effectively in education. For instance, Karal and Berigel (2006) stated that newly graduated teachers have some shortcomings in adapting technological developments into the educational-instructional process and in making use of technology. As the development level of countries is associated with their quality of education, increasing students' awareness of technological terms and developments during their educational life will make important contributions to their academic and social lives. Pre-service teachers' levels of technological awareness and knowledge and how competent they are at technology are not known well. In this connection, the current study aims to investigate science teacher candidates' awareness of technological terms and the effect of gender, grade level and family income level on this awareness. In this context, the research questions of the study are as follows:

1. What is the science teacher candidates' technological terms awareness level?
2. What is the effect of gender on the pre-service teachers' technological terms awareness?
3. What is the effect of grade level on the pre-service teachers' technological terms awareness?
4. What is the effect of family income level on the pre-service teachers' technological terms awareness?

Method

Research Design

The current study was conducted by using the survey method. The survey model is generally used to find out the attitudes, beliefs and opinions of a group chosen for educational research about a topic (McMillan & Schumacher, 2006). It was decided that this method was appropriate to be used as the main research design in this study.

Research Sample

The sampling of this descriptive study employing the survey model comprised 56 first-year students, 59 second-year students, 56 third-year students and 41 fourth-

year, in all a total of 212 students, attending the Department of Science Teaching at Mugla Sitki Kocman University in the 2015-2016 academic year.

Research Instruments and Procedures

In the current study, an information form developed by the researchers to find out the demographic properties of the science teacher candidates (gender, grade level, family income level) and the Questionnaire of Technological Terms Awareness and Knowledge Level developed by Ozsevgec, Batman, Yazar and Yigit (2014) were used as data collection instruments. The original questionnaire comprised four parts: the first part aiming to elicit students' demographics, the second part having 85 technological terms, the third part aiming to reveal the relationship between the technological tools most commonly used in the daily lives of pre-service teachers, such as television, computer, camera and mobile phone, and other technological terms. and the fourth part including open-ended questions to investigate participants' awareness of technological terms by using 20 significant technological terms. However, in the current study, only the second part of the questionnaire was used to collect data. The second part of the Questionnaire of Technological Terms Awareness and Knowledge Level (QTTAKL) consists of 85 terms and is intended to elicit the pre-service teachers' awareness level of technological terms.

Data Analysis

The collected data were analyzed in line with the research questions. The teacher candidates were asked to mark the given 85 terms to indicate the technological terms they were acquainted with. In the analysis of the collected data, Statistical Package for Social Sciences (SPSS) software was used and the significance level was set to be 0.05. The pre-service science teachers' technological terms awareness level was analyzed through descriptive statistics, and the effect of gender, grade level and family income level on this awareness was analyzed with the Chi-square goodness-of-fit test. Technological terms awareness levels were classified as low, medium and high. When all the terms are marked, the highest possible value to be obtained is 85. Participants marking 0 to 28 items are classified as having low-level awareness, those marking 29 to 57 items are classified as having medium-level awareness and those marking 58 to 85 items are classified as having high level awareness.

Results

The data collected through the questionnaire were analyzed by using appropriate statistical techniques and the findings obtained were tabulated and then interpreted.

Findings Concerning the First Research Question

The first research question was What is the science teacher candidates' technological terms awareness level? This question was designed to determine the candidates' technological terms awareness level by asking them to mark the terms they frequently encounter in their daily lives from among all the terms given in the questionnaire. Frequencies and percentages related to the pre-service teachers' technological terms awareness level are given in Table 1.

Table 1

Science Teacher Candidates' Technological Terms Awareness Level

Low		*Medium*		*High*	
N	*%*	*N*	*%*	*N*	*%*
20	9.4	102	48.1	90	42.5

It can be seen in Table 1 that 9.4% of the teacher candidates had a low awareness level; 48.1% of them had a medium awareness level and 42.5% of them had a high awareness level. It is clear that many of the teacher candidates have a medium level of technological terms awareness (48.1%).

Findings Concerning the Second Research Question

The second research question was What is the effect of gender on the pre-service teachers' technological terms awareness? The aim of this question was to determine how gender affected the pre-service teachers' technological terms awareness. The results of the Chi-square test conducted to determine the effect of gender on the teachers' candidates' awareness of technological terms are presented in Table 2.

Table 2

The Results of The Chi-Square Test Conducted to Determine the Effect of Gender on Awareness

Gender		*Low*	*Medium*	*High*	*Total*
Female	N (%)	17 (11.1)	79 (51.6)	57 (37.3)	153 (100)
Male	N (%)	3 (5.1)	23 (39.0)	33 (55.9)	59 (100)
Total	N (%)	20 (9.4)	102 (48.1)	90 (42.5)	212 (100)

$\chi^2 = 6.55$; sd = 2; p = 0.03; p<.05

As can be seen in Table 2, there is a significant correlation between the pre-service teachers' awareness of technological terms and gender ($\chi^2_{(2)} = 6.55$; p<.05). While most of the female pre-service teachers (51.6%) have medium-level awareness, most of the male students (55.9%) have high-level awareness. Moreover, 11.1% of the female pre-service teachers and 5.1% of the male pre-service teachers have low technological terms awareness level.

Findings Concerning the Third Research Question

The third research question was What is the effect of grade level on the pre-service teachers' technological terms awareness? This question problem aimed to determine the effect of grade level on the pre-service teachers' awareness of technological terms. The results of the Chi-square test conducted to examine the effect of grade level on the science teacher candidates' awareness of technological terms are presented in Table 3.

As can be seen in Table 3, there is a significant correlation between the science teacher candidates' awareness of technological terms and grade level [$\chi^2_{(6)}$=18.12; p<.05]. Many of the first-grade and third-grade students (58.9% and 44.6%, respectively) have high-level awareness; on the other hand, many of the second-year and fourth-grade students (62.7% and 51.2%) have medium-level awareness.

Table 3

The Results of the Chi-Square Test Conducted to Determine the Effect of Grade Level on Awareness

Grade level	*Low*	*Medium*	*High*	*Total*
1 N (%)	4 (7.1)	19 (33.9)	33 (58.9)	56 (100)
2 N (%)	9 (15.3)	37 (62.7)	13 (22.0)	59 (100)
3 N (%)	5 (8.9)	25 (44.6)	26 (46.4)	56 (100)
4 N (%)	2 (4.9)	21 (51.2)	18 (43.9)	41 (100)
Total N (%)	20 (9.4)	102 (48.1)	90 (42.5)	212 (100)

[χ^2 = 18.12; sd = 6; p = 0.00; p<.05]

Findings Concerning the Fourth Sub-Problem

The fourth research question was What is the effect of family income level on the pre-service teachers' technological terms awareness? The aim of this question was to determine the effect of family income level on the pre-service teachers' awareness of technological terms. The results of the Chi-square test conducted to examine the effect of family income level on the teacher candidates' awareness of technological terms are presented in Table 4.

Table 4

The Results of the Chi-Square Test Conducted to Determine the Effect of Family Income Level on Awareness

Family income	*level*	*Low*	*Medium*	*High*	*Total*
500- 1500 YTL	N (%)	11 (13.9)	39 (49.4)	29 (36.7)	79 (100)
1501- 2500 YTL	N (%)	3 (4.2)	38 (52.8)	31 (43.1)	72 (100)
2501- 3500 YTL	N (%)	1 (3.2)	16 (51.6)	14 (45.2)	31 (100)
3501 YTL and more	N (%)	5 (16.7)	9 (30.0)	16 (53.3)	30 (100)
Total	N (%)	20 (9.4)	102 (48.1)	90 (42.5)	212 (100)

[χ^2 = 10.72; sd = 6; p = 0.97; p>.05]

The data presented in Table 4 show that there is no significant correlation between the pre-service science teachers' awareness of technological terms and their family income level [$\chi^2_{(6)}$= 10.72; p>.05]. It can be seen from the table that many of the pre-service teachers with family income levels of 500-1500 TL, 1501-2500 TL and 2501-3500 TL (49.4%, 52.8% and 51.6%; respectively) have medium-level awareness, while most of the pre-service teachers with a family income level of 3501 and more (53.3%) have high-level technological awareness.

Discussion and Conclusion

At the end of the current study, it was concluded that the teacher candidates having a medium-level awareness of technological terms in general are mostly acquainted with popular technological terms. When the related literature is examined, it is seen that research focusing on the awareness of technological terms is quite limited. Becker and Maunsaiyat (2002), by using their adapted Scale of Technological Attitudes and Concepts, investigated Thai and American students' attitudes toward technological concepts and technology. Their findings revealed significant differences in favor of American students. These differences were reported to be a result of the education systems and cultures and Thai teachers' preference for a teacher-centered teaching approach. Pamuk (2007) intended to investigate the correlation between computer self-efficacy and attitudes toward the computer of pre-service science and mathematics teachers and the effect of gender, grade level, department, and the state of computer ownership on their self-efficacy and attitudes. The findings of the study revealed that the pre-service science teachers and mathematics teachers have high computer self-efficacy and attitude.

A significant correlation was found between the pre-service science teachers' awareness of technological terms and gender. The female students' technological terms awareness level is medium (the number of terms: 29-57) and the male students' technological terms awareness level is high (the number of terms: 58-85). Birgin, Coker and Catlioglu (2010) investigated the computer and internet use of first-year pre-service teachers in relation to the gender variable. They concluded that though computer ownership is higher among female students, male students' computer experience and their frequency of computer use were higher than for female students. Furthermore, while attitudes toward the computer did not significantly vary depending on gender, computer competencies are significantly in favor of the male students. Ozsevgec and Yazar (2012) found that male teacher candidates' technological terms awareness is higher than that of female teacher candidates. Kose, Gencer and Gezer (2007) investigated the attitudes of first-year students of vocational school of higher education toward the use of computers and the internet and the effect of variables such as program, gender, the state of computer ownership and access to the internet on these attitudes. Their findings revealed that students have positive attitudes toward the use of the computer and internet. These findings support the related finding of the current study. Akcay (2013) examined the Turkish language pre-service teachers' competencies of knowing the Turkish meanings of

informatics terms originating in a foreign language and concluded that gender had no influence on their competencies. This is not parallel to the finding of this study.

A significant correlation was found in our study between the pre-service science teachers' awareness of technological terms and their grade level. It was found that most of the first-year and third-year students had high-level awareness and most of the second-year and fourth-year students had medium-level awareness. It was determined that the first-year students' awareness level was higher than that of the third-year students. Bilecik, Çaglayan and Guven (2012), by using a Technological Knowledge Questionnaire, investigated the knowledge of 12 pre-service science and technology teachers about technology and technological products. It was found that third-year and fourth-year students provided more conscious responses to the questionnaire items than first-year and second-year students. Ozsevgec and Yazar (2012) found that the third-grade pre-service teachers had a higher level of awareness of technological terms than that of the first-grade students. Pamuk (2007) stated that grade level is an important factor significantly affecting computer self-efficacy and that fourth-year students had a higher level of computer self-efficacy than first-year students. Menzi, Calıskan and Cetin (2012) investigated pre-service teachers' technological competencies in terms of various variables. In terms of grade level, it was observed that from the first year toward the fourth year, the pre-service teachers' technological competencies developed in all 15 subdimensions. The findings of the current study do not concur with this finding.

In the current study, it was concluded that there was no significant correlation between the pre-service teachers' awareness of technological terms and the income levels of their families. Ozsevgec and Yazar (2012) found that pre-service teachers having higher family incomes have higher technological terms awareness than the pre-service teachers with lower family incomes. This finding is not parallel to the finding of this study.

The findings of the current study are limited to the pre-service teachers attending the Department of Science Teaching at the Education Faculty of Mugla Sitki Kocman University. In light of these findings, it can be suggested that more emphasis should be placed on technology-related concepts, applications and terms within the context of the courses Computer I-II and Teaching Technologies and Materials Design given to science students at education faculties so that the pre-service teachers can raise their awareness of new technological terms. A technology dictionary defining technological terms used for technological products, the meanings of these terms and the technological products they are used in can be prepared. Thus, students can learn the meanings of unknown terms easily. Further research may look at the effects of computer, TV or smart mobile phone possession on pre-service teachers' awareness of technological terms. The terms included in the questionnaire might undergo slight changes and then be administered to students from various levels of schooling; thus, comparative studies could be conducted.

References

Akcay, A. (2013). Turkce ogretmeni adaylarının yabanci kokenli bilisim terimlerinin Turkce karsiliklarini bilme yeterliklerinin cesitli degiskenlerden acisindan incelenmesi. [Investigation of the extent to which pre-service Turkish language teachers know the Turkish meanings of the terms of informatics in relation to different variables]. *Adıyaman Universitesi Sosyal Bilimler Enstitusu Dergisi Turkce'nin Egitimi Ogretimi, (Ozel Sayısı), 11,* 1-19.

Akkoyunlu, B., & Kurbanoglu, S. (2003). Ogretmen adaylarının bilgi okuryazarligi ve bilgisayar oz-yeterlilik algıları uzerine bir calısma [A study on pre-service teachers' information literacy and perceptions of their computer self-efficacy]. *Hacettepe Universitesi Egitim Fakultesi Dergisi*, *24*, 1-10.

Aksoy, H. H. (2003). Egitim kurumlarında teknoloji kullanımı ve etkilerine iliskin bir cozumleme [An analysis of the technology use and its effects in educational institutions]. *Egitim Bilim Toplum Dergisi, 1*(4), 4-23.

Altun, T., Yigit, N., & Adanur, Z. (2011). Ilkogretim ogrencilerinin bilgisayara yonelik tutumlarının incelenmesi: Trabzon ili ornegi [Investigation of elementary school students' attitudes towards the computer: The case of Trabzon]. *Turkish Journal of Computer and Mathematics Education*, *2*(1), 69-86.

Archer, B., & Roberts, P. H. (1979). Design and technological awareness in education. *Studies in Design Education Craft and Technology*, *12*(1), 55-56.

Arslan, A. (2006). Bilgisayar destekli egitim yapmaya iliskin tutum olcegi [An attitude scale for conducting computer-assisted teaching]. *Yuzuncu Yıl Universitesi Egitim Fakultesi Dergisi*, *3*(2), 24-33.

Bacanak, A., Karamustafaoglu, O., & Kose, S. (2003). Yeni bir bakıs: Egitimde teknoloji okuryazarligi [A new viewpoint: Technology literacy in education]. *Pamukkale Universitesi Egitim Fakultesi Dergisi, 2*(14), 191-196.

Becker, K. H., & Maunsaiyat, S. (2002). Thai students' attitudes and concepts of technology. *Journal of Technology Education*, *13*(2), 6-19.

Bilecik, A., Caglayan, N., & Guven, E. (2012*). Fen ve teknoloji ogretmen adaylarinin teknoloji ve teknolojik urun konusuna yonelik bilgi duzeylerinin incelenmesi [Investigation of pre-service science and technology teachers' information level about technology and technological product].* X. Ulusal Fen Bilimleri ve Matematik Egitimi Kongresi, 27-30 Haziran, Nigde.

Birgin, O., Coker, B., & Catlioglu, H. (2010). Investigation of first year pre-service teachers' computer and internet uses in terms of gender. *Procedia Social and Behavioral Sciences*, 2, 1588-1592.

Burkhardt, G., Monsour, M., Valdez, G., Gunn, C., Dawson, M., Lemke, C., Coughlin, E., Thadani, V., & Martin, C. (2003). *Literacy in the digital age*. Retrieved February 26, 2016 from http://pict.sdsu.edu/engauge21st.pdf.

Canbaz, N. (2010). *Yetiskin egitimi kurslarina devam eden kadin kursiyerlerin teknoloji okuryazarligi egitim ihtiyacini belirleme*. [Determination of the female course attendees' need for technological literacy training who are attending adult education courses. (An unpublished master's thesis)]. Canakkale 18 Mart Universitesi/ Sosyal Bilimler Enstitusu, Canakkale.

