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Table of Contents

Examining Primary School Teachers’ Attitudes Towards Distance Education in the COVID-19 Period	1
<i>Halit Karalar</i> <i>Sabri Sidekli</i>	
The State of Primary School Third-Grade Pupils’ Making Sense of the Concepts of “0” and “1”	13
<i>Halil Önal</i> <i>Sıtkı Çekirdekci</i> <i>Alper Yorulmaz</i>	
Interpersonal Problem-solving Skills Analysis: 5–8 Years Old Children’s Different Variables	28
<i>Perihan Tugba Seker</i> <i>Enes Furkan Celebi</i>	
Misconceptions in Projectile Motion and Conceptual Changes via Geogebra Applications	42
<i>Ferhat Aslan</i> <i>Ugur Buyuk</i>	
Is Global Quality Assurance System of Higher Education in United States, Vietnam and Japan Possible?	63
<i>Patricia Abels</i> <i>Ha Duy Mong Nguyen</i> <i>Hiroaki Kawamura</i> <i>Masahiro Chikada</i>	
Teacher Candidates' Cyberloafing Behaviors in Terms of Different Variables	81
<i>Yusuf Tarık Tatl</i> <i>Fatma Sadık</i>	
Comparatively Investigation of the Quality of Preschool Education Environments in Turkey and the US	101
<i>Maide Orçan Kaçan</i> <i>Seda Ata</i> <i>Seda Karayol</i>	

**Organizational Image and its Relation with Leader-member Exchange and
Organizational Justice in Schools111**
Selcuk Demir
Ahmet Saylik

Examining Primary School Teachers' Attitudes Towards Distance Education in the COVID-19 Period¹

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Abstract

Due to pandemic effects all over the world, the sudden switch to distance education has doubtlessly affected primary schools more adversely in education. Concerning the pandemic period, this study aimed to examine primary school teachers' attitudes on distance education. More specifically, the survey study with 173 primary school teachers' participation examined whether teachers' attitudes towards distance education have a meaningful difference in terms of gender, age, and teaching experience. The data which was collected via the "Attitude Scale on Distance Education" were analyzed through independent samples t-test and one-way analysis of variance (ANOVA). The results showed that there was no statistically significant difference between gender and primary school teachers' attitudes towards distance education; however, there is a statistically significant difference according to age and teaching experience. In addition, primary school teachers' attitudes towards distance education were negative. The possible reasons for these results were discussed and some implications were presented for research, practice, and policymakers.

Keywords: Attitudes towards distance education, primary school teachers, distance education, attitudes, COVID -19, pandemic

Introduction

After the announcement on COVID-19 as a global pandemic by World Health Organization on 11 March 2020 (WHO, 2020), governments had to make some strategic decisions on educational fields like all others in the world. To control the COVID-19 pandemic and overcome this period with minimum negative side effects, educational institutions have been closed up temporarily in many countries. According to the stated data on 2 April, 2020 of the United Nations Educational Scientific and Cultural Organization (UNESCO, 2020), 1.5 billion students (85% of the total number) have been affected in 172 countries in this period. To continue in teaching-learning activities, distance education, which has been previously used for assisting face-to-face education, has been the major alternative for compulsory education instead of class-based instructions in K-12 and higher education.

In public schools in Turkey, face-to-face education was discontinued on 13 March 2020. Ministry of National Education (MoNE), firstly, announced that the mid-term break that was planned in 6-10 April would be in 16-20 March; and there would be immediate distance education activities starting on 23 March 2020 (Arslan & Şumuer, 2020) with 18.108.860 students and

* This study' results were presented as an oral presentation at the International Symposium on Global Pandemics and Multidisciplinary Covid-19 Studies

1.077.307 teachers in Turkey (Demir & Kale, 2020). Thanks to the *Increasing Opportunities and Improvement of Technology* project (known as FATİH project in Turkey) that was started in 2016 by MoNE, fiber internet background has been set up all around the country and it helped to cover the COVID-19 pandemic period with minimum harm. In the scope of this project, an internet connection was supplied in approximately 13.800 schools in Turkey (MoNE, 2020). Furthermore, Education Informatics Network (known as EBA in Turkey) that was designed in this project was also used as the major instrument for distance education in the pandemic. This instrument included Zoom online conference software so that online classes were smoothly organized and accessed by teachers and students. Furthermore, students could reach the materials, assignments, and activities which were designed by teachers on this platform. Additionally, EBA TV channels were organized by MoNE and students could follow the lectures on TV. Between the dates 23 March 2020 and 19 June 2020 (the final date of spring semester), TRT EBA TV Primary School, TRT EBA TV Secondary School, and TRT EBA TV High School channels telecasted 2.516 hours of lecture (Arslan & Şumuer, 2020) and all of these courses were also available on EBA platform. As a result, thanks to the FATİH project, the Turkish education system has reached a network to overcome the negative side effects caused by the COVID-19 pandemic.

Distance education is not a new concept, though. About 300 years ago, weekly stenography education was sent by mail in the USA and it was presented as distance education; however, the first institution, which applied distance education in 1858 was the University of London (Clark, 2020). Distance education can be defined as “teaching and planned learning in which teaching normally occurs in a different place from learning, requiring communication through technologies as well as a special institutional organization” (Moore & Kearsley, 2012, p. 2). Distance education can also be defined as “institution-based formal education where the learning group is separated, and where interactive telecommunication systems are used to connect learners, resources, and instructors” (Schlosser et al., 2009, p. 1). Even if there are some differences in the definitions, there should be four basic components in distance education (Simonson et.al., 2015) namely: (1) Distance education is an institutional action, (2) students and teachers are separated temporarily and physically; communication can be asynchronous or synchronous, (3) media tools such as television, phone or internet are applied for interaction between student-student, student-teacher, and student-material, but are not limited to electronic media, (4) teachers should be interactive, and related materials and/or sources that are necessary for education should be accessible anywhere anytime.

Distance education has two modes: synchronous and asynchronous (Clark, 2020). Asynchronous mode refers to distance education in which students can access learning materials anytime, and they focus on learning individually. The core of asynchronous mode is supported by learning management systems (Moodle, Blackboard, Sakai, etc.). Synchronous mode, on the other hand, refers to the distance education that is planned and practiced by teachers and students in different places at the same time, thanks to integrated conference management software (Zoom, Adobe Connect, Microsoft Teams, BigBlueButton, etc.) in Learning Management System.