De Vries, M. J. (1994). *Technology education in western europe*. Innovations in science and technology education: Paris. UNESCO. Retrieved May 20, 2016 from http://www.iteawww.org/PATT10/Barak.pdf.

Dogan, M., Irioglu, Z., Serin, F. G., & Yuzerler, S. (2010). *İlkogretim matematik ogretmenlerinin materyal ve teknoloji kullanimina iliskin tutumlari [Elementary school math teachers' attitudes towards materials and technology use]*. IX. Ulusal Fen Bilimleri ve Matematik Egitimi Kongresi, 23-25 Eylul, Izmir.

European Commission (2013). ICT in schools survey. Retrieved August 10, 2016 from http://europa.eu/rapid/press-release_IP- 13-341_en.html

Eurydice (2007). The education system in France 2006/07. *The Information Database on Education Systems in Europe.* Retrieved February 25, 2007 from http://www.eurydice.org.

Ginestie, J. (2005). Analysing technology education through the curricular evoluation and the ınvestigation themes, *Internetional Conference PATT 15th*, 18-22 Nisan, Haarlem, Hollanda. Retrieved February 25, 2016 from http://www.iteaconnect.org/Conference/PATT/PATT15/Ginestie.pdf

Hur, J. W., Cullen, T., ve Brush, T. (2010). Teaching for application: A model for assisting preservice teachers with technology integration. *Journal of Technology and Teacher Education, 18*(1), 161-182.

ITEA (2000). International Technology Education Association (ITEA), Technology for all American project; standards for technological literacy: Content for the study of technology, Reston, Virginia.

Isman, A., Isbulan, O., Demir, Z., & Canan, O. (2008). *Egitim fakultesinde ogrenim goren ogretmen adaylarinin internet kullanma bariyerleri [Internet use barriers of pre-service teachers attending education faculties].* 8th International Educational Technology Conference (IETC-2008), Eskisehir, 6-9 May 2008.

Karal, H., & Berigel, M. (2006). Egitim fakultelerinin ogretmenlerin teknolojiyi egitimde etkin olarak kullanabilme yeterlilikleri uzerine etkileri ve cozum onerileri [The effect of education faculties on teachers' competency of using technology effectively and solution suggestions]. *Cukurova Universitesi Egitim Fakultesi Dergisi*, *2*(32), 60-66.

Kose, S., Gencer, A., & Gezer, K. (2007). Meslek yuksekokulu ogrencilerinin bilgisayar ve internete yonelik tutumlari [The attitudes of students from vocational schools of higher education towards the computer and internet]. *Pamukkale Universitesi Egitim Fakultesi Dergisi, 1*(21), 44-54.

McMillan, H., & J., Schumacher, S. (2006). *Researching in education evidence-based ınquiry*. (6th Edition) Boston: Allyn and Bacon Inc.

MEB. (2006). *İlkogretim fen ve teknoloji dersi ogretim programi ve kilavuzu (6., 7. ve 8. siniflar)[Curriculum and guideline of elementary school science and technology course (6th, 7th and 8th graders)].* Ankara: Milli Egitim Bakanligi Talim ve Terbiye Kurulu Baskanlıgı.

Menzi, N., Calıskan, E., & Cetin, O. (2012). Ogretmen adaylarinin teknoloji yeterliliklerinin cesitli degiskenler acisindan incelenmesi [Investigation of pre-service teachers' technology competencies in relation to different variables]. *Anadolu Journal of Educational Sciences International, 2*(1), 1-18.

Ozsevgec, T., & Yazar, E. (2012). *Ogretmen adaylarinin teknolojik terim farkindaliklarinin belirlenmesi [Determination of pre-service teachers' awareness of technological terms].* X. Ulusal Matematik ve Fen Egitimi Kongresi, 27-30 Haziran, Nigde Universitesi: Nigde.

Ozsevgec, T., Batman, D., Yazar, E., & Yigit, N. (2014). Ogretmen adaylarinin teknolojik terim farkindaliklarinin belirlenmesi [Determination of pre-service teachers' awareness of technological terms]. *Egitim ve Bilim, 39*(173), 235-248.

Pamuk, S. (2007). *Pre-Service science and mathematics teachers' computer related self-efficacy, attitudes and relationship among these variables.* (The Degree of Master). Middle East Technical Universty/The Enstitute of The Education, Ankara.

Rasinen, A. (2003). An analysis of the technology education curriculum of six countries. *Journal of Technology Education, 15*(1), 31-47.

Russell, M., Bebell, D., O'Dwyer, L., & O'Connor, K. (2003). Examining teacher technology use: implications for preservice and inservice teacher preparation. *Journal of Teacher Education*, *54*(4), 297-310.

Sade, D., & Coll, R. (2003). Technology and technology education: views of some Solomon island primary teachers and curriculum development officers. *International Journal of Science And Mathematics Education,* 1, 87–114.

Seferoglu, S. (2008*). İlkogretim okullarinda teknoloji kullanimi: Yasanan sorunlar, gozlemler ve cozum onerileri [Technology use in elementary schools: Problem experienced, observations and solution suggestions*]. Tahsilde Qloballasma ve IKT, Beynelxalq Elmi-Praktik Konfrans, 17-19 Mayıs, Baku-Azerbaycan.

TDK. (2016). Teknoloji [Technology]. Retrived July 08, 2016 from http://www.tdk.gov.tr.

UNESCO, (2008). ICT competency standards for teachers, competency standards modules UK: UNESCO, Retrived July 25, 2017 from http://cst.unesco-ci.org/sites/projects/cst/The%20Standards/ICTCSTCompetency%20Standards%20Modules.pdf.

Web, (2003). Technological questions and issues; What is technology?, Retrived July 18, 2017 from http://atschool.eduweb.co.uk/trinity/watistec.html.

Yazar, E. (2013). *Ogretmen adaylarinin teknolojik terim farkindaliklarinin ve bilgi duzeylerinin belirlenmesi.* (Yayimlanmamis Yuksek Lisans Tezi) [Determination of pre-service teachers' technological term awareness and information level. (An unpublished master's thesis)]. Karadeniz Teknik Universitesi/ Egitim Bilimleri Enstitusu, Trabzon.

Yilmaz, M. (2007). Sinif ogretmeni yetistirmede teknoloji egitimi [Technology training in educating classroom teachers]. *Gazi Universitesi Egitim Fakultesi Dergisi, 27*(1), 155-167.

Fen Bilgisi Öğretmen Adaylarının Teknolojik Terim Farkındalıkları

Atıf:

Can, S., & Kaymakci, G. (2017). Pre-service science teachers' awareness of technological terms. *Eurasian Journal of Educational Research*, 72, 167-184, DOI: 10.14689/ejer.2017.72.9

Özet

Problem Durumu: Ülkelerin hedeflenen düzeye ulaşması için, müfredatlarda yapılan reformlar ya da öğretmenlere yönelik hizmet içi eğitimler fen eğitiminin kalitesini arttıracak yollardandır. Fen ve teknoloji dersleri müfredat değiştirilerek, öğrencilerin dünya algılarının değişmesi hedeflenmiştir. Fen ve Teknoloji dersi programının temel amacı, öğrenci kişisel farklılıklarına bakılmaksızın bütün öğrencilerin birer fen ve teknoloji okuryazarı olabilmeleridir. Fen ve Teknoloji okuryazarı olmak ise dünyadaki gelişmeleri takip edebilecek kadar bilgi sahibi olmayı, sadece terim bilgilerinin değil, teknoloji ile ilgili olan kavramların da bilinmesini, farklı alanlarda bireyin önüne çıkan yenilikleri kabullenici ve sorgulayıcı olmayı gerektirmektedir. Teknoloji okuryazarlığı ise günlük hayat içerisinde yer alan ve teknoloji ile iç içe olan her insan için ihtiyaçtır. Teknoloji okuryazarlığının kalıcı bir şekilde kazandırılması için bazı hususlara dikkat edilmesi önem arz etmektedir. Teknoloji okuryazarlığının en önemli ve evrensel nitelikte olan boyutu teknolojiye ait anahtar kavramların doğru bilinmesi ve küresel dünyada/teknolojide oluşan ortak dilin netleştirilerek daha anlaşılabilir duruma getirilmesidir. Fen Eğitiminde hedeflenen amaçlara ulaşmada, öğretmenlerin teknolojik okuryazarlığa sahip olması önem arz etmektedir. Çünkü fen; biyoloji, kimya ve fizik bilimlerini kapsarken, teknoloji ise bu bilimlerin çalışmaları sonucunda elde ettikleri ürünleri ortaya koyar. Teknoloji okuryazarı bireyler, teknoloji ile toplum arasındaki ilişkinin anlaşılmasında kendi yerini belirleyerek, gerekli olan entelektüel birikim, özgüven ve disiplin sahibi olabilendir. Fen bilimleri ise bu anlamda öğrencilere bilim ve teknoloji açısından olumlu tutum kazandırmada oldukça etkilidir. Ancak ülkemizde bu alanda yapılan çalışmalar

incelendiğinde bireylerin teknoloji okuryazarı olma anlamında hedeflenen düzeyde olmadıkları görülmektedir. Bu durumun nedenleri arasında, okullarımızda gerek okul desteğiyle gerekse hükümetler tarafından gerçekleştirilen projelere yardımıyla birçok bilgisayar, teknolojik cihazlar, internet erişimi ve ders yazılım programlarının bulunmasına rağmen, öğrencilere bu araçlar yardımıyla öğretim gerçekleştirebilme ve teknolojik bilgileri yeterli düzeyde aktarabilecek yetişmiş, nitelikli ve bu alanda hakim öğretmen sayısının yetersiz olmasıdır. Dolayısıyla teknoloji-okuryazarı özelliğine sahip olması istenen ve geleceğin öğretmenleri olacak olan öğretmen adaylarının, teknolojik terim farkındalıklarının belirlenmesi bu anlamda önemlidir.

Araştırmanın Amacı: Bu çalışmanın amacı, fen bilgisi öğretmen adaylarının teknolojik terim farkındalık düzeylerini belirleyerek, cinsiyet, sınıf düzeyi ve aile gelir düzeyi değişkenlerinin etkisini araştırmaktır.

Araştırmanın Yöntemi: Tarama modelinde yürütülen bu araştırmanın örneklemini, 2015-2016 Öğretim yılında Muğla Sıtkı Koçman Üniversitesi Eğitim Fakültesi İlköğretim Bölümü Fen Bilgisi Öğretmenliği programında öğrenim gören seçkisiz olarak örnekleme alınan 56 1. sınıf, 59 2. sınıf, 56 3.sınıf ve 41 4. sınıf olmak üzere toplam 212 öğretmen adayı oluşturmaktadır. Çalışmada "Teknolojik Terimler Farkındalık ve Bilgi Düzeyi Anketi"nin ikinci bölümü kullanılmıştır. Anketin ikinci bölümü, 85 terimden oluşmakta ve öğretmen adaylarının teknolojik terim farkındalıklarının belirlenmesini amaçlamaktadır. Araştırma verileri üzerinden hesaplanan Cronbach Alfa güvenirlik katsayısı 0.79 olarak tespit edilmiştir. Nicel olarak toplanan veriler; frekans, yüzde dağılım ve kay- kare testi kullanılarak çözümlenmiştir.

Araştırmanın Bulguları: Bu araştırmada orta düzeyde teknolojik terim farkındalığına sahip öğretmen adaylarının güncel teknolojik terimlere çoğunlukla aşina oldukları ortaya çıkmıştır. Bu durum hem teknolojik araçları hem de kitle iletişim araçlarını kullandıkları ya da sıkça karşılaştıkları şeklinde yorumlanabilir. Cinsiyetin, Fen Bilgisi öğretmen adaylarının teknolojik terim farkındalıklarında etkili bir rol oynadığı belirlenmiştir. Kız öğrencilerin teknolojik terim farkındalıklarının orta düzeyde, erkek öğrencilerin ise yüksek düzeyde olduğu tespit edilmiştir. Bu durum, erkeklerin doğası gereği teknolojik araç ve gereçlere kızlara nazaran daha fazla ilgi duymasına bağlanabilir. Sınıf düzeyi öğretmen adaylarının teknolojik terim farkındalıklarında fark yaratmış olup, 1. ve 3. sınıf öğrencilerinde yüksek, 2. ve 4. sınıf öğrencilerinde ise çoğunlukla orta düzeyde teknolojik terim farkındalığına sahip olduğu sonucuna ulaşılmıştır. Ayrıca 1. sınıfların teknolojik terim farkındalıklarının 3. sınıflara göre daha yüksek olduğu tespit edilmiştir. Lisans öğrenimlerinin sonlarına doğru gerek derslerin yoğunlaşması gerekse KPSS'ye yönelik hazırlanma süreci bu tür teknolojik kavramlara uzak kalmalarına neden olabilir. Bunun yanında öğretmen adaylarının aile gelir düzeyi, teknolojik terim farkındalıklarını etkilememiştir. Bunun sebebi gelir düzeyi düşük olan ailede yetişen öğretmen adaylarının teknolojik imkânlara karşı meraklı ve araştırmacı olması gösterilebilir.

Tartışma ve Sonuç: Öğretmen adaylarının günümüz teknolojisine ayak uydurabilmesi, hem çevresindeki teknolojik olayları anlamlandırabilmesine hem de teknolojinin eğitime entegrasyonunu algılayabilmesine katkı sağlayacaktır. Bu bağlamda araştırmada fen bilgisi öğretmen adaylarının teknolojik terim farkındalıklarının orta düzeyde olduğu belirlenmiştir. Teknolojik terim farkındalığı ile cinsiyet ve sınıf düzeyi arasında anlamlı bir ilişki olduğu ancak aile gelir düzeyinin anlamlı bir farklılık yaratmadığı sonucuna ulaşılmıştır. Bu sonuçlar doğrultusunda Eğitim fakültelerinin Fen Bilgisi Öğretmenliği öğretim programlarında bulunan derslerde teknoloji ile ilgili kavramlara, uygulamalara ve terim bilgilerine daha fazla yer verilebilir. Ankette yer alan terimler zaman içerisinde güncellenerek farklı öğretim kademelerinde yer alan öğrencilere uygulanarak daha kapsamlı ve karşılaştırmalı bir çalışma yapılabilir. Gelişmiş ülkeler, eğitim programlarını oluştururken teknolojiye hızlı adapte olabilen, teknolojiyi verimli kullanabilen ve en önemlisi de teknolojiyi üretebilen bireyler yetiştirmeyi hedef almaktadırlar. Bu bağlamda üniversite düzeyinde teknoloji eğitimi, ihtiyaçlar doğrultusunda yeniden yapılandırılarak öğretim programlarında daha fazla yer verilmesi, teknoloji okuryazarı öğretmen adayı sayısının artmasına yardımcı olabilir.

Anahtar sözcükler: Aile gelir düzeyi, teknoloji, teknolojik bilgi, fen eğitimi.

Eurasian Journal of Educational Research 72 (2017) 185-202

Eurasian Journal of Educational Research
www.ejer.com.tr

Critical Thinking Disposition of Music Teachers*

Ilgim KILIC[1], Tarkan YAZICI[2], Sefika Izgi TOPALAK[3]

ARTICLE INFO

Article History:

Received: 21 Sept.2015

Received in revised form: 18 Apr.2016

Accepted: 13 Oct. 2017

DOI: 10.14689/ejer.2017.72.10

Keywords

Criticism,
music education,
thinking skills.

ABSTRACT

Purpose: This study aims to assess the critical thinking dispositions of music teacher candidates using variables such as age, gender, secondary school type, daily TV viewing frequency, parental attitudes, and frequency of book and newspaper reading. **Research Methods:** To obtain a general review of the research subject, the researchers developed a survey. The sample was 131 students in the Department Fine Arts, Faculty of Education in Fatih, Karadeniz Technical University, during the 2013-2014 education period. The researchers used the California Critical Thinking Disposition Inventory (CCTDI-T) to determine the study group's critical thinking disposition. **Findings:** The critical thinking disposition of the study group varied considerably based on book and newspaper reading frequency. Integrative orientations towards EFL learning were observed. Students' motivation had a greater influence on language learning. The overall mean score for students' self-efficacy was found to be at the moderate level (M = 3.88). Furthermore, female students' self-efficacy scores were significantly higher than those of the male students. Lastly, a positive correlation was found between students' motivational orientations and self-efficacy beliefs. **Implications for Research and Practice**: Critical-thinking-oriented courses and seminars should be provided for music teacher candidates to help develop their critical thinking capabilities. Learning-teaching activities should be provided to create a teaching environment based on critical thinking. Various socio-cultural activities should be provided for teacher candidates to develop their critical thinking capabilities.

* This study was partly presented at the 1st Eurasian Educational Research Congress in İstanbul, 24-26 April, 2014.

[1] Başkent University, Faculty of Education, Department of Primary Education, Division of Classroom Education, Ankara, e-mail: ilgimkilic@gmail.com, ORCID: orcid.org/0000-0001-6566-026X

[2] Mersin University, Faculty of Education, Department of Fine Arts Education, Mersin, e-mail: tyazici@mersin.edu.tr, ORCID: orcid.org/0000-0002-7028-7401

[3] KTU, Fatih Faculty of Education, Department of Fine Arts Education, Trabzon, e-mail: sefikat@gmail.com, ORCID:orcid.org/0000-0002-8626-5194

Introduction

Teaching critical thinking to students has always been an essential mission of social studies education. Forawi (2016) declares that in a world that is growing more complex and changing at an ever-increasing rate, students should be equipped with life skills that include critical thinking. Individual learners who actively attend lessons and discuss answers by examining the questions, analysing ideas and respecting different points of view are increasingly needed today. Individuals are enlightened through critical thinking (Varoglu, 2014). As mentioned in Shaheen's (2016) research, according to university teachers, critical thinking involves the skills of analysis of given information to show a broad understanding and knowledge of the subject and ability to discuss alternative perspectives on the issues with open-mindedness. Similarly, Franco (2016) specifies that a critical thinker is flexible and open to the possibility of correcting or disconfirming beliefs and knowledge about the world. Also, a critical thinker is willing to be creative enough to think differently and seek new and more information, even if contrary to what is already known 'for sure'.

According to Turkoglu (1983), education that is the prerequisite of social, economical, political developments is formed and performed in a scope including scientific-artistic-technical fields (Ucan, 1997). Music education that is mostly vocal and audio art education is an integral component of general education and constitutes the basis of spiritual education has importance for both social and cultural fields (Ucan, 1997; San, 1979; Sun, 1969). According to Karolyi (1996), since music includes learning and development periods and has an integral connection between feelings and ideas, it is both art and science and must be perceived emotionally and comprehended with the mind (Yazici, 2013; cited in Bastug, 1999).

People look for "true and consistent", "useful and handy", "genuine and beautiful" and "beyond daily life experiences" as a way to best arrange, pursue, develop and improve their lives. Music education is one of the most important building blocks for an individual with personal, social-cultural, economic and educational aspirations (Ucan, 2005). Students who are actively involved in learning-teaching get more excited about education and are better able to think critically. To encourage students' excitement, teachers should turn their classes into vibrant, motivating environments that stimulate the minds of students and allow them to enter a complex state of ambiance (Yaman, 2014). Consequently, critical thinking includes an active and organized intellectual process that regards the idea of interaction that aspires to understand individuals' existence, recent events, circumstances and ideas (Ertas, 2012). Moreover, music teachers with critical thinking skills will be able to educate thinking, reasoning, problem-solving students through music education (Yazici & Izgi, 2013). At times, music teachers do not realize, or even ignore, their students' potential and blunt critical thinking skills and prevent their different points of view (Moseley, 2012). Accordingly, it is crucial that music teacher candidates become individuals who are open to active-independent-new ideas (Ozden, 2011). Critical thinking having a multidimensional thinking ability is very important to an educated person. A critical thinker has different world perception and has a more intellectual

lifestyle because he/she looks across the world from different perspectives (Karakuzular, 2013).

Critical thinking, a philosophical way of thinking, allows people to be versatile and filter all kinds of information through the critical mind. In the education field, as in other fields, critical thinking helps solve problems. Accordingly, the success of a program is related to how much a student uses these skills to produce information and direct the community (Yazici, 2013). From this perspective, critical thinking is a valuable tool which allows individuals to resolve problems; it follows individuals throughout their lives (Yazici & Izgi Topalak, 2013).

According to Beyer (1985), critical thinking has attracted researchers' attention since 1980, and the descriptions in this scope have started to vary. The concept of critical thinking is described as follows:

- Grant (1988): a thinking processes such as comparing; thinking rationally, creatively and progressively;

- Lipman (1991): reliable thinking that helps judgment based on standards;

- Chaffee (1994): an effective, organized and practical process that can be used to understand environmental conditions, develop the ability to describe thoughts, analyse problems, decide and assess, and begin goal-oriented studies;

- TDK (2005): a process that considers all related factors after sensitively assessing the evidence to reach objective results as much as possible;

- Habermas (1998): critical, evaluative, sceptical, analytical, clear, careful, logical and independent thinking, process of problem solving and intellectual development;

- Norris (1985): application foreknown by students and a valuation of their thoughts, change of prelearning (cited in Tabak, 2011).

Critical thinking is a skill that must be given to students during their education. The reason is that, according to Ozden (2011), a student having critical thinking skills obtains following:

- Ability to distinguish the difference between realities and hypotheses;

- Skill in testing a source's reliability;

- Ability to distinguish between relevant and irrelevant information;

- Awareness of prejudice and cognitive mistakes;

- Ability to realise incoherent jurisdictions;

- Ability to question effectively;

- Skilful use of verbal and written language; and

- Ability to think of thinking

A student should obtain information by research, being sceptical, creatively solving problems instead of repeating what has been expressed. Thanks to critical thinking, a student gains freedom of thought, increases a base of knowledge, thinks rationally, feels comfortable using his or her mind, takes a different approach to events-cases, and thinks about relations between reason, result, and possibility. Accordingly, the content of a teaching program must not be contrary to modern, scientific, artistic and philosophical knowledge (Sonmez, 2011). Pedagogue Vexliard highlights that the duty and function of teaching must be "to give knowledge" and "find new realities" (cited in San, 1979). A society that consists of individuals with high vitality, sensitivity and minds thanks to education would be different from the societies that have come into existence until now (Russell, 2006).

Method

Research Design/Model

Research is descriptive. To determine and assess the attitudes of music teacher candidates regarding critical thinking in terms of variables such as age, gender, type of graduate secondary education, amount of TV watched per day, parents' attitudes, frequency of reading books and newspapers, the scanning method was selected as a research type. To obtain a general view of the research subject in the scope of statistical analysis of obtained quantitative data, the researchers reached the sample with the survey method.

Research Sample/Working Group

The study was carried out with 131 students in Music Teaching in Fatih Faculty of Education, Karadeniz Technical University, who continue their education during the 2013-2014 education period. Of the teachers, 53.4 percent are female (n=70), and 46.6 percent are male (n=61).

Research Instrument and Procedure

To determine the attitudes of music teacher candidates regarding critical thinking in research, the California Critical Thinking Dispositions Inventory has been used. Below is information about the measuring tool.

California Critical Thinking Dispositions Inventory. The California Critical Thinking Dispositions Inventory (CCTDI-T), developed by Facione, Facione and Giancarlo (1998) has been used in this research. Transcription to Turkish and reliability-validity studies of this inventory in Turkey have been performed by Kokdemir (2003); this inventory has been preferred as it is a favorite inventory in studies of critical thinking dispositions and is compatible with the level of university students. The original inventory consists of 75 articles, with seven sub-dimensions as follow:

1. Truth-seeking,
2. Open-mindedness,
3. Analytical abilities (Analyticity),
4. Systematic tendencies (Systematicity),
5. Self-confidence,
6. Inquisitiveness, and
7. Cognitive maturity.

Internal consistency (alpha) of new inventory, which consists of six dimensions and 51 articles, is .88 for the total; for sub dimensions, analyticity .75, open mindedness .76, inquisitiveness .78, truth-seeking .61, systematically .63. Total variance described by inventory is 36.13% (Kokdemir, 2003).

Validity and Reliability

The findings obtained have been analysed at the confidence interval of 95% and a significance level of 5%, the confidence of inventory has been analyzed as very high-0,893.

Data Analysis

When analysing data, descriptive statistical methods (number, percentage, average, standard deviation) have been used. In a parametric comparison of quantitative data between groups, a normalcy distribution test has been carried out, and it has been seen that distribution is not compatible with a normal distribution. For this reason, non-parametric tests were performed.

Results

In this section, the findings from the data analysis are presented. On the basis of findings obtained, descriptions and comments are presented.

When the p value in Table 1 is assessed, a significant difference cannot be found as per $p< 0.5$. As per these values, critical thinking skills in the study group are not related to the mother's attitude. These findings indicate that an individual's social circle is more effective than his or her family for critical thinking.

Table 1

Findings With Regard to Variance of Mother's Attitude

Factor	*Mother's attitude*	*Rank average*	*St. dev.*	*p*
	Democratic	66.79		
	Tolerant	68.32		
Analyticity	Protective	66.68		
	Authoritarian	37.00	9.48	.487
	Uninterested	41.75		
	Inconsistent	34.50		
	Other	89.75		
	Democratic	70.85		
	Tolerant	73.46		
Open-mindedness	Protective	61.93		
	Authoritarian	52.20	10.11	.056
	Uninterested	11.25		
	Inconsistent	25.00		
	Other	17.75		
	Democratic	72.62		
	Tolerant	66.69		
	Protective	64.22		
Inquisitiveness	Authoritarian	50.60	8.43	.954
	Uninterested	72.75		
	Inconsistent	70.50		
	Other	61.25		
	Democratic	72.12		
	Tolerant	66.29		
	Protective	63.48		
Self-confidence	Authoritarian	52.40	5.63	.703
	Uninterested	79.25		
	Inconsistent	36.50		
	Other	100.50		
	Democratic	57.15		
	Tolerant	69.67		
	Protective	67.53		
Truth-seeking	Authoritarian	83.70	6.45	.127
	Uninterested	38.50		
	Inconsistent	15.00		
	Other	9.50		
	Democratic	58.56		
	Tolerant	73.71		
	Protective	64.91		
Systematicity	Authoritarian	38.60	4.06	
	Uninterested	15.75		
	Inconsistent	24.00		.103
	Other	74.75		

Table 2

Findings With Regard to Variance of Father's Attitude

Factor	*Father's attitude*	*Rank average*	*St. dev.*	*p*
Analyticity	Democratic	65.31	9.48	.181
	Tolerant	56.82		
	Protective	75.37		
	Authoritarian	57.79		
	Uninterested	100.17		
	Inconsistent	51.00		
	Other	70.57		
Open-mindedness	Democratic	70.23	10.11	.998
	Tolerant	66.87		
	Protective	64.03		
	Authoritarian	65.16		
	Uninterested	74.00		
	Inconsistent	68.50		
	Other	64.36		
Inquisitiveness	Democratic	61.77	8.43	.093
	Tolerant	57.50		
	Protective	70.46		
	Authoritarian	62.53		
	Uninterested	118.17		
	Inconsistent	114.50		
	Other	75.71		
Self-confidence	Democratic	67.65	5.63	.096
	Tolerant	60.13		
	Protective	74.14		
	Authoritarian	51.68		
	Uninterested	107.50		
	Inconsistent	106.00		
	Other	60.00		
Truth-seeking	Democratic	54.77	6.45	.725
	Tolerant	65.58		
	Protective	63.30		
	Authoritarian	77.61		
	Uninterested	63.83		
	Inconsistent	76.00		
	Other	75.07		
Systematicity	Democratic	42.19	4.06	.246
	Tolerant	71.63		
	Protective	71.03		
	Authoritarian	57.42		
	Uninterested	64.00		
	Inconsistent	68.00		
	Other	67.21		

When p value in Table 2 is assessed, a significant difference cannot be found as per p<0.5. As per these values, critical thinking skills in the study group are not related to the father's attitude. Consequently, parents do not affect an individual's critical thinking.

Table 3

Findings With Regard to Gender Variance

Factor	*Gender*	*Rank average*	*St. dev.*	*p*
Analyticity	Male	59.98	9.48	.115
	Female	70.38		
Open-mindedness	Male	58.64	10.11	.051
	Female	71.57		
Inquisitiveness	Male	64.25	8.43	.723
	Female	66.60		
Self-confidence	Male	60.89	5.63	.189
	Female	69.57		
Truth-seeking	Male	59.49	6.45	.087
	Female	70.81		
Systematicity	Male	63.16	4.06	.503
	Female	67.57		

When p value in Table 3 is assessed, a significant difference cannot be found as per p< 0.5. As per these values, critical thinking skills in the study group are not related to gender variance. In other words, gender does not affect critical thinking.

Table 4

Findings With Regard to Variance of Newspaper-Reading Frequency

Factor	*Newspaper reading frequency*	*Rank average*	*St. dev.*	*p*
Analyticity	Every day	89.04	9.48	.002
	A few times a week	72.08		
	A few times a month	62.91		
	Do not read	44.67		
Open-mindedness	Every day	71.25	10.11	.955
	A few times a week	64.78		
	A few times a month	65.60		
	I do not read	66.27		
Inquisitiveness	Everyday	84.04	8.43	.041
	A few times a week	71.36		
	A few times a month	61.48		
	Do not read	51.60		

Table 4 Continue

Factor	Newspaper reading frequency	Rank average	St. dev.	p
Self-confidence	Every day	88.07		
	A few times a week	75.28		
	A few times a month	61.78	5.63	.000
	Do not read	40.23		
Truth-seeking	Every day	74.36		
	A few times a week	58.88	6.45	.272
	A few times a month	66.88		
	I do not read	75.04		
Systematically	Every day	71.18		
	A few times a week	70.87	4.06	.428
	A few times a month	63.55		
	Do not read	56.63		

When p value in Table 4 is assessed, a significant difference can be found as per $p<0.5$ in Analyticity, Inquisitiveness and Self-Confidence at the end of comparative analysis for variance in reading the newspaper. A significant difference in this scope appears in the group of "reading the newspaper every day", when rank average values are considered. The thinking capability of a person who reads newspapers improves. Accordingly, a person approaches events more objectively and thinks reasonably.

Table 5

Findings With Regard to Variance of Book-Reading Frequency

Factor	*Book-reading frequency*	*Rank average*	*St. Dev.*	*p*
Analyticity	Every day	75.46		
	A few times a week	61.17	9.48	.003
	A few times a month	76.44		
	Do not read books	43.35		
Open-mindedness	Every day	59.33		
	A few times a week	68.78	10.11	.777
	A few times a month	65.69		
	Do not read books	69.10		
Inquisitiveness	Every day	71.67		
	A few times a week	63.44		
	A few times a month	72.90	8.43	.103
	Do not read books	50.65		
Self-confidence	Every day	72.98		
	A few times a week	61.33		
	A few times a month	75.79	5.63	.014
	Do not read books	46.85		
Truth-seeking	Every day	64.73		
	A few times a week	61.25	6.45	.737
	A few times a month	67.15		
	Do not read books	72.15		
Systematicity	Every day	75.38		
	A few times a week	58.81		
	A few times a month	70.15	4.06	.251
	Do not read book	59.29		

When Table 5 values are assessed, comparative analysis for reading book variance shows a significant difference in Analyticity and Self-confidence factors as per p< 0.5. This significant difference appears in the group of "reading books every day", when rank average is considered. Reading books has the effect of improving individuals' perspective of an event and their way of examining and analysing the event.