Due to pandemic effects all over the world, the sudden switch to distance education has doubtlessly affected primary schools more adversely in education. Considering the developmental stages of primary school students, they are in the concrete operational stage and need concrete learning experiences, materials, and physical games; however, education in a virtual platform that may not be suitable for students' developmental stages has become a current issue. Relatively, teachers who do not have any experience in distance education had to deal with many struggles in this period as well. In Switzerland, a conducted study on primary and secondary school students' language and math performance after 8 weeks of distance education in the pandemic period, showed that secondary school students have not been adversely affected by distance education, while the academic performance of primary school students has been fallen by half (Tomasik et. al., 2020).

Though there is limited study on distance education practice in primary schools (Hilli, 2020), there have been many attempts to understand the effects of distance education during the pandemic in primary schools. In the related literature, there are some studies reflecting the ideas of primary school teachers, primary school students, and parents on distance education in the pandemic (F. Demir & Özdaş, 2020; Yurtbakan & Akyıldız, 2020), the satisfaction of primary school teachers on distance education (Korucuk, 2020), parents' opinions about students' experiences (Erol & Erol, 2020; İnci-Kuzu, 2020), the suitability of primary school curricula for distance education (Koç, 2021). Although there are some studies regarding in-service teachers' attitudes (Ağır et al., 2007; Uzunboyulu, 2007; Yahşi & Kırkıç, 2020) and pre-service teachers' attitudes (Bayram et al., 2019; Halitoğlu, 2021; Yenilmez et.al., 2017) on distance education in different subject-specifics, the concerned studies are still limited to focus particularly on primary school teachers' attitudes towards distance education.

In addition to literature based gap, there are three barriers to distance education/e-learning (Panda & Mishra, 2007) widely known as: (1) personal barriers (lack of knowledge, skills, training, role-models and time), (2) attitudinal barriers (not believing technology, unwillingness for technology use, anxiety on student communication) and (3) organizational barriers (insufficient technical support, equipment, software, teaching design and not knowing the value of online education). In these barriers, attitudinal prejudices are some of the most important barriers for the efficacy and transferability in the distance education (Ağır et al., 2007; Panda & Mishra, 2007; Yahşi & Kırkıç, 2020). Within this scope, as a keystone of educational changes, studying primary school teachers' attitudes towards distance education in the pandemic is significant for both getting success on distance education and presenting empirical evidence for policymakers and practitioners' decisions in the following procedures. Consequently, this study aimed to determine the primary school teachers' attitudes towards compulsory distance education in pandemic and the following questions are attempted to be answered:

- What are the primary school teachers' attitudes towards compulsory distance education in pandemic period?
- Is there any statistically significant difference in the primary school teachers' attitudes towards compulsory distance education during pandemic in terms of gender?
- Is there any statistically significant difference in the primary school teachers' attitudes towards compulsory distance education during pandemic in terms of age?
- Is there any statistically significant mean difference in the primary school teachers' attitudes towards compulsory distance education during pandemic in terms of teaching experience?

To address these questions, the researchers collected data from 173 primary school teachers. Independent samples t-test and one-way analysis of variance (ANOVA) were used to analyze the data. The research seeks to add to the growing diversity of global knowledge in primary school and distance education in the COVID-19 pandemic.

Method

Research Model

Survey model is used in studies that aim to determine participants' ideas, interests, skills, attitudes, etc. on a specific research field (Büyüköztürk et.al., 2009) for the aim of describing characteristic features of participants both individually and in groups (Fraenkel et.al., 2012). In this descriptive research, a survey model is used to examine the primary school teachers' attitudes towards distance education.

Participants

The research was conducted with the participation of 173 in-service primary school teachers working in public schools in one of the western provinces of Turkey. Not all participants had previous teaching experience of distance learning of adult or children students, rather they had face-to-face teaching experience. Since this study was conducted in the pandemic, the convenience sampling method was preferred to reach participants. Table 1 shows the demographic information of voluntarily and willingly participated teachers.

		<i>f</i>	%
Gender	Female	130	75.1
	Male	43	24.9
	Total	173	100
Age	21-31	112	64.7
	32-41	21	12.1
	42+	40	23.1
	Total	173	100
Teaching Experience	1-7	108	62.4
	8-14	38	22.0
	15+	27	15.6
	Total	173	100

Table 1. *Demographic Information of Participants*

Data Collection Tools

As for data collection instruments in the study, the personal information form designed by the researchers was used to get the demographic information of participants. To determine the attitudes of participants towards distance education, the “Attitude Scale Towards Distance Education” developed by (Ağır et.al., 2007) was used. This scale consists of two sub-dimensions and 21 items in total; it is designed as a five-point Likert-scales, namely, strongly disagree (1) to strongly agree (5). The scale consists of seven negative items. The lowest point that can be obtained from this scale is 21; the highest point is 105. The first sub-dimension is “The advantages of distance education”, with the lowest point as 14, the highest point as 70. The second sub-dimension is “The limitations of distance education”, with the lowest point as 7, the highest point as 35. Cronbach Alpha reliability coefficient was calculated as 0.835 for this scale (Ağır et. al., 2007). In this study, the Cronbach Alpha reliability coefficient was calculated as 0.85 for the first sub-dimension (The Advantages of Distance Education), and 0.75 for the second sub-dimension (The Limitations of Distance Education), and 0.85 on the total scale.

Data Collection

The scale was converted into a Google Form, and the access link was shared with 215 in-service primary school teachers via social media as Facebook, Instagram, and WhatsApp groups. In this form, teachers were informed about the research and it was announced that participation in the study was voluntary. The form was filled out by the 173 teachers within three weeks. The response rate of the scale was 80.5%, indicating an acceptable rate. When the responses stopped increasing, the data collection phase was completed and the data analysis phase was initiated. Since the form was digital and each question had to be answered, the data were obtained without any errors and missing values.

Data Analysis

To determine the statistical tests for data analysis, firstly, normal distribution rates of the data were examined. Since the coefficient of Kurtosis and Skewness scores of sub-dimensions and total scale were calculated between -1 and +1 (see Table 2), it was seen that there was no mean deviation in normal distribution scores (Hair et al., 2019). Since group scores and variances were normally distributed, independent samples t-test and one-way analysis of variance (ANOVA) test were used to analyze mean differences. Since the groups do not have an equal number of participants, the Scheffe test as one of the Post-Hoc Tests was used for mean differences between group average scores.

Cohen's *d* was used to report the effect sizes of the significant differences found in the results of the *t*-test and Scheffe test. The effect size values of 0.20, 0.50, and 0.80 were interpreted as small, medium, and large, respectively (Cohen, 1992). Also, 95% confidence intervals of the found effect sizes were given to provide additional evidence in effect sizes. Eta squared (η^2) was used to report the effect sizes of the significant differences according to results of ANOVA. The effect sizes values of 0.01, 0.06, and 0.14 were interpreted as small, medium, and large, respectively (Büyüköztürk, 2015).

The collected data were analyzed via the Jamovi program (The Jamovi Project, 2020). It was purposefully selected since it is a free and user-friendly software that uses R statistical program (R Core Team, 2019). In the data analysis process, the significance level is determined as .05 in this study.

Results

Primary School Teachers' Attitudes Towards Distance Education

The descriptive data of sub-dimensions and total scores on primary school teachers' attitudes in the Attitude Scale on Distance Education are presented in Table 2.

	Item	N	M	SD	Min	Max	Skewness	Kurtosis
ADE	14	173	38.4	10.6	14	65	-0.12	-0.26
LDE	7	173	14.9	5.0	7	30	-0.56	0.53
Total	21	173	53.3	13.0	21	84	-0.34	-0.17

Table 2. *Descriptive Findings on Attitude Scale toward Distance Education Scores*

Note. ADE: Advantages of Distance Education, LDE: Limitations of Distance Education

Primary school teachers' average scores on the "Advantages of Distance Education" were calculated as 38 and this value was lower than the general average (52) considering the total range (14 to 70) for this scale. This finding means that primary school teachers had negative attitudes on the advantages of distance education. Additionally, primary school teachers' average scores on the sub-dimension, namely the "Limitations of Distance Education", were calculated as approximately 15 and this value was lower than the general average (21) considering the total range (7 to 35) for this scale. This finding means that there are some limitations in distance education according to primary school teachers. The average of total scores was nearly 53 for this study and this value was lower than the general average (63) considering the total range (21 to 105) of the scale, indicating primary school teachers had negative attitudes towards distance education. To sum up, primary school teachers think that there are some limitations in distance education and it may not be very advantageous; therefore, they may have negative attitudes towards distance education.

Primary School Teachers' Attitudes Towards Distance Education in terms of Gender

Table 3 presents the descriptive data of sub-dimensions and total scores on primary school teachers' attitudes in the Attitude Scale on Distance Education and t-test results in terms of their gender. There was no significant difference between genders. It shows that gender is not a significant factor in attitudes towards distance education.

			N	M	SD	df	t	p
Advantages of Distance Education	Female	130	38.60	10.55	171	0.45	0.65	
	Male	43	37.80	10.89				
Limitations of Distance Education	Female	130	14.90	4.81	171	0.02	0.99	
	Male	43	14.90	5.41				
Total	Female	130	53.50	12.80	171	0.37	0.71	
	Male	43	52.70	13.77				

Table 3. *T-test results of Attitude Scale towards Distance Education Scores in terms of Gender*

Primary School Teachers' Attitudes Towards Distance Education in terms of Age

Table 4 presents the descriptive data of sub-dimensions and total scores on primary school teachers' attitudes in Attitude Scale on Distance Education, and one-way variance analysis (ANOVA) results in terms of their age. There was a significant difference in the average scores of the scale ($F = 5.41$, $p < .01$) in terms of age with medium effect ($\eta^2 = 0.06$). As for the sub-dimensions of this study, there was a significant difference in the "Advantages of Distance Education" with medium effect ($\eta^2 = 0.07$) for the general results ($F = 6.54$, $p < .01$); however, there was no significant difference in the "Limitations of Distance Education" ($F = 1.78$, $p > .05$). On the contrary, in all age groups, the participants had similar negative attitudes towards the limitations of distance education.

	(1) 21-31 Ages (n = 112)		(2) 32-41 Ages (n = 21)		(3) 42+ Ages (n = 40)		F	p	Scheffe test
	Mean	SD	Mean	SD	Mean	SD			
ADE	40.1	9.8	39.5	12.3	33.3	10.6	6.54	0.00	1 > 2 2 > 3
LDE	15.3	4.8	13.2	4.6	14.4	5.4	1.78	0.17	---
Total	55.4	11.8	52.7	14.5	47.7	14.5	5.41	0.00	1 > 3

Table 4. *An Analysis of Distance Education Attitude and Age*

Note. ADE: Advantages of Distance Education, LDE: Limitations of Distance Education

The reason for the mean difference between the score of the Attitude Scale on Distance Education and the scores of sub-dimensions were examined via the Scheffe test as one of the Post-

Hoc Tests. There was a mean difference in favor of the 21-32 age group with medium effect (Cohen's $d = 0.66$) when it is compared with the 42+ age group in general ($t = 3.28, p < .01$). These findings show that primary school teachers who are 21-32 years old had more positive attitudes towards distance education than primary school teachers who are 42+ years old, and there was no significant difference among other age groups. In the sub-dimension on the "Advantages of Distance Education", there was a significant mean difference in favor of 21-32 age group with medium effect (Cohen's $d = 0.60$) when it was compared with 42+ age group participants' scores ($t = 3.58, p < .01$). However, even if there was no significant difference between 32-41 and 42+ age groups ($t = 2.24, p > .05$), it can be accepted that there was a mean difference in favor of 32-41 age groups with medium effect (Cohen's $d = 0.60$) since there was no 0 value [0.07 - 1.14] in 95% confidence interval range scores. All of these findings state that the positive attitudes towards the "Advantages of Distance Education" are getting lower when the age of participants gets older. Besides, the most negative attitudes were seen in 42+ age group participants.

Primary School Teachers' Attitudes Towards Distance Education in terms of Teaching Experience

Table 5 shows the descriptive data of sub-dimensions and total scores on primary school teachers' attitudes in Attitude Scale on Distance Education and one-way variance analysis (ANOVA) results in terms of their teaching experience.

	(1) 1-7 Years (n = 108)		(2) 8-14 Years (n = 27)		(3) 15+ Years (n = 38)				
	Mean	SD	Mean	SD	Mean	SD	<i>F</i>	<i>p</i>	Scheffe test
ADE	40.4	9.7	35.9	9.2	33.9	12.5	5.72	0.00	1 > 2 1 > 3
LDE	15.5	4.7	13.2	5.1	14.7	5.0	3.10	0.04	1 > 2
Total	55.9	11.7	49.2	15.1	48.6	12.6	6.25	0.00	1 > 2 1 > 3

Table 5. An Analysis of Distance Education Attitude and Teaching Experiences

Note. ADE: Advantages of Distance Education, LDE: Limitations of Distance Education

As seen in Table 5, there was a significant mean difference ($F = 6.25, p < .01, \eta^2 = 0.07$) on the average scores of the scale in terms of teaching experiences with medium effect. For the sub-dimensions of this study, there was a significant difference ($F = 5.72, p < .01, \eta^2 = 0.06$) in the "Advantages of Distance Education" with medium effect. For the "Limitations of Distance Education", there was a significant mean difference ($F = 3.10, p < .05, \eta^2 = 0.04$) with medium effect.