Table 6

Findings With Regard to Variance of Graduate Secondary Education Institution

Factor	*Graduated secondary education institution*	*Rank average*	*St. Dev.*	*p*
Analyticity	Fine Arts High School	67.80		
	Anatolian High School	46.42		
	General High School	69.02		
	Technical High School	25.17	9.48	.233
	Other	57.75		
Open-mindedness	Fine Arts High School	66.24		
	Anatolian High School	57.67		
	General High School	65.38	10.11	.937
	Technical High School	70.50		
	Other	84.25		
Inquisitiveness	Fine Arts High School	64.56		
	Anatolian High School	59.50		
	General High School	76.02	8.43	.138
	Technical High School	22.83		
	Other	47.50		
Self-confidence	Fine Arts High School	65.47		
	Anatolian High School	62.33		
	General High School	71.52	5.63	.472
	Technical High School	29.67		
	Other	63.50		
Truth-seeking	Fine Arts High School	65.31		
	Anatolian High School	81.25		
	General High School	63.44	6.45	.585
	Technical High School	60.83		
	Other	100.25		
	Fine Arts High School	65.18		
Systematicity	Anatolian High School	58.00		
	General High School	68.71	4.06	.951
	Technical High School	67.50		
	Other	78.50		

When p values in Table 6 are assessed, a significant difference cannot be found as per p< 0.5. As per these values, critical thinking skills in the study group are not related to the variance of "graduated secondary education institutions". In the

development of critical thinking tendency, teaching model based on critical thinking capabilities takes effect, not the type of school.

Table 7

Findings With Regard to Variance of Daily TV Watching

Factor	*Period of watching TV per day*	*Rank average*	*St. dev.*	*p*
Analyticity	0-1 hour	65.36		
	1-3 hours	68.73		
	3-6 hours	65.36	9.48	.149
	6 hours and more	24.00		
	Never	70.50		
Open-mindedness	0-1 hour	63.10		
	1-3 hours	64.74		
	3-6 hours	63.22	10.11	.793
	6 hours and more	63.20		
	Never	74.33		
Inquisitiveness	0-1 hour	63.85		
	1-3 hours	71.16		
	3-6 hours	64.75	8.43	.147
	6 hours and more	25.50		
	Never	68.61		
Self-confidence	0-1 hour	60.25		
	1-3 hours	70.27		
	3-6 hours	81.22	5.63	.106
	6 hours and more	36.70		
	Never	61.83		
Truth-seeking	0-1 hour	61.81		
	1-3 hours	63.80		
	3-6 hours	65.78		
	6 hours and more	83.60	6.45	.666
	Never	72.15		
Systematicity	0-1 hour	69.96		
	1-3 hours	64.00		
	3-6 hours	59.47		
	6 hours and more	24.40	4.06	.060
	Never	76.11		

When p value in Table 7 is assessed, a significant difference cannot be found as per $p< 0.5$. As per these values, critical thinking skills in the study group are not related to the variance of "daily TV watching". In fact, televisions' visual content does not give people a chance to think while they are watching; it only serves to guide society.

Table 8

Findings With Regard to Age Variance

Factor	*Age*	*Rank average*	*St. dev.*	*p*
Analyticity	18-19	66.11	9.48	.363
	20-21	70.06		
	22-23	53.59		
	24 and over	60.21		
Open-mindedness	18-19	64.41	10.11	.736
	20-21	68.53		
	22-23	62.64		
	24 and over	56.94		
Inquisitiveness	18-19	59.99	8.43	.619
	20-21	67.86		
	22-23	61.84		
	24 and over	71.65		
Self-confidence	18-19	58.70	5.63	.536
	20-21	70.13		
	22-23	66.23		
	24 and over	63.74		
Truth-seeking	18-19	63.22	6.45	.596
	20-21	62.80		
	22-23	74.09		
	24 and over	59.85		
Systematically	18-19	66.73	4.06	.311
	20-21	61.24		
	22-23	74.55		
	24 and over	53.71		

When p value in Table 8 is assessed, a significant difference cannot be found as per $p<0.5$. As per these values, critical thinking skills in the study group are not related to the variance of "age". Consequently, age does not affect an individual's ability to obtain critical thinking skills.

Discussion and Conclusion

The critical thinking disposition of the music teacher candidates in the research does not significantly vary according to age, gender, graduate secondary education institution, watching TV per day, or mother-father attitudes. However, it significantly varies in accordance with book and newspaper reading frequency.

The impact of newspaper and book reading frequency on the participants' critical thinking dispositions is a positive result; reading allows individuals to make sense of written symbols using cognitive behavior and psycho-motor skills, to have skills in analysis, synthesis and interpretation skills for self-teaching after education (Demirel

1990; Saracaloglu et al., 2003). Literacy is one of the most important conditions in culture and policy as well as local, national and global economy. Creation of a functionally literate audience illuminate a country's workforce and creates independent, powerful, productive societies that seek the rights to what they produce (Kellner, 2002; Sarihan, 2003).

In national or international studies of the research subject, there is a significant difference between gender and critical thinking of teachers (on behalf of female groups) in primary education schools. There is a significant relation between critical thinking skills of teacher candidates and their secondary education institutions. Gender variance of students in secondary education has an impact on critical thinking disposition, but gender variance of university students and music teacher candidates does not impact their critical thinking dispositions. Parents' attitude has no relation to the critical thinking skills of university students. Also, critical thinking skills of university students do not show a statistically significant difference as per variance of book-newspaper reading frequency. Further, it has been found that there is a significant relation between teachers' general critical thinking tendencies and their understanding of class management and where they perceive themselves. In a review of current education programs, the more critical lessons in a program, the more effective the critical thinking of teacher candidates. There is a positive relation between teachers' critical thinking tendencies and their abilities to use critical thinking strategies (Hayran, 2000; Kurum, 2002; Kokdemir, 2003; Ay & Akgu,l 2008; Elam, 2002; Piji, Kucuk & Uzun, 2013; Ozdemi,r 2005; Sen, 2009; Varoglu, 2014; Unal, 2014; Sahin, 2014).

At the end of the research, it was concluded that critical-thinking oriented courses and seminars should be provided for music teacher candidates to develop their critical thinking capabilities. Learning-teaching activities should be provided to create teaching environments based on critical thinking. Instructors should have critical thinking abilities to share the concepts of critical thinking with music teacher candidates. Various socio-cultural activities should be provided for teacher candidates as a way to develop their critical thinking capabilities. Finally, substantial research should be carried out to further analyse the effect of teacher behaviors and educational activities on critical thinking.

References

Ay, S. & Akgol, H. (2008). Gender, age and class level with critical thinking. *Journal of Theoretical Educational Science*, 1(2), 65-75.

Bastug Sen, S. (1999). *Biomechanical basis of piano technique.* Istanbul: Pan Publishing.

Demirel, O. (1990). *Principles-methods-techniques in teaching foreign language*. Ankara: Usem Publications.

Elam, J. H. (2002). Assessment of critical thinking skills and disposition of optometry students. *ASCO*, 28(1), 11-15.

Ertas, H. (2012). *The Effects of Critical Thinking Education Supported by Out-of-School Activities on Critical Thinking Disposition and Attitude toward Physics Course*. PhD Thesis, Unpublished. Ankara: University of Hacettepe.

Franco, A. (2016). What do ode to joy, the nobel peace prize, umbrellas and cartoons have in common? Why critical thinking matters and how higher education moulds. *Higher Education for the Future,* 3 (1), 108-124.

Forawi, S.A. (2016). Standard-based science education and critical thinking. *Thinking Skills and Creativity*, 20, 52-62.

Hayran, I. (2000). *The Thoughts of Teachers in Primary Education about Thinking Skills and Operations*. Master Thesis, Unpublished. Afyon: University of Afyon Kocatepe.

Karakuzular, D. (2012). *Developing Critical Thinking Skills of Efl Learners through A Sequence of Critical Thinking Tasks.* Master Thesis, Unpublished. Adana: University of Cukurova.

Kellner, D. (2002). New technologies/new literacy: Reconstruction of education in new millennium. *Education Sciences in Theory and Application*, 2 (1), 107-132.

Kokdemir, D. (2003). *Making Decision and Solving Problems in Uncertainty Cases*. PhD Thesis, Unpublished. Ankara: University of Ankara.

Kurum, D. (2002). *Critical Thinking Power of Teacher Candidates*. Master Thesis, Unpublished. Eskisehir: University of Anadolu.

Moseley, A. (2012). *Philosophy from A to Z.* İstanbul: Ntv Publications.

Ozdemir, S. M. (2005). Assessment of thinking skills of university in terms of different variances. *Turkish Journal of Educational Sciences,* 3 (3), 3-7.

Ozden, Y. (2011). *Learning and teaching.* Ankara: Pegem Academy.

Piji Kucuk D, & Uzun, Y. B. (2013). Critical thinking disposition of music teachers. *KEFAD*, 1(14), 327-345.

Russell, B. (2006). *Upon education: in especially preschool period*. Izmir: Ilya Publications.

San, I. (1979). *Artistic creation, creativity in child.* Ankara: Turkey Is Bank Publications.

Sarihan, Z. (2003). Cost-free project to get students adopt habit of reading: A book in schools for every month. *Journal of Lifelong Education*, 31-34.

Shaheen, N. (2016). International students' critical thinking-related problem areas: uk university teachers' perspectives. *Journal of Research in International Education*, 15 (19), 18-31.

Sonmez, V. (2011). *Principles and methods of teaching.* Ankara: Ani Publishing.

Sun, M. (1969). *Cultural-musical-theatrical problems in Turkey.* Ankara: Kultur Publications.

Sahin, A. (2014). *The Relationship between English Language Teachers' Critical Thinking Dispositions Levels and Their Levels of Utilizing Critical Thinking Strategies.* Master Thesis, Unpublished. Mersin: University of Cag.

Sen, U. (2009). Assessment of critical thinking dispositions of Turkish language teacher candidates in terms of different variances. *ZfWT,* 1 (2), 69-89.

Tabak, C. (2011). *Critical Thinking Disposition of Students in 4th Class of Department of Music Teaching.* Master Thesis, Unpublished. Burdur: University of Mehmet Akif Ersoy.

Turkoglu, A. (1983). *Education systems in France, Sweden and Romania: "A comparative research".* Ankara: Ankara University Faculty of Educational Sciences Publications.

Ucan, A. (1997). *Music education: Basic concepts-principles-approaches.* Ankara: The Encyclopedia of Music Publications.

Ucan, A. (2005). *Human and music, human and art education*. Ankara: Universal Music House.

Unal, Y. (2014). *Developing Critical Reading for Pre-Service English Teachers: Actual Reflections.* Master Thesis, Unpublished. Sakarya: University of Sakarya.

Varoglu, G. (2014). *Classroom Management Approach of The Teachers and Critical Investigation of The Relationship Between The Trends of Thinking (Istanbul Besiktas District Sample).* Master Thesis, Unpublished. Istanbul: University of Yeditepe.

Yaman, Y. (2014). *Effects of Brain Based Science Teaching on Gifted Students' Achievement, Critical Thinking, Creativity and Attitudes*. PhD Thesis, Unpublished. Istanbul: University of Istanbul.

Yazici, T. (2013). Necessity of Philosophy-Based Music Education. *Paper presented at International Perspectives on New Aspects of Learning in Teacher Education Conference,* University of Dicle, Turkey, 03-05 October.

Yazici, T. & Izgi Topalak, S. (2013). Teachers' thoughts about use of creative thinking skill in music education. *JRET*, 2(4), 195-204.

Müzik Öğretmeni Adaylarının Eleştirel Düşünme Eğilimleri

Atıf:

Kilic, I., Yazici T. & Izgi Topalak, S. (2017). Critical thinking disposition of music teacher. *Eurasian Journal of Educational Research*, 72, 185-202, DOI: 10.14689/ejer.2017.72.10

Özet

Problem durumu: Çağımızın hızla ilerleyen ve gelişen dünyasına uyum sağlayabilecek, fikirlerini, düşüncelerini paylaşarak öğrenmeye açık; aktif birer katılımcı olarak derslerde tartışmalara girebilen, konuları eleştirel bir gözle inceleyip çözüm yolları üretebilen bireyler yetiştirmeye olan gereksinim giderek artmaktadır. Çünkü sorunları algılayabilen, tartışabilen ve farkındalık geliştirebilen bireyler aynı ölçüde çözüm yollarına da ulaşabilirler. Öğrenci, aktarılanları bilmek yerine araştırarak, şüphe duyarak, yaratıcı problemler çözerek bilgiye ulaşabilmelidir. Eleştirel düşünme sayesinde öğrenci; düşünce özgürlüğü kazanmakta, bilgi birikimini artırmakta, mantıksız düşünmemekte, aklını kullandığını hissetmekte, olgulara-olaylara farklı açılardan bakabilmekte ve her şeyin sebep-sonuç-olabilme olasılığını düşünmektedir. Dolayısıyla, bir öğretim programının içeriği; çağdaş bilimsel, sanatsal ve felsefi bilgilere ters düşmemeli, yok saymamalıdır (Sönmez, 2011). Eğitimci Vexliard da öğretimin görevi ve işlevinin; "bilgi vermek" ve "yeni gerçekleri bulmak" olması gerektiğini vurgulamıştır (aktaran San, 1979). Çünkü eğitimin kazandırabileceği en üst düzeyde canlılığa, duyarlılığa ve zekâya sahip bireylerden oluşan bir toplum şimdiye kadar olanlardan çok farklı olacaktır (Russell, 2006).

Çok yönlü düşünmeyi destekleyen bir düşünce becerisi olan eleştirel düşünce, eğitimli bir insan için çok önemlidir. Eleştirel bir düşünür çevresine farklı açılardan bakabildiği için dünyayı daha farklı algılamakta ve daha entelektüel bir yaşam tarzına sahip olmaktadır (Karakuzular, 2013). Öğrenci, aktarılanları bilmek yerine araştırarak, şüphe duyarak, yaratıcı problemler çözerek bilgiye ulaşabilmelidir. Eleştirel düşünme sayesinde öğrenci; düşünce özgürlüğü kazanmakta, bilgi birikimini artırmakta, mantıksız düşünmemekte, aklını kullandığını hissetmekte, olgulara-olaylara farklı açılardan bakabilmekte ve her şeyin sebep-sonuç-olabilme olasılığını düşünmektedir. Bir felsefi düşünme türü olan eleştirel düşünme, olgulara ve olaylara çok yönlü bakmayı, insanın deneyim yoluyla ulaştığı her türlü bilgiyi, eleştirerek aklın süzgecinden geçirmesini sağlar. Bu özelliği ile her alanda olduğu gibi eğitim alanında da yaşanan problemlere ve bu problemlerin çözümüne yardımcı olmaktadır. Bu noktada eleştirel düşünme, bireyin amacına ulaşmasını zorlaştıran, karşısına çıkan engellemeleri/problemleri çözebilmesi yönünde etkili bir araç ve bireyi yaşamı boyunca takip eden bir beceri olarak karşımıza çıkmaktadır (Yazıcı & İzgi Topalak, 2013).

Eleştirel düşünen müzik öğretmenleri de müzik öğretimi aracılığıyla soran, düşünen, akıl yürüten, problem çözen ve sorgulayan öğrenciler yetiştirebilecektir (Yazıcı & Topalak, 2013). Ancak müzik öğretmenleri, bazen öğrencilerin potansiyelini görmeyerek ya da görmezden gelerek onların eleştirel düşünme becerilerini köreltebilmekte ve öğrencilerin farklı bakış açılarının ortaya çıkmasını engelleyebilmektedir (Moseley, 2012). Oysa düşünmekten ve anlamaktan yoksun olmak, bir varlık problemidir. Dolayısıyla müzik öğretmeni adaylarının aktif-bağımsız-yeni düşüncelere açık olan, eleştirel düşünen bireyler olmaları önem taşımaktadır (Özden, 2011).

Bütün bunlara bağlı olarak müzik öğretmeni adaylarının eleştirel düşünme eğilimleri, öğrencilerin olaylara, fikirlere, kurallara, davranışlara, nesnelere farklı bakabilmelerinin sağlanabilmesi bakımından önem kazanmaktadır.