The reason for the mean difference between the total scores of the Attitude Scale on Distance Education and sub-dimensions was examined via the Scheffe test. There was a significant mean difference in favor of 1-7 years in teaching experience with medium effect (Cohen's $d = 0.54$) when it was compared with 8-14 years ($t = 2.84, p < .05$). There was a significant mean difference again in favor of 1-7 years with medium effect (Cohen's $d = 0.54$) when it was compared with 15+ years ($t = 2.70, p < .05$). These findings show that primary school teachers who have been teaching for 1-7 years had more positive attitudes towards distance education than others

with 8-14 and 15+ teaching experience, and there was no significant difference between 8-14 and 15+-years groups.

According to Scheffe test results, the mean difference between average scores of the “Advantages of Distance Education” can be explained with the mean difference in favor of 1-7 years in the teaching experience group with medium effect (Cohen’s $d = 0.63$) when it is compared with 15+ years group participants’ scores ($t = 2.94, p < .05$). Even if there was no significant difference between the 1-7 and 8-14 years’ group ($t = 2.30, p > .05$), since there is no 0 value [0.06 - 0.81] in 95% confidence interval range scores the significant mean difference in favor of the 1-7 years’ group with medium effect (Cohen’s $d = 0.43$) was acceptable. All of these findings state that the positive attitudes towards the “Advantages of Distance Education” are getting lower when the participants’ years in teaching experience increase. The most negative attitudes were seen in 15+ years of teaching experience.

The mean difference between average scores of “Limitations of Distance Education” can be explained with the significant difference in favor of 1-7 years of teaching experience group with medium effect (Cohen’s $d = 0.47$) when it is compared with 8-14 years ($t = 2.48, p < .05$). It reflects that teachers with 8-14 years teaching experience considered distance education as limited when they are compared with other teaching experience groups.

Discussion

Politics and policymakers tend to use technology as a tool in problem-solving when struggling in educational systems, and this tendency does not change in this suffering period. Distance education takes a crucial role in the pandemic period to prevent problems in closed-up schools. This study aimed to search the attitudes of primary school teachers who have been highly affected by this compulsory distance education in pandemic. More specifically, with the participation of 173 primary school teachers, it was examined that whether there is a significant difference on attitudes towards compulsory distance education regarding age, gender, and teaching experience of primary school teachers.

The study concluded that primary school teachers have negative attitudes towards the advantages of distance education. Relatively, they think that distance education offers limited teaching experience in this period. This finding is contrasted to many studies in the related literature (Halitoglu, 2021; Yahşi & Kırkıç, 2020; Yenilmez et al., 2017). However, the participant group is limited to primary school teachers, and students in this level of education are in the concrete operational stage. These antecedents may result in similar and/or different teaching challenges experienced by different subject areas. Therefore, the findings should be discussed within this perspective. The barriers which are experienced by the primary school teachers on distance education in the pandemic are used in classifying the primary and secondary barriers in technology integration in education (Ertmer, 1999).

The experienced primary barriers in distance education can be summarized as inappropriate course contents with unattainable objectives, lack of feedback and ineffective communication in distance education (S. Demir & Kale, 2020); distractions of environmental factors (Arslan & Şumuer, 2020; S. Demir & Kale, 2020, İnci-Kuzu, 2020); lower levels of motivation, technical inaccessibility (Arslan, Şumuer, 2020; F. Demir & Özdaş, 2020; S. Demir & Kale, 2020; Fidan, 2020); insufficient assessment tools, problems in displaying current courses in EBA TV, limited time for online courses (F. Demir & Özdaş, 2020); problems in the use of EBA TV (Özdaş, 2020).

The secondary barriers are based on teacher related reasons. These barriers can be summarized, considering distance education, as lack of preparation (Fidan, 2020; Özdoğan & Berkant, 2020); lack of experience and knowledge (the lack of knowledge and skills), pressure in self-improvement (S. Demir & Kale, 2020), and limited activities (F. Demir & Özdaş, 2020). All of these barriers can explain the reasons for the negative attitudes of primary school teachers in distance education.

Furthermore, stated barriers are not only observed in Turkey. The conducted study in Hong Kong (Lau & Lee, 2020) reported that primary school students were not be able to complete the tasks individually. The report emphasizes that they needed to have much more materials to learn interactively, had problems in getting motivated and engaged in the courses, had concentration problems due to their parents, and had some technical and supplementary problems in this period. In another study conducted in Switzerland (Tomasik et.al., 2020), conclusions indicated that middle school students were not highly affected in this period when compared with primary school students. The results remark that primary school students' learning performance decreased to half in distance education compared to face-to-face education. In a similar finding by Erol and Erol (2020), it was noticed that the academic success of primary school students got lower in the distance education period and their parents had not mediated the individual learning successfully.

When the attitudes of primary school teachers were examined in terms of their gender, similar to the related literature (Halitoglu, 2021; Öneri-Uzun et al., 2020; Yahşi & Kırkıç, 2020), gender has not been a significant variable for the attitudes, since the mentioned barriers are experienced by both male and female teachers.

Concerning teaching experience, there was a significant mean difference in the attitudes of primary school teachers. The results showed that 1-7-year experienced teachers have more positive attitudes towards distance education than 8-14 or 15+ years. Also, as teaching experience has increased, the positive attitudes towards the advantages of distance education have been getting lower. 8-14-year experienced teachers stated more limitations resulting from distance education than 1-7-year ones. This finding supports previous studies in the literature (Uzunboylu, 2007; Yahşi & Kırkıç, 2020). These studies briefly explain that teachers in their early carriers have more positive tendencies to benefit from distance education.