Amaç: Çalışma müzik öğretmeni adaylarının eleştirel düşünme eğilimlerinin; yaş, cinsiyet, mezun olunan ortaöğretim türü, günlük televizyon izleme süresi, anne tutumu, baba tutumu, kitap okuma sıklığı ve gazete okuma sıklığı değişkenleri açısından saptanması amacı ile yapılmıştır.

Yöntem: Araştırma betimsel bir araştırmadır. Müzik öğretmeni adaylarının eleştirel düşünme eğilimlerinin; yaş, cinsiyet, mezun olunan ortaöğretim türü, günlük televizyon izleme süresi, anne tutumu, baba tutumu, kitap okuma sıklığı ve gazete okuma sıklığı değişkenleri açısından saptanabilmesi ve incelenebilmesi için araştırma türü olarak tarama yöntemi seçilmiştir. Araştırmacılar, elde edilen nicel verilerin istatiksel çözümlemeleri doğrultusunda araştırma konusunun genel bir görünümünü elde edebilmek için anket yöntemi ile örneklemine ulaşmıştır. Çalışma, 2013-2014 eğitim-öğretim yılında KTÜ Fatih Eğitim Fakültesi Güzel Sanatlar Eğitimi Bölümü Müzik Öğretmenliği Programında öğrenim görmekte olan 131 öğrenci ile yapılmıştır. Araştırmaya bulunan katılımcıların % 53,4'ü kadın (n=70), % 46,6'sı erkektir (n=61). Araştırmada müzik öğretmeni adaylarının eleştirel düşünme eğilimlerinin saptanması amacıyla "The Critical Thinking Dispositions Inventory (California Eleştirel Düşünme Eğilimi Ölçeği)" kullanılmıştır. Ölçeğin orijinal biçimi 75 maddeden ve 7 alt boyuttan oluşmaktadır. Ölçeğin alt boyutları doğruyu arama alt ölçeği, açık fikirlilik alt ölçeği, analitiklik alt ölçeği, sistematiklik alt ölçeği, kendine güven alt ölçeği, meraklılık alt ölçeği, olgunluk alt ölçeğinden oluşmaktadır.

Veriler değerlendirilirken tanımlayıcı istatistiksel metotları (sayı, yüzde, ortalama, standart sapma) kullanılmıştır. Niceliksel verilerin gruplar arası parametrik karşılaştırmalarında normallik dağılım testi yapılmış ve dağılımın normal dağılıma uygun olmadığı görülmüş, bu nedenle non-parametrik testler uygulanmıştır. Elde edilen bulgular % 95 güven aralığında, %5 anlamlılık düzeyinde değerlendirilmiş olup ölçeğin güvenirliği 0,893 olarak çok yüksek bulunmuştur.

Bulgular: Araştırma verilerine göre çalışma grubunda eleştirel düşünme becerileri "anne tutumu"- "baba tutumu", "cinsiyet", "mezun olunan okul türü" ve "günlük televizyon izleme" değişkenleri ile ilişkili değildir. Ancak "her gün gazete okuma" değişkeni ve "kitap okuma" değişkeni incelendiğinde analitiklik, meraklılık ve kendine güven konularında $p<0,5$'e göre anlamlı fark bulunmuştur. Buna göre oluşan anlamlı fark sıra ortalama değerleri dikkate alındığında her gün gazete okuyanlar ve kitap okuyanlar yönünde gerçekleşmiştir.

Sonuç ve öneriler: Araştırmaya katılan müzik eğitimi öğretmeni adaylarının eleştirel düşünme eğilimleri; yaş, cinsiyet, mezun olunan ortaöğretim türü, günlük televizyon izleme süresi, anne-baba tutumuna göre anlamlı bir fark göstermemekte ancak gazete ve kitap okuma sıklığına göre anlamlı bir fark göstermektedir. Araştırma sonucunda; müzik öğretmeni adaylarına eleştirel düşünce eğilimine yönelik kurslar, seminerler verilerek öğretmen adaylarının bu becerilerinin geliştirilmesinin sağlanması; eleştirel düşünme becerisine faydalı öğrenme ortamlarını

oluşturabilmelerine yönelik öğrenme-öğretme etkinliklerinin düzenlenmesi önerilmektedir. Ayrıca müzik öğretmeni adaylarına eleştirel düşünmenin öğretilebilmesi için, ders veren öğretim elemanlarının da eleştirel düşünme becerisine sahip olmaları önem arz etmektedir. Öte yandan öğretmen adaylarının eleştirel düşünme becerilerinin geliştirilmesine yönelik çeşitli sosyal-kültürel etkinliklerin gerçekleştirilmesi ve öğretmen davranışlarının, öğretim etkinliklerinin eleştirel düşünme üzerindeki etkileri gibi konularda araştırmaların yapılması önem kazanmaktadır.

Anahtar Sözcükler: Müzik, müzik öğretmeni, eleştirel düşünme.

Eurasian Journal of Educational Research 72 (2017) 203-220

Eurasian Journal of Educational Research
www.ejer.com.tr

Science Teacher Candidates' Epistemological Beliefs and Critical Thinking Disposition*

Zeynep KOYUNLU UNLU[1] Ilbilge DOKME[2]

ARTICLE INFO

Article History:
Received: 27 Apr. 2017
Received in revised form: 03 Aug. 2017
Accepted: 19 Nov. 2017
DOI: 10.14689/ejer.2017.72.11

Keywords
science education,
teacher education,
epistemological beliefs,
critical thinking disposition

ABSTRACT

Purpose: The purpose of the study is to determine the effect of gender and class level on science teacher candidates' epistemological beliefs and critical thinking disposition, as well as examine the relationship between these two dependent variables. **Research Methods:** This study was designed as a descriptive survey. Participants were 447 students majoring in science education. The data for the epistemological beliefs was collected with the Scale of Epistemological Beliefs (SEB); data for critical thinking disposition was collected with the California Critical Thinking Disposition Inventory (CCTDI). The data was evaluated in SPSS with a Mann Whitney U, Kolmogorov-Smirnov, and two variable correlation. **Findings** The study found that female students had more developed epistemological beliefs than their male counterparts. Students' SEB and CCTDI scores also exhibit a moderate positive correlation. The students' epistemological beliefs and critical thinking dispositions did not vary regularly by class level. **Implications for Research and Practice:** Applications developing male students' epistemological beliefs and critical thinking skills can be done so as to reduce the negative effects of gender on the learning-teaching process. Additionally, activities should be included in applied courses (such as lab and student presentations) in the science teaching program to develop such skills in students.

* This study was partly presented at the 2nd International Eurasian Educational Research Congress in Ankara, 08-10 June, 2015

[1] Bozok University, TURKEY, zeynepko.unlu@gmail.com, ORCID: https://orcid.org/0000-0003-3627-1809

[2] Gazi University, TURKEY, ilbilgedokme@gazi.edu.tr, ORCID: https://orcid.org/0000-0003-0227-6193

Corresponding author: Ilbilge DOKME

Introduction

A "disposition" is a tendency to do something and, by extension, "thinking dispositions" are a person's general tendencies to think. Critical thinking typically has two components: "critical thinking skills" and "critical thinking dispositions" (Ennis, 1987). An individual's performance in critical thinking is supported by two sources. The first is the individual's natural thinking disposition and the second is the cognitive skills learned later in life (Clifford, Boufal, & Kurtz, 2004). These skills, which help develop critical thinking, are in fact a part of scientific thinking. In its broadest sense, scientific thinking starts with the creation of hypotheses to solve a problem and the collection of information or data in light of these hypotheses. The later stages of scientific thinking require critical thinking skills. This means analyzing the information or data collected beforehand, interpreting them objectively using the principles of determinism and reaching reasonable results (Dick, 1991; Ennis, 1991; Facione, 1990; Halpern, 1998). All of these practices require a systematic effort of the mind. Those who have thinking dispositions learn these skills more quickly and easily. Ennis (1991) argued that those who had thinking dispositions have the following qualities: what they say, write, or desire to convey is accurately and easily understood; they are able to concentrate on a specific subject and consider an event as a whole; they are capable of researching and revealing an event's causes; they endeavor to be an educated and knowledgeable person; they seek alternatives; they look for a certainty just as much as the case requires; they are aware of people's fundamental beliefs; they are an open-minded person; they discard current judgments if proof and reasoning is insufficient; they act if proof and reason are sufficient; and they are capable of using other people's critical thinking skills.

Research on the correlation between critical thinking and epistemology has brought a new perspective to the study of critical thinking. Epistemology, which is the theory of knowledge, has been the primary focus of philosophers for centuries with the question "what is the source of knowledge?". The subject of knowledge is "the knower" and its object is "the known." Subjective philosophies regard the knower to be close to the resource of knowledge, while objective philosophies regard knowledge to be close to the known. Beliefs about how knowledge is formed, the certainty level and limits of knowledge, and how the act of knowing is performed are included in epistemological beliefs (Brownlee, Purdie, & Boulton-Lewis, 2001; Burr & Hofer, 2002; Hofer & Pintrich, 1997; Ozden, 2003; Ravindran, Grene, & Debacker, 2000). Perry (1970), who did the first classification of epistemological beliefs, described four developmental stages surrounding these beliefs. First, those beliefs are in the dualism stage think their knowledge is either absolutely wrong or right. Second those in the multiplicity stage accept there are different perspectives, without any criterion determining one opinion being superior to the other. Third, those who recognize that some opinions are better than the others are in the relativism stage. And finally, those in the stage of commitment within relativism recognize that, epistemologically, some opinions are more logical than the others and they stick to the more logical. After Perry, many researchers conducted studies of the development and change of epistemological beliefs over time. For instance, Kuhn

and Weinstock (2002) argued that children initially have the belief of realist epistemology (all arguments are correct), then they have the belief of absolutist epistemology (arguments may be correct or incorrect), and then they have the belief of multiplist epistemology (everyone has an opinion which is correct for themselves). Studies conducted until the late 1980s concerned the types of epistemological beliefs that develop and change and, thus, connect to each other. Schommer (1990) brought a new perspective to epistemology and claimed that the types of epistemological beliefs might differ from each other. For the first time, Schommer (1990) conceptualized epistemological beliefs in five dimensions and developed a questionnaire based on studies by Perry (1970) and Schoenfeld (1983). The epistemological beliefs measured by this questionnaire are, respectively, simplicity of knowledge, certainty of knowledge, source of knowledge from omniscient authority, innate ability of knowledge, and speed of knowledge. Any perspective in epistemology will indicate that a naïve personal epistemology restricts students' thinking and reasoning performances, while mature personal epistemology enhances these performances (Chan, Ho, & Ku, 2011). This anticipated influence of epistemology leads to the conclusion that the correlation between epistemology and critical thinking is an interesting subject of study.

Contemporary studies on epistemological beliefs have their roots in the early work of Marlene Schommer (Schommer, 1990), who proposed an original model for epistemological beliefs with five dimensions: certainty of knowledge, simplicity of knowledge, innate ability of knowledge acquisition, speed of knowledge acquisition, and omniscient authority. Many studies support that these epistemic beliefs have powerful effects on cognitive aspects of learning and thinking (Hyytinen, Holma, Toom, Shavelson, & Lindblom-Ylänne, 2014; Kuhn, Cheney, & Weinstock, 2000; Many, Howard, & Hoge, 2002; Mohamed & El-Habba, 2013). Correlations between epistemological beliefs and performance on learning and reasoning tasks have been investigated with a great deal of effort in recent years. It can be deduced from the findings of these studies that students with sophisticated epistemic beliefs were found to have a deep level of understanding (Chen & Pajares, 2010; Kuhn, 1999; Lodewyk, 2007; Peng & Fitzgerald, 2006; Schommer-Aikins & Easter, 2006; Schommer-Aikins, Duell, & Hutter, 2005; Stathopoulou & Vosniadou, 2007) and a higher ability to inquire and reason (Benson, 1989; Hofer & Pintrich, 1997). Bailin (1999) argued that a useful way to think about a problem is in terms of epistemological understanding, and that this way of thinking about the issue can provide both pedagogical and conceptual grounding in efforts to foster critical thinking. Kuhn (1999) developed a critical thinking model and classified a person's epistemological understanding level as realist, absolutist, multiplist or evaluativist. A person with a realist epistemological understanding level has insufficient critical thinking. At this level, arguments are the copies that represent an outer reality. The absolutist epistemological understanding level is a foundation for a more advanced form of critical thinking. In the multiplist epistemological understanding level, where critical thinking is yet insufficient, arguments can be selected freely. In the evaluativist epistemological understanding level, arguments, which can be evaluated

and compared by the criteria of discussion and proof, are judged. At this level, critical thinking can be qualified as a tool that develops comprehension.

After the reform of the Turkish National Education system, one of the important challenges for the science teachers is to encourage the development of critical thinking skills in their students (Ministry of National Education-Turkish Education Board [MoNE-TEB], 2005). Science education curriculum, which will be gradually included in Turkey beginning with the 2017-2018 academic year, also highlights the issues of critical thinking and epistemology in order to cope with global competition and to create a prosperous community (MoNE-TEB, 2017). Besides, studies concerning critical thinking and epistemological beliefs are also available in Turkey and have been conducted with prospective science teachers. For example, a study conducted with prospective science and physics teachers, found that prospective teachers' epistemological beliefs did not differ according to department of study, gender, or class levels. Accordingly, no changes were found in participants' epistemological beliefs throughout their education at university (Koc & Memduhoglu, 2017). Conversely, Yılmaz, Tuzun and Topcu (2013) found in their study with prospective science teachers that epistemological beliefs could change over time and that those beliefs were influential in academic achievement. Another study conducted with prospective physical science teachers found there were differences between prospective teachers' critical thinking tendencies according to gender and class level. Besides, participants' critical thinking tendencies increased in parallel to increase in their achievement levels, and the tendencies decreased as their achievement levels decreased (Tumkaya, 2011). Still another study with science teachers found that most of the participants understood science as a pursuit that is concerned with a limited area and tries to reveal the certain and unchanging truth (Ayvacı & Er Nas, 2010).

Epistemological beliefs influence teachers' practice in the classroom (Luft & Roehrig, 2007). Acquiring developed critical thinking skills is very important in developing epistemological beliefs (Kuhn & Dean, 2004). Since teachers are the unchanging component of the teaching profession for years, it is essential that teachers have critical thinking skills in order to instill in students these skills and to strengthen students' epistemological beliefs. Thus, analyzing the critical thinking tendencies and epistemological beliefs of prospective teachers-who contribute to raising the next generation-is important. Because differences according to gender influence prospective teachers' learning-teaching processes, gender is considered an independent variable in this study. In addition, class levels is considered another variable in this study so as to be able to assess the effects of the education received in the development of those skills. It is believed that an analysis of these variables would give an idea to practitioners and researchers. In addition preservice teachers generally tend to employ rote memorization when it comes to solving science problems, without any attempt to use critical thinking skills. Thereby it can be too hard for students to solve non-routine science problems. Critical thinking includes the component skills of analyzing arguments, making inferences using inductive or deductive reasoning, judging or evaluating, and making decisions or solving problems (Lai, 2011).

Our students' lack of critical thinking skills in science problem solving prompted us to explore critical thinking disposition and the relationships between critical thinking disposition and epistemological belief. This raised the following research questions, which are used within the current study:

1. Is there a statically significant difference between female and male students' scores on the Scale of Epistemological Beliefs (SEB)?
2. Is there a statically significant difference among the scores of freshmen, sophomores, juniors and seniors on the SEB?
3. Is there a statically significant difference between the female and male students' scores on the California Critical Thinking Disposition Inventory (CCTDI)?
4. Is there a statically significant difference among the scores of freshmen, sophomores, juniors and seniors on the CCTDI?
5. Is there any correlation between the science teacher candidates' epistemological beliefs and critical thinking disposition?

Method

Research Design

This study was designed as a descriptive survey study to determine the effect of gender and class level on pre-service science teachers' epistemological beliefs and critical thinking disposition, as well as the relationship between these two dependent variables (Frankeal & Wallen, 2003).

Research Sample

The study was conducted with the participation of prospective science teachers because sophisticated critical thinking tendencies and epistemological beliefs are more integral to scientific inquiry compared to the work conducted in other disciplines.