Conclusions from primary school teachers' attitudes regarding age showed that there was a significant mean difference. The study explained that 21-32-year old primary school teachers had more positive attitudes towards distance education than 42+-year old teachers. As the age is getting older, positive attitudes are decreasing. Besides, the most negative attitudes are placed in the group of 42+-year old teachers. However, there was not a significant difference in the attitudes of primary school teachers about the limitations of distance education in terms of their age. The reason for this may be that young teachers take classes with more up-to-date instructional technologies and distance education in their initial teacher education. Indeed, respectively young teachers are exposed to courses practiced through distance education so that they are more familiar with its function. To exemplify, Paydar and Doğan (2019) examined the opinions of pre-service primary school teachers on distance education, and concluded that they generally had positive opinions and ideas on distance education. Connectedly, another study conducted with 236 candidate teachers from different disciplines concluded that candidate teachers' attitudes had a generally positive on distance education (Halitoğlu, 2021).

Implications for Research, Practice, Policymakers

The results of this study show that younger and low-experienced primary school teachers have more positive attitudes towards distance education in the pandemic than older and experienced ones. Therefore, it is suggested to practice blended learning in which younger teachers continue with distance education, and 45-65-year-old teachers sustain face-to-face teaching activities during the pandemic. In this way, the work load on distance education can be decreased and the huge pressure on older teachers can be controlled. Even the COVID-19 pandemic is over; future threats resulting from destroying forests can trigger new pandemic (Snowden, 2019). To be chary for these kinds of new pandemics, it is suggested that policymakers should create new policies as precautions for primary and secondary technology based barriers. After the pandemic, if policymakers, researchers, and practitioners want primary school teachers to use technology effectively in their classrooms, they should overcome the secondary barriers which are more significant for technology integration (Ertmer, 1999; Hew & Brush, 2007). Several studies which

are based on the technology acceptance model (TAM), the theory of planned behavior (TPB), and related theories show that the beliefs and attitudes of users are effective on the aim of using technology and attitudes toward it (Davis, 1989). In this sense, it is suggested to increase the positive attitudes of primary school teachers towards distance education. To do so, there can be professional development programs on distance education with contents including primary school students' developmental stages. Teachers can be grouped according to age and teaching experience, then a professional development program can be practiced referring to these groups. The beliefs, attitudes, intentions, and usage of technology can change in time depending on individual experiences and learning (Bhattacharjee & Premkumar, 2004). Therefore, to follow the changes in primary school teachers' attitudes towards distance education, it is suggested to conduct similar studies on this field, designed periodically to get information about the attitudes of primary school teachers towards distance education.

Limitations of the Study

Research findings are limited to a certain extend. The number of primary school teachers is small; therefore, the generalizability is low. This means that findings cannot be interpreted to reflect all primary school teachers in Turkey. However, research findings will make sense in understanding primary school teachers' attitudes towards distance education in the pandemic. Another limitation of the study is the high participation of young classroom teachers with little teaching experience. Similar studies can be conducted with more senior and more experienced teachers.

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The State of Primary School Third-Grade Pupils' Making Sense of the Concepts of "0" and "1"

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Abstract

This paper focuses on determining the opinions of primary school third-grade pupils about the conceptual meaning and use of the numbers "0" and "1". The current study employed the case study design, which is one of the qualitative research methods. In the selection of the sample, the criterion sampling method, one of the purposive sampling methods, was used. The study was conducted with the participation of a total of 114 third-grade pupils (58 girls and 56 boys) attending two state primary schools located in the city of Ankara in the fall term of the 2019-2020 school year. As the data collection tool, a semi-structured interview form developed by the researchers in relation to the concepts of "0" and "1" was used. In the analysis of the data obtained in relation to the concepts of "0" and "1", content analysis was used. The primary school third-grade pupils made sense of the number "0" in association with the categories of four operations, ineffective element, absorbing element, number, natural number, meaningless, valueless, absence, even number, beginning, and letter. The categories in which most thoughts about the meaning of the number "1" are gathered are number, ineffective element, and uniqueness. It was determined that the pupils are more successful in the use of the numbers "0" and "1" in the addition and subtraction operations than in the multiplication and division operations.

Keywords: Zero, One, Primary School, Problem

Introduction

Various problem situations are encountered in daily life. This ranges from what time to wake up in the morning to the time spent in traffic after work. It can be said that numbers and mathematics are used to overcome many of these problem situations. For this reason, numbers make human life easier and constitute an important part of life. According to Connor (2019), numbers give shape and texture to everything that is felt, said, imagined, and done. This feature and prevalence of numbers have found a place in one of the many definitions of mathematics. Mathematics is expressed as the common name of the sciences that examine the properties of quantities such as arithmetic, algebra, and geometry on the basis of numbers and measures (Toptaş & Olkun, 2007). Based on the definition, it can be stated that numbers are the basis of mathematics. It affects mathematics achievement because they improve pupils' math skills, counting, and thinking strategies which contribute to pupils' problem-solving skills (Baroddy, 1987; Hughes, 1989). Failure to grasp numbers and the relationships between them causes the problem-solving skills not to develop, and pupils develop a negative attitude towards mathematics due to failure in

problem solving (Başar, Ünal & Yalçın, 2002). Due to their importance in the development of mathematical skills, the relationship between numbers and arithmetic operations are addressed at different densities in the mathematics curriculums of all grade levels from preschool to higher education. This is especially at the primary school level where the objectives related to numbers and operations occupy an important place (Ministry of National Education [MEB], 2018; National Council of Teachers of Mathematics [NCTM], 2000). Therefore, the basis of the concept of number is laid in primary school years.

Number is a concept that has an abstract structure and is a product of the mind as it is intellectually created (Baykul, 2016; Witzel & Little, 2018). It is important for children to be exposed to meaningful experiences about numbers through activities at early ages as numbers are not only for counting but also form a basis for learning through understanding at more advanced levels (Haylock & Cockburn, 2013). Mathematics subjects addressed in the first years of primary school generally consist of natural numbers and four operations performed with natural numbers. The mathematical concepts encountered in the set of natural numbers are also encountered in other number sets. In addition, the teaching of natural numbers and four operations performed with natural numbers constitute the basis for the teaching of other number sets (Olkun & Toluk Uçar, 2018).