The study used criterion sampling, purposeful sampling method (Patton, 2002). Participants were 447 students majoring in science education (115 freshmen, 119 sophomores, 129 juniors, and 84 seniors) at a university located in Ankara, the capital of Turkey. Of the participant students, 357 were females and 90 were males.

Research Instruments and Procedures

Scale of epistemological beliefs. The first data collection tool in the study was an SEB with a five-point Likert-type scale developed by Schommer (1990) and adapted by Deryakulu and Buyukozturk (2002). The scale had a total of 35 items, 17 negative and 18 positive. This scale had three factors (Factor I: The belief that learning depends on effort; Factor II: The belief that learning depends on ability; and Factor III: The belief that there is only one truth). The measurement reliability of the scale was 0.72.

California critical thinking disposition inventory. The second data collection tool was the CCTDI with a six-point Likert-type scale from The Delphi project (1990) and adapted by Kokdemir (2003). The scale had a total of 51 items, 22 negative and 29 positive. This scale has six sub-scales "Analyticity", "Open mindedness", "Inquisitiveness", "Self Confidence", "Truth Seeking", and "Systematicity". The measurement study of the scale was to be found 0.81.

Data Analysis

The data was evaluated in the SPSS program, and its .05 degree of significance was accepted. The series mean method was used for missing values. After assigning data to missing values, normality analysis was examined by Kolmogorov-Sminow. It was found that the SEB and CCTDI scores were not a normal distribution according to gender and class level. The Mann Whitney U test was used to determine whether there was a significant difference between students' SEB, CCTDI scores, and gender. The Kruskal Wallis test was used to determine if there was a significant difference between students' SEB, CCTDI scores and class level. To determine the relationship between students' SEB and CCT scores, two variable correlations (Spearman Brown rank difference correlation coefficient) were used.

Results

Findings about the First Research Question

The purpose of the first research question is to determine any statistical differences in students' SEB scores by gender. For this purpose, the authors used the Mann Whitney U test. Table 1 illustrates the SEB factors of male and female students and the t-test results of the means of their total SEB scores.

Table 1

Female and Male Students' Scores on the SEB

Factors of SEB	Groups	N	Mean rank	Sum of rank	U	p
The belief that learning depends on effort	Female	357	228.9	81718.5	14314.5	.1
	Male	90	204.55	18409.5		
The belief that learning depends on ability	Female	357	222.77	79529	15626	.68
	Male	90	228.88	20599		
The belief that there is only one truth	Female	357	233.33	83299.5	12733.5	.00
	Male	90	186.98	16828.5		
Total SEB scores	Female	357	231.45	82626	13407	.01
	Male	90	194.47	17502		

As Table 1 shows, there is no significant difference between male and female students' mean scores on the factor that learning depends on effort (U=14314.5,

p>.05) and the belief that learning depends on ability (U=15626, p>.05). However, there is a significant difference between female and male students' mean scores on the factor that there is only one truth in favor of the female students (U=12733.5, p<.05). There is also a significant difference between female and male students' total SEB scores (U=13407, p<.05). The mean of female students' SEB scores is higher than that of the male students). Based upon this finding, it could be claimed that there is a significant difference between male and female participants' SEB scores.

Findings about the Second Research Question

The purpose of the second research question is to determine if there is any significant difference between students' SEB scores and class levels. For this purpose, the authors used Kruskal Wallis. Findings about the second question, whether there is a significant difference between students' class level and SEB scores, are shown in Table 2.

Table 2

The Results of the Students' SEB Scores by Class Level

Groups	N	Mean rank	χ^2	p	Post-hoc
Freshmen	115	227.87	38.1	.00	1>4, 2>1, 2>3, 2>4, 3>4
Sophomores	119	267.15			
Juniors	129	226.31			
Seniors	84	154.03			

As seen in Table 2, students' SEB scores vary by class level (χ^2=38.1, p<.05). According to the results, this difference is between the seniors and freshmen, sophomores and juniors. The SEB mean score of students can be seen in Table 2, post-hoc column.

Findings about the Third Research Question

The purpose of the third research question is to determine any statistically significant difference between students' CCTDI scores by gender. For this purpose, the authors used the Mann Whitney U test. The results of the Mann Whitney U test, whether there was a significant difference between female and male students' California Critical Thinking Disposition Inventory (CCTDI) scores, are shown in Table 3.

Table 3

Female and Male Students' Scores on the CCTDI

Factors of CCTDI	Groups	N	Mean rank	Sum of rank	U	p
Analyticity	Female	357	229.95	82092.5	13940.5	.052
	Male	90	200.39	18035.5		
Open-mindedness	Female	357	222.51	79437.5	15534.5	.62
	Male	90	229.89	20690.5		
Inquisitiveness	Female	357	221.53	79086	15183	.42
	Male	90	233.80	21042		
Self-confidence	Female	357	226.39	80821	15212	.43
	Male	90	214.52	19307		
Truth-seeking	Female	357	215.36	76884	12981	.00
	Male	90	258.27	23244		
Systematicity	Female	357	230.34	82232.5	13800.5	.03
	Male	90	198.84	17895.5		
Total CCTDI scores	Female	357	224.11	80005.5	16027.5	.97
	Male	90	223.58	20122.5		

As Table 3 shows, there is no significant difference between male and female students' factors of analyticity (U=13940.5, p>.05), open-mindedness (U=15534.5, p>.05), inquisitiveness (U=15183, p>.05), self- confidence (U=15212, p>.05) and the mean of their total CCTDI scores (U=16027.5, p>.05). However, there is a significant difference between male and female students' mean scores on the systematicity (U=13800.5, p<.05) and truth-seeking factor (U=12981, p<.05)

Findings about the Fourth Research Question

The purpose of the fourth research question is to determine any significant difference between students' CCTDI scores and class levels. The authors used Kruskal Wallis for this purpose. Findings about the fourth question, whether there was a significant difference between students' class level and CCTDI scores, are shown in Table 4.

Table 4

The Results of the Students CCTDI Scores by Class Level

Groups	N	Mean rank	χ^2	p	Post-hoc
Freshmen	115	206.21			
Sophomores	119	230	7.05	.07	-
Juniors	129	244.73			
Seniors	84	208			

According to Table 4, students' total CCTDI scores do not vary by class level (χ^2=7.05, p>.05). In other words, class level does not affect CCTDI scores of grade level students.

Findings about the Fifth Research Question

The aim of the fifth research question is to determine the correlation between students' SEB and CCT scores. The authors used two-variable correlations in order to determine any correlation between students' SEB and CCTDI scores. The results of this problem are shown in Table 5.

Table 5

Correlations between SEB and CCTDI Scores

CCTDI	SEB			
	The belief that learning depends on effort	The belief that learning depends on ability	The belief that there is only one truth	Total SEB scores
Analyticity	.39	.12	.13	.27
Open-mindedness	.04	.43	.33	.30
Inquisitiveness	.38	.13	.11*	.22
Self-confidence	.36	.06	.19	.28
Truth-seeking	.03	.34	.24	.23
Systematicity	.01	.24	.22	.21
Total CCTDI scores	.27	.19	.34	.42

*Correlation is significant at the 0.05 level (2-tailed).

As clearly seen in Table 5, there is a moderate and positive correlation between the first factor of the SEB, the belief that learning depends on effort, and analyticity, inquisitiveness, self-confidence, while there is a low correlation among open-mindedness, truth-seeking, systematicity and total CCTDI scores. There is a low and positive correlation between the second factor of the SEB (which was the belief that learning depends on ability) and analyticity, inquisitiveness, self-confidence, systematicity, and total CCTDI scores while there is a moderate and positive correlation between this factor and open-mindedness, truth seeking. There is a low and positive correlation between the third factor of the SEB (which is the belief that there is only one truth), and analyticity, and truth seeking, inquisitiveness, self-confidence, systematicity, while there is a moderate and positive correlation between this factor and total CCTDI scores. There is a moderate and positive correlation between total SEB scores and open mindedness, total CCTDI scores.

Discussion and Conclusion

This study aimed to investigate the effect of gender and class level on pre-service science teachers' epistemological beliefs and critical thinking disposition, and as well as examine the relationship between these two dependent variables.

Taking the mean SEB scores into consideration, female students' epistemological beliefs were higher than those of the male students. In "the belief that there is only one truth" sub-dimension of SEB, there was a significant difference in favor of the female students. There was no difference by gender in the "belief that learning depends on effort" and "belief that learning depends on ability" sub-dimensions. This research is consistent with some research findings in terms of the fact that female students have more developed epistemological beliefs than male students (Kaya, 2009; Schommer, 1993). Some studies, in contrast, found that female students believed more than male students that learning depends on effort (Deryakulu & Buyukozturk, 2003; Terzi, Sahan, Celik, & Zog, 2015). The above-mentioned study is different from others in terms of this sub-dimension (the belief that learning depends on effort). Some studies, however, revealed that gender did not affect epistemological beliefs. Tumkaya (2012), for instance, in a study performed with university students, found that epistemological beliefs did not differ according to gender. The researcher claimed that the situation stemmed from the fact that students' epistemological beliefs were shaped by difficulties they encountered in their efforts to reach knowledge and by the opportunities they had.

This study found that students' epistemological beliefs did not increase regularly as their class levels rose from freshman to senior. Yet, the fact that the sophomores had more developed epistemological beliefs than the others could be related to their education. The absence of differences between class levels could also have led to this result. As a matter of fact, in another study found that tenth graders had more developed epistemological beliefs than sixth and eighth graders (Kurt, 2009). Another study suggests that a personal epistemological belief that knowledge is constructed is more likely to be found among juniors and seniors in college than among freshman or sophomore college students (Peterson, 1995, p. 31). A study conducted with high school students, in contrast, found that the final year students had more developed epistemological beliefs than the first-year high school students (Schommer, 1993). Tumkaya (2012) attributes the inconsistencies between findings to such environmental factors as teachers' attitudes, how difficult a course is, the perceived classroom atmosphere and study and assessment conditions rather than class levels.

In critical thinking disposition, it is only in the truth seeking sub-dimension there is a significant difference in favor of the male students. In the systematicity sub-dimension where there is a significant difference in favor of the female students. There are no differences between total critical thinking disposition scores according to gender. Also, the students' critical thinking disposition did not vary regularly by their year of study. Like these results, relevant studies also find that students' critical thinking skills may not change during their university education (Bakır, 2015;

Hyytinen, et. al., 2014). According to another study conducted with approximately 2300 students from 24 different institutions, critical thinking skills did not change in 45% of students during the first two years (Arum & Roksa, 2011). Unlike these results, Walsh and Hardy (1999) conducted a study with university students who were trained in applied and unapplied sciences, and found that female students' open-mindedness and maturity mean scores were higher than those of the male students. The difference in epistemological beliefs and critical disposition by gender and class level results from the rich living experiences in the processes of reaching and acquiring knowledge.

The study also found a moderate and positive correlation between pre-service science teachers' epistemological beliefs and critical thinking disposition. It may be stated that these positive and strong correlations are an indicator that epistemological beliefs and critical thinking skills are quite developed (Kuhn, 1999; Kuhn & Dean, 2004). This situation is influential in academic achievement. There are studies in the literature demonstrating that individuals having developed critical thinking skills and epistemological beliefs have high academic achievement (Tumkaya, 2011). In support of this idea, Peterson (1995) found that the participants who comprehended the structuring or relativity of knowledge had a strong disposition of critical thinking. In the same vein, another study performed with the participation of university students found that students' critical thinking disposition affected their epistemological beliefs (Basbay, 2013). Regarding this point, Man (2007) suggested a model that included a two-way correlation between epistemological beliefs and cognitive skills and thinking dispositions, as well as the influence of cognitive skills, thinking dispositions and epistemological beliefs on critical thinking.

Considering that teachers have been an unchanging component of education for many years, they should have critical thinking skills and strong epistemological beliefs to be able to teach these skills to students. Accordingly, it is important that pre-service teachers' critical thinking inclinations and epistemological beliefs be analyzed since they will contribute to raising future generations. The inclination for critical thinking and epistemological beliefs have a direct relationship with science, which uses scientific methods to gain knowledge. Science lessons provide obtaining knowledge by means of comprehension, interpretation and thinking. Accordingly, science courses should be arranged to improve pre-service teachers' epistemological beliefs and critical thinking skills, particularly those received by pre-service science teachers. In this way, science teachers will raise individuals who have critical thinking and who will learn how to learn in the future.

To improve critical thinking skills and epistemological beliefs in students, the improvement of the teachers' critical thinking skills and epistemological beliefs should be considered. Teachers are responsible for contributing to the development of students, and they should allow students have discussions, express themselves, and compare their own opinions with those of others in a democratic environment. It is possible to conduct studies of teaching departments and small groups of teachers and students about their inclination for critical thinking and epistemological beliefs using qualitative data collection methods.

The course of "Thinking Skills" will be taught to 7th and 8th graders in Turkey beginning with the 2017-2018 academic year (MNE-TEB, 2016). It is thought that the course will contribute to the development of students' epistemological beliefs and critical thinking skills.

As mentioned in the "Discussion" section, there are several studies concerning epistemological beliefs and critical thinking skills in the literature that were conducted with the participation of prospective teachers. Despite some common points, there are inconsistencies between the findings of those studies. Thus, qualitative studies to provide in-depth knowledge about the effects of gender on prospective science teachers' learning-teaching processes and the effects of education received/courses taught on their critical thinking and epistemological beliefs are needed.

References

Allen, J. D., & Razvi, S. (2006). *Students' perspectives, levels of epistemological understanding, and critical thinking dispositions related to the use of case studies in an educational psychology course.* Annual Meeting of the American Educational Research Association, San Francisco.

Arum, R., & Roksa, J. (2011). *Academically adrift. Limited learning on college campuses*. Chicago: the University of Chicago Press.

Ayvacı, H. S., & Er Nas, S. (2010). Fen ve teknoloji öğretmenlerinin bilimsel bilginin epistemolojik yapısı hakkındaki temel bilgilerini belirlemeye yönelik bir çalışma [A study to determine science and technology teachers' basic knowledge about epistemological structure of scientific knowledge. *Kastamonu Education Journal, 18*(3), 691-704.

Bakır, S. (2015). Critical thinking dispositions of pre-service teachers. Educational *Research and Reviews, 10*(2), 225-233. doi: 0.5897/ERR2014.2021.

Bailin, S. (1999). The problem with percy: epistemology, understanding and critical thinking. *Informal Logic, 19*(2&3), 161-170.

Basbay, M. (2013). Analysing the relationship of critical thinking and metacognition with epistemological beliefs through structural equation modeling. *Education and Science, 38*(169), 249-262.

Benson, G. D. (1989). Epistemology and science curriculum. *Journal of Curriculum Studies, 21*(4), 329-344.

Burr, J. E., & Hofer B. K. (2002). Personal epistemology and theory of mind: deciphering young children's beliefs about knowledge and knowing. *New Ideas in Psychology, 20*(2-3), 199-224.

Brownlee, J., Purdie, N., & Boulton-Lewis, G. (2001) Changing epistemological beliefs in pre service teacher education students. *Teaching in Higher Education 6*(2), 247-268.

Chan, N-M., Ho, I. T., & Ku, K. Y. L. (2011). Epistemic beliefs and critical thinking of Chinese students. *Learning and Individual Differences 21,* 67–77.

Chen, J., & Pajares, F. (2010). Implicit theories of ability of grade 6 science students: relation to epistemological beliefs and academic motivation and achievement in science. *Contemporary Educational Psychology, 35*, 75-87.

Clifford, J. S., Boufal, M. M., & Kurtz, J. E. (2004). Personality traits and critical thinking skills in college students: Empirical tests of a two-factor theory. *Assessment, 11,* 169-176.

Deryakulu, D., & Buyukozturk, S. (2002). Epistemolojik inanç olceginin gecerlik ve güvenirlik calısması [The reliability and validity study of epistemological beliefs scale]. *Egitim Arastırmaları Dergisi, 8,* 111–125.