Since number information is a necessity of counting skill, the development of the concept of number is associated with the acquisition of counting skill (Aktaş Arnas, 2002). Counting is also the basis of mathematical operations, and every mathematical operation means counting (Connor, 2019). This is because counting-based approaches are generally used to teach four operations (Sarama & Clements, 2003). The four basic operations, addition, subtraction, multiplication, and division, are the basic operations in arithmetic, the broadest and most well-known branch of mathematics (Akkan, Baki & Çakıroğlu, 2011). Arithmetic includes finding the unknown based on the known with the help of the four basic operations, numbers and the relationships between numbers, four operations with numbers, and all calculations based on these four operations (Akkan, 2009). Numbers and counting are the basis of arithmetic, and arithmetic is the basis of mathematics (Albayrak, 2010). Therefore, knowledge of arithmetic requires knowledge of numbers. In this case, it can be said that the numbers 0 (zero) and 1 (one) require knowledge of their properties according to the operations in arithmetic, but they pose difficulties for pupils. The multiplication properties of 0 (zero) and 1 (one) may be confused by some pupils with their properties of addition. For example, regarding 0 (zero), while the result does not change in the " $6 + 0$ " operation, the result is always zero in the " 6×0 " operation. Similarly, regarding 1, in the " $1 + 4$ " operation, one more of the number is obtained, while the number remains the same in the " 1×4 " operation (Van de Walle, Karp & Williams, 2016). Therefore, the ability to perform the four operations by pupils depends on the discovery of numbers (Ferah, 2006). The discovery of numbers and the development of the concepts behind the rules and properties of the four operations can be accomplished through word problems and verbalizing numerical expressions (Van de Walle, Karp & Williams, 2016).

The concepts of counting and number, which can be seen as the basis of arithmetic, are among the concepts in whose definitions mistakes are commonly made (Albayrak, 2010; Yenilmez & Demirhan, 2013). In terms of the concept of number, it is seen that pupils often make mistakes in the use of the numbers 0 (zero) and 1 (one) (Arslan & Ubuz, 2015; Dinç Artut & Tarım, 2006; Haylock & Cockburn, 2013; Hughes, 1986; Sadi, 2007; Tall & Razali, 1993). Studies show that 0 (zero) and 1 (one) are two important numbers in the number system. In addition, although the concept of number is one of the concepts in which the most identification errors are made, it also forms the basis of the learning area of algebra (Paydar, Doğan & Şahin, 2019; Yenilmez & Demirhan, 2013). In the primary school period, it is important to determine how the numbers 0 (zero) and 1 (one) are perceived by pupils due to their unique characteristics, how these numbers are used when performing operations, and how these numbers are used in problem-posing processes. Numbers are used in almost every aspect of daily life. For this reason, students should learn numbers accurately, especially in primary schools, which are the basis of education.

Therefore, it is thought that it is important to determine the problems experienced by the students in the nominal and ordinal meaning of the number 0. Additionally, in order to eliminate the difficulties experienced in the numbers 0 and 1 regarding the properties of four operations, it must be determined first. Therefore, the primary aim of the current study is to determine the opinions of primary school 3rd grade pupils on the concepts of 0 and 1. To this end, the sub-aims that the study sought to answer is as follows: “What are the opinions of the primary school 3rd grade pupils about the meaning of the number 0?”, “What is the state of the primary school 3rd grade pupils’ using the number 0 in the four operations?”, “What is the state of the primary school 3rd grade pupils’ posing and solving problems using the number 0?”, “What are the opinions of the primary school 3rd grade pupils about the meaning of the number 1?”, “What is the state of the primary school 3rd grade pupils’ using the number 1 in the four operations?”, “What is the state of the primary school 3rd grade pupils’ posing and solving problems using the number 1?”

Literature Review

Numbers are not the names of objects or phenomena observed in nature, but are concepts formed in our minds during the counting process and are used to quantify the quantities (Yıldırım, 2010). In order to express the quantity of the multiplicities, the set reached by starting from the number "1" and continuing to infinity consecutively is called the set of counting number. The child uses counting numbers first. When 0 (zero) is added to the set of counting numbers, a set of natural numbers is obtained (Baykul, 2016).

When 0 (zero) is taken from the figural point of view, it results to the expressions “zero” as a word and “0” as a symbol in the language of mathematics (Haylock & Cockburn, 2013). Mathematical symbols (0, 1, 2, 3, +, -, <, >, %, etc.) are important tools used in conveying mathematical information (Olkun & Toluk Uçar, 2018). Sometimes, the 0 (zero) symbol is used to denote “nullity”, “nothing” or “absence”. If a child wins six stones while playing and then loses these six stones, then there is no stone left, 0 (zero) stone. If there is no seven-year-old child in a class, the seven-year-old group refers to the “empty set” (Haylock & Cockburn, 2013). While pupils do not experience difficulties in understanding this meaning of “0” denoting absence, they may have difficulties in comprehending the nominal and ordinal meanings that reveal the labelling and sorting features. According to Haylock and Cockburn (2013), the reason for this situation is that the counting feature of numbers is overemphasized. For example, representing a ground floor with 0 (zero) in the elevator or not using 0 (zero) in the sense of absence in the thermometer can cause difficulties for pupils (Güneş & Aydoğdu-İskenderoğlu, 2019). When its ordinal meaning in the ordering feature of numbers is considered, it is seen that 0 (zero) is as important as the other numbers because 0 (zero) can be the starting point on the number line, it represents the point before one, and it indicates the point that separates positive and negative numbers on the number line (Haylock & Cockburn, 2013). Another difficulty with zero is seen in multi-digit numbers. In multi-digit numbers, a false relationship is established between the word “hundred” and the symbol 0 (zero); for example, the placeholder property of the zero is difficult to grasp, as in the case of numbers “637” and “60037” (Arslan & Ubuz, 2015; Olkun & Toluk Uçar, 2018).

Another number concept that pupils have difficulty with is the number 1 (one). “One” is the nature of the bond that forms the common feature between one thing and another that can be counted as one. There are two forms of a number; the unity of the indivisibility whose part is the same and the first unit of a sequence when seen from the perspective of a situation referring to two or more than two (Connor, 2019). The difficulties experienced by pupils regarding the first meaning of the number “one” have been revealed by studies. Dinç Artut and Tarım (2006) asked primary school pupils to take number bars as many as the number “16” and then to show the number bars as many as the number in each digit. They concluded that number bars (10 pieces) equal to the number “1” in the tens place could not be modelled by the pupils. It is seen that in this error that emerged depending on the digit value, the pupils were unable to comprehend that ten

one numbers come together and form a ten in the sense of the unity of the indivisibility, each part of which is the same.

Understanding the concepts of “zero” and “one” can be difficult for children who are new to mathematics. As a result of this difficulty, mistakes can be made by children (Ashlock, 1994; Brown & Burton, 1978; Chick & Baker, 2005; Doğan, 2002; Engelhardt, 1977; Govindan & Ramaa, 2013; Kubanç, 2012; Önal, 2018; Radatz, 1980; Roberts, 1968; Sadi, 2007; Spooner, 2002; Tall & Razali, 1993; Thompson & Bramald, 2002; Varol & Kubanç, 2015; Yorulmaz & Önal, 2017; Young & O’Shea, 1981). However, learning numbers without making mistakes is important for mathematics education.

Method

In this section of the study, information about the research model, study group, data collection tool, data collection process, and data analysis is presented.

1. Research Model

Qualitative research is used to define and interpret the basic characteristics of individual and social events and phenomena by the researcher with an explanatory and interpretative perspective (Creswell, 2016; Neuman, 2010). The current study employed one of the qualitative research methods in the case study design. Case study is an approach involving the collection of in-depth information from multiple sources of information (observation, interview, audio-visual materials, documents and reports) about a real-life, current and constrained system (case) or multiple constrained systems in a given time and an in-depth and longitudinal examination of the analyzed data (Creswell, 2016; Flyvbjerg, 2006; Glesne, 2012). In this study, students' views on the numbers "0" and "1" and their usage in mathematics will be examined in depth. In this connection, this design was employed in the current study, as it was aimed to reveal and describe primary school third-graders' level of understanding the concepts of “0” and “1”.

2. Study Group

The study group of the current research was determined by using criterion sampling, which is one of the purposive sampling methods. In the current study carried out in the fall term of the 2019-2020 school year, the following criteria were used in the selection of the participants: being a third grade pupil and attending a state primary school. The reason why the study was carried out in the third grade of primary school is that the development of the concepts of "0" and "1" ends in this grade. Correspondingly, a total of 114 third-grade pupils (58 girls and 56 boys) attending two different state primary schools in the city of Ankara participated in the study. A great care was taken to involve pupils from different socio-economic levels in the study and schools were selected based on these criteria.

3. Data Collection Tool

In the current study, a semi-structured interview form developed by the researchers was used to collect data. The semi-structured interview form was developed to determine primary school third-grade pupils' level of understanding the concepts of “0” and “1” by reviewing the primary school math curriculum, teacher books, pupil textbooks, workbooks and related literature consisting of three parts. In the first part of the data collection tool, there are questions to determine how pupils make sense of the numbers “0” and “1”; in the second part, there are questions to determine their state of using the numbers “0” and “1”; in the four operations and in the third part, there are questions to determine their state of using the numbers of “0” and “1” in problem posing and problem solving. The semi-structured interview form prepared by the researchers was sent to two mathematics education experts and three classroom teachers, and also expert opinions were obtained. The semi-structured interview form was finalized by making arrangements regarding the appropriateness of the questions and procedures in line with the expert opinions and supporting with appropriate visuals. The form was piloted on 34 third-grade pupils who were studying at

another primary school that was not included in the study group. The semi-structured interview form, which is the final form that was given as a result of the pilot study, is presented below.

Number	Questions	Responses
1	What is/are the meaning(s) of this number?	
	Find the results of the operations given in the next column.	$5 + 1 =$ $6 - 1 =$ $4 \times 1 =$ $3 \div 1 =$
	Pose a word problem by using this number and find its result.	
0	What is/are the meaning(s) of this number?	
	Find the results of the operations given in the next column.	$3 + 0 =$ $7 - 0 =$ $2 \times 0 =$ $10 \div 2 =$
	Pose a word problem by using this number and find its result.	

Figure 1. Data collection tool regarding the numbers “0” and “1”

4. Data Collection Process and Consent

Necessary permissions were obtained from the administrators and teachers in the schools where the study would be carried out. The pupils were informed about the purpose of the study in the mathematics lesson together with the classroom teacher. After the necessary information was given, the interview form prepared by the researchers was applied individually to the third-grade pupils in the study group. Each interview lasted for 10-15 minutes. The interviews were also tape-recorded. The data obtained from the semi-structured interviews were organized.

5. Data Analysis

The data obtained regarding the concepts of “0” and “1” were analyzed by using the content analysis technique. The data analysis process included the following stages: Firstly, preparing and organizing data for analysis; Secondly, coding the data and reducing them to categories by combining codes; and finally the presentation of the data in the forms of figures, tables, and discussions (Creswell, 2016). Content analysis is defined as a systematic, repeatable technique in which some words of a text are summarized into smaller content categories with coding based on certain rules (Büyüköztürk, Kılıç Çakmak, Akgün, Karadeniz & Demirel, 2012). Coding and analyzing data is an analytical step. Organizing coding hierarchically is part of the analysis process (Gibbs, 2007; Glesne, 2012).

In-depth data collection, data triangulation, detailed description and consistency are taken into account in establishing the validity and reliability of the data obtained in qualitative research (Yıldırım & Şimşek, 2018). Written documents obtained from interview forms and audio recordings from the 114 primary school third-grade pupils participating in the study show that in-depth data were collected, and the data collected from different schools and socio-economic environments show that data triangulation was ensured. The data obtained from the pupils participating in the study were coded as Ö1, Ö2, With the analysis of the data as themes and sub-themes in line with the sub-problems and elicitation of the web of relationships, a detailed description was made. In order to increase the reliability, the coder reliability method was chosen, and a second researcher also carried out the coding of the data and the review of the coding. The data were re-coded by the second researcher and the coding consistency value was found to be

93.6%. As a result of the analysis, codes and categories for the concept of “0” and “1” were created, and the analyzed data were digitized and presented in tables. Sample statements from raw data and photographs from forms are included in the findings section in order to ensure the credibility of the results of the data analysis.

Results

Findings derived from the data are presented in tables in this part of the study. The data obtained in the context of research questions from the primary school third-grade pupils participating in the current study were collected under the following headings; the meaning of the numbers “0” and “1”, the state of their use in the four operations, word problem posing and solving, and the formation of themes and codes.

The opinions of the primary school third-grade pupils regarding the meaning of the number “0” are presented in Table 1.