Dick, R. D. (1991). An empirical taxonomy of critical thinking. *Journal of Instructional Psychology, 18*(2), 79-92.

Ennis, R. H. Ennis (1987). A Taxonomy of Critical Thinking Dispositions and Abilities. In J.B. Baron and R.J. Sternberg (Eds.), *Teaching for thinking*. New York: W.H. Freeman.

Ennis, R. H. (1991). An elaboration of a cardinal goal of science instruction: scientific thinking. *Educational Philosophy and Theory, 23* (1), 31-44.

Facione, P. A. (1990). *Critical thinking: a statement of expert consensus for purposes of educational assessment and instruction.* Millbrae, CA: The California Academic Press.

Frankel, J. R., & Wallen, N. E. (2003). *How to design and evaluate in education*. New York: McGraw-Hill Higer Education.

Halpern, D. F. (1998). Teaching critical thinking for transfer across domains: Dispositions, skills, structure training, and metacognitive monitoring. *American Psychologist, 53*(4), 449-455.

Hofer, B., & Pintrich, P. (1997). The development of epistemological theories: beliefs about knowledge and knowing and their relation to learning. *Review of Educational Research, 67*, 88-140.

Hyytinen, H., Holma, K., Toom, A., Shavelson, R. J., & Lindblom-Ylänne, S. (2014). The complex relationship between students' critical thinking and epistemological beliefs in the context of problem solving. *Frontline Learning Research, 6,* 1-25. doi: http://dx.doi.org/10.14786/flr.v2i4.124

Koc, S., & Memduhoglu, H. B. (2017). Öğretmen adaylarının epistemolojik inançlar: bir karma yöntem çalışma [Epistemological beliefs of preservice teachers: a mixed method study]. *Electronic Journal of Social Sciences, 16*(60), 119-134.

Kokdemir, D. (2003). *Belirsizlik durumlarında karar verme ve problem cozme [Uncertainty in decision making and problem solving].* Yayınlanmamıs doktora tezi, Ankara Universitesi, Ankara.

Kuhn, D. (1999). The developmental model of critical thinking. *Educational Researcher, 28*(2), 16-26, 46.

Kuhn, D., Cheney, R., & Weinstock, M. (2000). The development of epistemological understanding. *Cognitive Development, 15*(3), 309-328.

Kuhn, D., & Dean, D., Jr. (2004). Metacognition: A bridge between cognitive psychology and educational practice. *Theory into Practice, 43*(4), 268-273.

Kuhn, D., & Weinstock, M. P. (2002). What is epistemological thinking and why does it matter? In Hofer, B. K. & Pintrich, P. R. (Eds.), *Personal epistemology: the psychology of beliefs about knowledge and knowing* (pp. 121-144). Mahwah, NJ: Erlbaum.

Lai, E. R. (2011). *Critical thinking: A literature review.* Pearson's Research Reports.

Lodewyk, K. (2007). Relations among epistemological beliefs, academic achievement, and task performance in secondary school students. *Educational Psychology, 27*, 307-327.

Luft, J., & Roehrig, G. H. (2007). Capturing science teachers' epistemological beliefs: the development of the teacher beliefs interview. *Electronic Journal of Science Education, 11*(2), 38-63.

Man, C. N. (2007). *Epistemological beliefs and critical thinking among Chinese students.* Master thesis, The University of Hong Kong, China.

Many, J., Howard, F., & Hoge, P. (2002). Epistemology and preservice teacher education: How do beliefs about knowledge affect our students' experiences? *English Education, 34*, 302-322.

Mohamed, M. T., & El-Habba, M. (2013). The relationship between epistemic beliefs and academic performance: are better students always more mature? *Journal of Educational and Developmental Psychology, 3*(1). doi: http://dx.doi.org/10.5539/jedp.v3n1p158

MoNE-TEB. (2005). *Fen bilimleri dersi öğretim programı (ilkokul ve ortaokul 3, 4, 5, 6, 7 ve 8. sınıflar) [Science curriculum (primary and secondary schools 3, 4, 5, 6, 7 and 8 classes)].* Ankara.

MoNE-TEB. (2017). *Fen bilimleri dersi öğretim programı (ilkokul ve ortaokul 3, 4, 5, 6, 7 ve 8. sınıflar) [Science curriculum (primary and secondary schools 3, 4, 5, 6, 7 and 8 classes)].* Ankara.

MoNE-TEB. (2016). *Düşünme eğitimi dersi (7. ve 8. sınıflar öğretim programı) [Course of thinking education teaching program (7 and 8 classes)].* Ankara.

Ozden, Y. (2003). *Öğrenme ve öğretme [Learning and teaching].* Ank: PegemA Yayınları.

Patton, M. Q. (2002). *Qualitative research & evaluation methods*. Thousand Oaks, CA: Sage.

Peng, H., & Fitzgerald, G. (2006). Relationships between teacher education students' epistemological beliefs and their learning outcomes in a case-based hypermedia learning environment. *Journal of Technology and Teacher Education, 14*, 255-285.

Perry, W. G. (l970). *Forms of intellectual and ethical development in the college years: A scheme.* New York: Holt, Rinehart and Winston.

Peterson, A. K. (1995). *The relationship between personal epistemology and accountability on critical thinking disposition*. Doctoral dissertation, Iowa State University, Iowa.

Ravindran, B., Grene, B.A. & Debacker, T.K. (2000). Predicting preservice teachers' cognitive engagement with goals and epistemological beliefs. *Department of Educational Psychology*, 222-232.

Schoenfeld, A. H. (1983). Beyond the purely cognitive: Beliefs systems, social cognitions, and metacognitions as driving forces in intellectual performance. *Cognitive Science, 7*, 329-363.

Schommer, M. A. (1990). Effects of beliefs about the nature of knowledge on comprehension. *Journal of Educational Psychology, 82*(3), 498-504.

Schommer, M. (1993). Epistemological development and academic performance among secondary students. *Journal of Educational Psychology, 85*, 406-411.

Schommer-Aikins, M., Duell, O., & Hutter, R. (2005). Epistemological beliefs, mathematical problem-solving beliefs, and academic performance of middle school students. *Elementary School Journal, 105*, 289-304.

Schommer-Aikins, M., & Easter, M. (2006). Ways of knowing and epistemological beliefs: combined effect on academic performance. *Educational Psychology, 26*, 411-423.

Strathopoulou, C., & Vosniadou, S. (2007). Exploring the relationship between physical related epistemological beliefs and physical understanding. *Contemporary Educational Psychology, 32*, 255-281.

The Delphi Report (1990). Retrieved from: https://assessment.trinity.duke.edu/documents/Delphi_Report.pdf

Tumkaya, S. (2011). Fen bilimleri öğrencilerinin eleştirel düşünme eğilimleri ve öğrenme stillerinin incelenmesi [Comparison of college science major students' learning styles and critical thinking disposition]. *Journal of Kırsehir Education Faculty, 12*(3), 215-234.

Tumkaya, S. (2012). The investigation of the epistemological beliefs of university students according to gender, grade, fields of study, academic success and their learning styles. *Educational Sciences: Theory & Practice, 12*(1), 88-95.

Walsh, C.M., & Hardy, R.C. (1999). Dispositional differences in critical thinking related to gender and academic major. *Journal of Nursing Education, 38*(4),149-155.

Yılmaz Tuzun, O., & Topcu, M. S. (2013). Exploration of preservice science teachers' epistemological beliefs, world views, and self-efficacy considering gender and achievement. *Elementary Education Online, 12*(3), 659-673.

Fen Bilgisi Öğretmen Adaylarının Epistemolojik İnançları ve Eleştirel Düşünme Eğilimleri

Atıf:

Koyunlu Unlu, Z., & Dokme, I. (2017). Science teacher candidates' epistemological beliefs and critical thinking disposition. *Eurasian Journal of Educational Research*, 72, 203-220, DOI: 10.14689/ejer.2017.72.11

Özet

Problem Durumu: Eleştirel düşünme ile epistemoloji arasındaki ilişkinin araştırılması eleştirel düşünme ile ilgili araştırmalara yeni bir bakış açısı getirmiştir. Bilgi felsefesi olarak adlandırılan epistemoloji filozofların yüzyıllardır "bilginin kaynağı nedir?" sorusuna verdiği yanıtların adresi olmuştur. Bilginin öznesi "bilen" nesnesi "bilinen" dir. Öznel felsefeler bilginin kaynağını bilene yakın görürken nesnel felsefeler bilgiyi bilinene yakın görmüşlerdir. Bilginin ne olduğu nasıl oluştuğu, bilginin kesinlik derecesi ve sınırları, bilme eyleminin nasıl gerçekleştiği üzerine inançlar ise epistemolojik inançlar kapsamında yer almaktadır. Epistemolojik inançlarla ilgili dört gelişim evresi tanımlamıştır: Bilginin doğası ile ilgili inançları düalizm evresinde olanlar bilgilerin ya mutlak doğru veya yanlış olduğunu düşünürler, çoğulcu evresinde olanlar da bir fikrin diğerinden daha üstün olduğunu ayırt edecek bir ölçüt olmaksızın farklı bakış açılarının varlığını kabul ederler. Bazı fikirlerin diğerlerinden daha iyi olduğunu fark edenlerin epistemolojik inançları göreli evrededir. Bağlılık evresinde olanlar epistemolojik olarak bazı fikirlerin diğerlerinden daha iyi olduğunu fark edip iyi olana bağlı kalırlar. Hangi perspektiften bakarsak bakalım zayıf epistemolojik inançların öğrencilerin düşünme ve mantık yürütme performanslarını sınırlayacağı, olgunlaşmış epistemolojik inançların ise öğrencilerin bu performanslarını genişleteceği düşünülebilir. Epistemolojinin bu şekilde öngörülen etkisi epistemoloji ve eleştirel düşünme arasındaki ilişkinin araştırılmasını ilgi çekici bir araştırma konusu kılmaktadır.

Öğretmenin, yıllar boyunca öğretimin değişmeyen bileşeni olduğu göz önünde bulundurulduğunda öğrencilere eleştirel düşünme becerisinin kazandırılması ve öğrencilerin epistemolojik inançlarının güçlendirilmesi için öncelikle öğretmenlerin bu beceriye hakim olmaları gerekmektedir. Bu doğrultuda gelecek nesillerin yetişmesine katkı sağlayacak olan öğretmen adaylarının eleştirel düşünme eğilimlerinin ve epistemolojik inançlarının incelenmesi önem teşkil etmektedir. Eleştirel düşünme eğilimi ve epistemolojik inançlar, bilgiye ulaşmada bilimsel yöntemin kullanıldığı fen ile doğrudan ilişkili olduğundan bu araştırma fen bilgisi öğretmen adayları üzerinde gerçekleştirilmiştir.

Araştırmanın Amacı: Bu araştırmanın amacı cinsiyet ve sınıf seviyesinin fen bilgisi öğretmen adaylarının epistemolojik inançları ile eleştirel düşünme eğilimlerine etkisini ve bu iki bağımsız değişken arasındaki ilişkiyi belirlemektir.

Araştırmanın Yöntemi: Betimsel tarama yönteminin kullanıldığı bu araştırmaya bir üniversitenin fen bilgisi öğretmenliği bölümünde öğrenim gören 447 öğrenci (357 kız, 90 erkek) katılmıştır. Bu öğrencilerden 115'i birinci, 119'u ikinci, 129'u üçüncü ve 84'ü dördüncü sınıf öğrencisidir. Veri toplama aracı olarak Epistemolojik İnançlar Ölçeği (EİÖ) ve California Eleştirel Düşünme Eğilimi Ölçeği (CEDEÖ) kullanılmıştır. Ölçüm güvenirliği (Cronbach Alpha) 0.72 olan EİÖ, toplam 3 boyut (öğrenmenin çabaya bağlı olduğuna inanç, öğrenmenin yeteneğe bağlı olduğuna inanç, tek bir doğrunun var olduğuna inanç) ve 35 maddeden oluşmaktadır. CEDEÖ ise 6 boyut (analitiklik, açık fikirlilik, meraklılık, kendine güven, doğruyu arama, sistematiklik) ve 51 maddeden oluşmaktadır. CEDEÖ'nün ölçüm güvenirliği (Cronbach Alpha) 0.81'dir. Veriler SPSS programında analiz edilmiştir. Kayıp değerler için SPSS'de seriler ortalaması yöntemine başvurulmuştur. Daha sonra verilerin normallik varsayımları Kolmogorov-Smirnov testi ile değerlendirilmiştir. SEB ve CCTDI puanlarının cinsiyet ve sınıf seviyesine göre normal dağılım göstermediği tespit edilmiştir. Bu nedenle veri analizinde Mann Whitney U, Kruskal Wallis H- Testleri ile Sperman Brown Sıra Farkları korelasyon katsayısı kullanılmıştır.

Araştırmanın Bulguları: Kız ve erkek öğrencilerin öğrenmenin çabaya bağlı olduğuna ve öğrenmenin yeteneğe bağlı olduğuna dair faktör ortalama puanları arasında anlamlı bir farklılık bulunmamıştır. Fakat kız ve erkek öğrencilerin tek bir doğrunun var olduğuna dair inanç faktörü ortalama puanları arasında kız öğrencilerin lehine anlamlı bir farklılık bulunmuştur. Ayrıca kız ve erkek öğrencilerin EİÖ puanları arasında kız öğrencilerin lehine anlamlı bir farklılık vardır. Öğrencilerin EİÖ puanları sınıf seviyesine göre farklılaşmaktadır.

Kız ve erkek öğrencilerin analitiklik, açık fikirlilik, meraklılık, kendine güven ve toplam CEDEÖ puanları arasında anlamlı olarak bir farklılık bulunmamıştır. Fakat kız ve erkek öğrencilerin doğruyu arama ve sistematiklik faktörü ortalama puanları arasında anlamlı olarak bir farklılık bulunmuştur. Öğrencilerin CEDEÖ sonuçları sınıf seviyesine göre farklılaşmamaktadır.

SEB birinci faktörü olan öğrenmenin çabaya bağlı olduğuna inanç ile analitiklik, meraklılık ve kendine güven arasında orta düzeyde ve pozitif yönde; açık fikirlilik, doğruyu arama, sistematiklik ve toplam CEDEÖ puanları arasında düşük düzeyde

bir korelasyon vardır. EİÖ ikinci faktörü olan öğrenmenin yeteneğe bağlı olduğuna inanç ve analitiklik, meraklılık, sistematiklik ve toplam CEDEÖ ortalama puanları arasında düşük düzeyde; kendine güven, açık fikirlilik ile orta düzeyde ve pozitif yönde bir ilişki vardır. EİÖ üçüncü faktörü olan tek bir doğrunun var olduğuna inanç ile açık fikirlilik ve toplam CEDEÖ puanları arasında pozitif yönde ve orta düzeyde; analitiklik, meraklılık, kendine güven, doğruyu arama, sistematiklik arasında pozitif yönde ve düşük düzeyde bir ilişki vardır. Toplam EİÖ puanları ve toplam CEDEÖ puanları arasında ise pozitif yönde ve orta düzeyde bir ilişki vardır.

Araştırmanın Sonuçları ve Önerileri: Sonuç olarak fen bilgisi öğretmenliği bölümünde öğrenim gören kız öğrencilerin epistemolojik inançlarının erkek öğrencilere göre daha gelişmiş olduğu, öğrencilerin epistemolojik inançları ve eleştirel düşünme eğilimlerinin sınıf seviyesine göre düzenli olarak değişmediği, genel olarak epistemolojik inançlar ve eleştirel düşünme eğilimleri arasında orta düzeyde bir ilişki olduğu söylenebilir. Tartışma kısmında değinildiği gibi literatürde öğretmen adayları üzerinde gerçekleştirilen epistemolojik inanç ve eleştirel düşünme konulu pek çok nicel araştırma mevcuttur. Bu araştırma sonuçlarında ortak noktalar olsa bile tutarsızlıklar mevcuttur. Cinsiyet faktörünün fen bilgisi öğretmen adaylarının öğrenme-öğretme süreçlerine ve alınan eğitimin/derslerin eleştirel düşünme ile epistemolojik inançlara etkisi konularında derinlemesine bilgi sağlayacak nitel çalışmalara ihtiyaç vardır.

Eleştirel düşünme becerisinin ve epistemolojik inançların gelişimi için öncelikle öğretmen eğitimine önem verilmelidir. Bu konuda öğrencinin gelişimine katkı sağlamakla görevli olan öğretmenlere büyük görevler düşmektedir. Demokratik bir ortamda öğrencilerin tartışmalarına, kendilerini ifade etmelerine ve düşüncelerini diğerleri ile karşılaştırmalarına izin verilmelidir.

Cinsiyet faktörünün öğrenme-öğretme sürecine olumsuz etkilerinin azaltılması için erkek öğrencilerin epistemolojik inanç ve eleştirel düşünme becerilerini geliştiren uygulamalar yapılabilir. Ayrıca fen bilgisi öğretmenliği programında verilen uygulamalı derslerde (laboratuvar ve sunumların öğrenciler tarafından yapıldığı dersler gibi) öğretmen adaylarının bu becerilerini geliştiren etkinliklere yer verilmelidir.

Anahtar Kelimeler: fen eğitimi, öğretmen eğitimi, epistemolojik inançlar, eleştirel düşünme eğilimi

Submission Checklist

Makale Sunumu Kontrol Çizelgesi

Indicate that this submission is ready to be considered by this journal by checking off the following.

Aday makalenin değerlendirilmeye hazır olduğunu aşağıdakilerin her biri ile karşılaştırarak kontrol ediniz.

Manuscript Agreement:

I / We hereby accept that, the article after being accepted for publication in the Eurasian Journal of Educational Research (EJER), the author (s) as, all rights related to the article has been transferred to the ANI PUBLISHING under the laws of the, "copyright transfer".

Makale Eurasian Journal of Educational Research (EJER) dergisinde basıma kabul edildikten sonra, yazar(lar) olarak; makale ile ilgili tüm hakları, "Telif Hakkı Devir" yasaları uyarınca, ANI YAYINCILIĞA devrettiğimizi kabul ediyoruz.

Manuscript Submission:

I have prepared my manuscript based on the criteria listed below and I accept all submission conditions.

Makalemi aşağıda belirtilen kriterlere göre hazırladım ve makale gönderme koşullarının tamamını kabul ediyorum.

Indicate that this submission is ready to be considered by this journal by checking off the following.

Aday makalenin değerlendirilmeye hazır olduğunu aşağıdakilerin her biri ile karşılaştırarak kontrol ediniz.

1	☒	*The manuscript is a report of original educational research or a discussion article on research topics in education.* Aday makale, eğitim alanıyla doğrudan ilgili bir araştırma ya da tartışma yazısıdır.
2	☒	*The submission has not been previously published, nor sent to another journal for consideration.* Sunulan çalışma daha önce herhangi bir yerde yayınlanmamıştır, başka bir derginin incelemesinde değildir.
3	☒	*Within a year, I have not submitted a manuscript to EJER as an author or co-author for review other than this manuscript.* Son bir yıl içerisinde, yazarı olduğum ya da yazarları arasında bulunduğum başka bir çalışma değerlendirilmek üzere EJER'e sunulmamıştır.
4	☒	*All authors of this manuscript are subscribers of the EJER and accept to pay **400 EURO** for the cost of proofreading and 10 loose copies of their articles if the manuscript is accepted.* Aday makalenin kabul edilip basılması halinde makalelerinin İngilizce son okuma (proofreading) ve 10 serbest kopya gönderimi nedeniyle oluşan **1275 TL** maliyeti Anı Yayıncılık'a ödemeyi kabul ederler.
5	☒	*The entire manuscript is written in English.* Aday makalenin bütününün yazım dili İngilizce'dir.

6	☒	*The original manuscript is typed on A4 paper. The margins are 2.5 cm.* Aday makale kenar boşlukları 2.5 cm olan A4 kağıda yazılmıştır.
7	☒	*Each paragraph is longer than two sentences.* Her bir paragraf en az üç cümle içermektedir.
8	☒	*The entire manuscript - including quotations, references, author note, content footnotes, figure captions, and all parts of tables – is double-spaced.* Aday makalenin tamamı, alıntılar, kaynakça, şekil ve tablo başlıkları da dâhil olmak üzere çift aralıklı yazılmıştır.
9	☒	*The submission file is in Microsoft Word document file format. 12-point Times New Roman font is used in entire manuscript.* Aday makale, tamamında 12 punto Times New Roman yazı tipi kullanılarak hazırlanmış bir Microsoft Word dokümanıdır.
10	☒	*The text has had the authors' names removed. If an author is cited, "Author" and year are used in the bibliography and footnotes, instead of author's name, paper title, etc. The author's name has also been removed from the attached document.* **Aday makale, yazar adları çıkarılarak sunulmuştur**. Eğer yazar kendisine atıfta bulunduysa yazarın adına ve çalışma başlığına yer verilmeyecek, sadece "Author" yazılarak çalışmanın yılı belirtilecektir. Eklenen dosyada yazar adı belirtilmeyecektir.
11	☒	*The title is 10 to 12 words.* Aday makalenin başlığı 10-12 sözcük uzunluğundadır.
12	☒	*The maximum length of the manuscript-including structured abstract in English, tables, and references is 6000 words. This limitation does not include Turkish extended abstract (750-1000 words) which is placed after the references section.* Aday makale, İngilizce abstract, tablolar ve kaynakça vb. tüm ögeler dâhil olmak üzere en fazla 6000 sözcüktür. Kaynakça'nın ardından yer verilen uzun Türkçe özet (750-1000 sözcük) bu sayıya dâhil değildir.
13	☒	*The article is preceded by* ***English Structured Abstract of not more than 250 words*** *and not less than 200 using five required headings:* **Purpose***: State the problem in field. Then explain the purpose of the study.* **Method:** *Specify the research design, sample, and research instrument and data analysis in brief.* **Findings***: Highlight the significant, interesting or surprising results.* **Implications for Research and Practice** . (These headings may need some adaptation in the case of discussion papers: *Background, Purpose of Study, Sources of Evidence, Main Argument, and Conclusions)*. More information available from http://www.tandf.co.uk/journals/authors/rereabstracts.asp Yapılandırılmış İngilizce öz 200-250 sözcük uzunluğunda olup, aday makalenin başında yer almakta ve **Purpose** *(İlk önce alanda karşılaşılan sorunu belirtelim. Daha sonra araştırmanın amacını bir cümle ile veriniz),* **Method** *(Araştırma deseni, örneklem, very taoplama aracı ve verilerin analizinini kısaca açıklaynız),* **Findings** *(En önemli ve çarpıcı araştırma bulgularını verelim)***Implications for Research and Practice, (***Uygulama ve ileriye dönük araştırmalar için olası çıkarımlarınız)* başlıklarını içermektedir. Bu başlıklar tartışma yazıları için: *Çalışmanın Temeli, Çalışmanın Amacı, Kanıt Kaynakları, Ana Tartışma*

		ve Sonuçlar şeklinde olabilir. Daha fazla bilgi için; http://www.tandf.co.uk/journals/authors/rereabstracts.asp adresine başvurunuz.
14	☒	*Following the structured abstract in English four to six keywords are included. They should* ***represent*** *the content of your manuscript and* ***be specific*** *to your field or sub-field. Avoid using keywords form the title of the paper.* Yapılandırılmış İngilizce özden sonra 4-6 anahtar sözcüğe yer verilmiştir. Anahtar kelimeler çalışmanızı temsil etmeli ve kendi alanınıza ya da alt alanlara özgü olmalıdır. **Makale adındaki kavramları anahtar kelime olarak seçmekten kaçınınız**.
15	☒	*An extended (750-1000 words) Turkish structured abstract is placed following the "References" section using five required headings: Problem Statement, Purpose of Study, Methods, Findings and Results, and Conclusions and Recommendations*. (These headings may need some adaptation in the case of discussion papers: *Background, Purpose of Study, Sources of Evidence, Main Argument, and Conclusions)*. More information available from http://www.tandf.co.uk/journals/authors/rereabstracts.asp Kaynakça'dan sonra 750-1000 sözcükten oluşan Türkçe yapılandırılmış öze yer verilmiştir. Türkçe yapılandırılmış öz *Problem Durumu, Araştırmanın Amacı, Araştırmanın Yöntemi, Araştırmanın Bulguları, Araştırmanın Sonuçları ve Önerileri* başlıklarını içermektedir. Bu başlıklar tartışma yazıları için: *Çalışmanın Temeli, Çalışmanın Amacı, Kanıt Kaynakları, Ana Tartışma ve Sonuçlar* şeklinde olabilir. Daha fazla bilgi için; http://www.tandf.co.uk/journals/authors /rereabstracts.asp
16	☒	*Following the Turkish structured abstract, four to six keywords are included.* Uzun Türkçe özetten sonra 4-6 anahtar sözcüğe yer verilmelidir.
17	☒	*References are not cited in the structured abstracts in English and in Turkish.* İngilizce abstract ve Türkçe öz içerisinde atıfta bulunulmamıştır.
18	☒	*The format of headings, tables, figures, citations, references, and other details follow the* ***APA 6 style*** *as described in the Publication Manual of the American Psychological Association, 6th edition, available from http://www.apa.org* Aday makalenin başlıkları, tabloları, şekilleri, atıfları, kaynakçası ve diğer özellikleri tamamen APA altıncı baskıda belirtildiği şekildedir.
19	☒	*All illustrations, figures, and tables are placed within the text at the appropriate points, rather than at the end.* Aday makalenin şekilleri ve tabloları metin içerisinde bulunmaları gereken uygun yerlere yerleştirilmiştir. Makale sonunda sunulmamıştır.
20	☒	Citations in the text of the document include the author's surname, the year of publication, and, when there is a specific quote from a source used, a page number where the quote is located in the text. **Example:** Nothing seemed so certain as the results of the early studies (Tatt, 2001, p. 445). It was precisely this level of apparent certainty, however, which led to a number of subsequent challenges to the techniques used to process the data (Jones & Wayne, 2002, p. 879). There were a number of fairly obvious flaws in the data: consistencies and regularities that seemed most irregular, upon close scrutiny (Aarns, 2003; West, 2003, p. 457).

		With studies by two authors, always include both author names: (Anderson & Bjorn, 2003) As Anderson and Bjorn (2003) illustrated in their recent study As recently as 2003, a prominent study (Anderson & Bjorn) illustrated When a study has 3, 4, or 5 authors, include the names of all the authors the first time the work is cited: (Anderson, Myers, Wilkes, & Matthews, 2003) For all subsequent citations of this work, use "et al.": (Anderson et al., 2003) When a work has 6 or more authors, use et al.: (Bell et al., 2003) For unsigned works, include the title, enclosed in parentheses. Put quotation marks for short work titles, and italicize the titles of reports, books, and other significant works: ("Recent Developments," 2004) (Dictionary of Tetrathalocigistic Diseases, 2004) Metin içindeki atıfları üstte verilen örneklere uygundur.
21	☒	Three levels of headings are used: Level 1, Level 3 and Level 4. The headings are formatted as follows: Centered Uppercase and Lowercase Heading (Level 1) *Flush Left, Italicized, Uppercase and Lowercase Side Heading* (Level 3) *Indented, italicized, lowercase paragraph heading ending with a period.* Start writing after the period (Level 4). Aday makale içerisinde üç farklı düzey başlık kullanılmıştır. Düzey 1, Düzey 2, Düzey 3. Başlıklar bu düzeylere uygun olarak aşağıdaki şekilde biçimlendirilmiştir: Ortalı ve Her Sözcüğün İlk Harfi Büyük Yazılmış Başlık (Düzey 1) *Tam Sola Dayalı, İtalik ve Her Sözcüğün İlk Harfi Büyük Yazılmış Başlık* (Düzey 3) *İçeriden, italik, tamamı küçük harflerle yazılmış ve nokta ile bitten başlık.* Noktadan sonra normal metin yazımına devam edilmeli (Düzey 4).
22	☒	References are listed in alphabetical order. Each listed reference is cited in text, and each text citation is listed in the References. Basic formats are as follows: Haag, L., & Stern, E. (2003). In search of the benefits of learning Latin. *Journal of Educational Psychology, 95,* 174–178. Bollen, K. A. (1989). *Structural equations with latent variables*. New York: Wiley. Johnson, D. W., & Johnson, R. T. (1990). Cooperative learning and achievement. In S. Sharan (Ed.), *Cooperative learning: Theory and research* (pp. 173–202). New York: Praeger. **Turkish References Only:** Çınkır, Ş., & Çetin, S. K. (2010). Öğretmenlerin okullarda mesleki çalışma ilişkileri hakkındaki görüşleri [Teachers' opinions about the professional working relationships in schools]. *Kuram ve Uygulamada Eğitim Yönetimi, 1 6*(3), 353-371. **Article in an Internet-only journal/Periodical, database**

		Fredrickson, B. L. (2000, March 7). Cultivating positive emotions to optimize health and well being. *Prevention & Treatment, 3,* Article 0001a. Retrieved November 20, 2000, from http://journals.apa.org/prevention/volume3/pre0030001a.html More information is available from: http://citationonline.net/CitationHelp/csg04-manuscripts-apa.htm#references Kaynakça'nın yazımı üstte verilen örneklere uygundur.
23	☒	***Order of the main parts in the manuscript is as follows:*** *Main title in English (max. 12 words)* *Structured abstract (min. 200- max.250 words length)* *Keywords (in English, min. four-max. six)* *Main text* *References* *Main Title in Turkish (max. 12 words* *Extended structured abstract (min.750-max.1000 words length in Turkish)* *Keywords (in Turkish, min. four-max. six)* Aday makaleyi oluşturan ana öğeler aşağıdaki düzendedir: İngilizce Ana Başlık (En fazla 12 sözcük) Yapılandırılmış İngilizce Abstract (En az 200, en fazla 250 sözcük) Anahtar Sözcükler (İngilizce, en az dört, en fazla altı) Ana Metin Kaynakça Türkçe Ana Başlık (En fazla 12 sözcük) Yapılandırılmış Türkçe Öz (En az 750, en fazla 1000 sözcük) Anahtar Sözcükler (Türkçe, en az dört, en fazla altı)
24	☒	**Structure of the Manuscript should be as follows:** Manuscript Title **English Abstract (200-250 words) Sub-headings:** *Purpose:…* *Purpose of Study:…* *Method:….* *Findings:….* *Implications for Research and Parctice:…* *Keywords:..* **Introduction Method (sub-headings):** *Research Design*

		Research Sample ♦*Research Instrument and Procedure* *Data Analysis* **Results, Discussion and Conclusion, References** **Extended Turkish Abstract (750-1000 words) Sub-headings:** *Problem Durumu:…* *Araştırmanın Amacı:…* *Araştırmanın Yöntemi:…* *Araştırmanın Bulguları:…* *Araştırmanın Sonuçları ve Önerileri:…*
25	☒	***EJER editor reserves the right to reject manuscripts and not to publish it that do not comply fully with the EJER Manuscript Submission Guidelines.***

SUBSCRIPTION/ABONELİK

Annually / Yıllık

Individual */ Kişi Aboneliği .....: 80 TL*

Institution */ Kurum Aboneliği .....: 250 TL*

Abroad */ Yurtdışı Aboneliği:.....: 250 $*

Student */ Öğrenci Aboneliği:.....: 70 TL*

For single issue / Tek sayılar için

Individual */ Kişiler .....: 25 TL*

Institution */ Kurumlar .....: 75 TL*

Payment / Ödeme

İş Bankası Kızılay Şubesi, Anı Yayıncılık 4214-0962561

Account number/Numaralı hesap

♦ Reliability and the validity of the research instrument used or adapted in the work must be provided, and explained in detail.