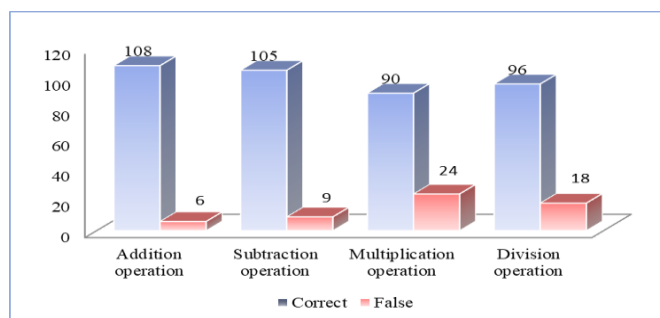
Category	Code	f
Four operations (24)	It is used in the addition, subtraction, multiplication, and division operations.	21
	It is used only in the multiplication operation.	2
	It cannot be found in the quotient of any number.	1
Ineffective element (45)	It means ineffective.	25
	It has no effect in the addition and subtraction operations.	20
Absorbing element (53)	It is the absorbing element in the multiplication operation.	47
	Multiply by whatever number the result will be 0.	6
Number (36)	It is the smallest number.	30
	It is a number.	4
	It is used to denote nothing as a number.	2
Natural number (6)	“0” is the natural number.	4
	It is the smallest of the natural numbers.	2
Meaningless (21)	It has no meaning.	19
	It alone doesn't mean anything.	2
	It means valueless.	7
Valueless (11)	It is a number that has no value on its own.	3
	If there is no number in front of it, it has no value.	1
Absence (73)	It means absence.	34
	It means nothingness.	34
	It represents the absence of an attribute.	4
	There is no digit value.	1
Even number (7)	“0” is an even number.	7
Beginning (6)	It is the beginning of numbers.	4
	It is the beginning of everything.	2
Letter (5)	It is a letter.	3
	It indicates the letter “O”.	2
Others (7)	Generally, there is a new meaning.	2
	Blood group.	1
	It has the meaning of empty and plain.	1

It means a circle.	1
It means unqualified.	1
The number I don't like.	1

Table 1. *The opinions of the primary school third-grade pupils regarding the meaning of the number "0"*

It can be seen in Table 1, from the responses of the primary school third grade pupils, the following categories of meaning for the number "0" were obtained: "absence (f=73)", "absorbing element (f=53)", "ineffective element (f=45)", "number (f=36)", "four operations (f=24)", "meaningless (f=21)", "valueless (f=11)", "even number (f=7)", "others (f=7)", "natural number (f=6)", "beginning (f=6)" and "letter (f=5)". The category most frequently emphasized by the primary school third grade pupils for the meaning of the number "0" is "absence" and in this category, the expressions used the most include "It means absence" and "It means nothingness". The expression used the most in the category of absorbing element is "It is the absorbing element in the multiplication operation". The expression used the most in the category of "ineffective element" is "It means ineffective". The expression used the most in the category of number is "It is the smallest number". The expression used in the category of "four operations" is "It is used in the addition, subtraction, multiplication and division operations". The expression used the most in the category of "meaningless" is "It has no meaning". The expression used the most in the category of "valueless" is "It means valueless". The expression used the most in the category of "even number" is "0 is an even number". The expression used the most in the "natural number" is "0 is a natural number". The expression used the most in the category of "beginning" is "It is the beginning of numbers" and the expression used the most in the category of "letter" is "It is a letter". In the category of others for the meaning of the number "0", the following expressions were stated; "Generally, there is a new meaning (f=2)", "blood group (f=1)", "It has the meaning of empty and plain (f=1)", "It means a circle (f=1)", "It means unqualified (f=1)", and "The number I don't like (f=1)".

The primary school third-grade pupils' state of using the number "0" in the four operations is given in Graph 1.

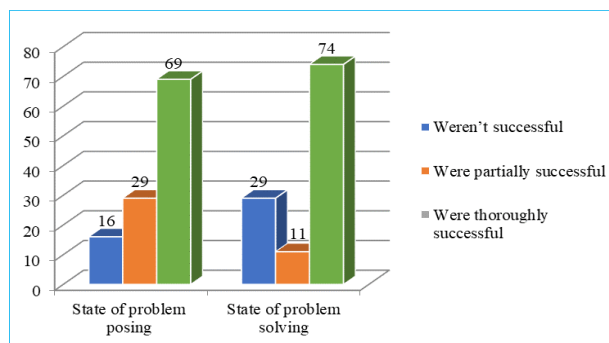


Graph 1. *Pupils' state of using the number "0" in the four operations*

When the primary school third-grade pupils' state of using the number "0" in the four operations was examined, it was seen that 108 of them used it correctly while 6 of them used it wrongly in the addition operation. In the subtraction operation, 105 of the pupils used it correctly while 9 of them used it wrongly. In the multiplication operation, 90 of the pupils used it correctly while 24 of them used it wrongly. In the division operation, 96 of the pupils used it correctly while 18 of them used it wrongly. The pupils made the largest number of mistakes in the multiplication operation while the smallest number of mistakes in the addition operation. The pupil coded as Ö23 used the number "0" correctly in all the operations and the pupil coded as Ö52 used it wrongly in the multiplication operation. Therefore, the photographs of the pupils showing the operations are given below.

Figure 2. Ö23 and Ö53's state of using the number "0" in the four operations

Findings related to the primary school third-grade pupils' state of posing and solving word problems including the number "0" are given in Graph 2.



Graph 2. Pupils' state of posing and solving a problem including the number "0"

When the primary school third-grade pupils' state of posing a problem using the number "0" was examined, it was seen that 69 of them were thoroughly successful in posing a problem; 29 of them were partially successful in posing a problem while 16 of them weren't successful in posing a problem. When the pupils' state of solving a problem including the number "0" was examined, it was seen that 74 of them were thoroughly successful in solving the problem; 11 of them were partially successful in solving the problem while 29 of them weren't successful in solving the problem. It is seen that the pupils were more successful in posing a problem including the number "0" than solving a problem including the number "0". The photos showing the correct use of the number "0" in posing and solving a problem by the pupils coded as Ö39 and Ö65 are shown below.

Figure 3. The use of the number of "0" in problem posing and solving by Ö39 and Ö65

The opinions of the primary school third-grade pupils regarding the meaning of the number "1" are presented in Table 2.

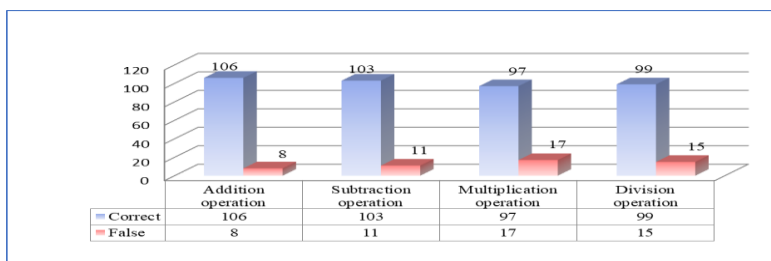
Category	Code	F
Four operations (25)	It is used in the addition, subtraction, multiplication, and division operations.	23
	We put it at the end of operations.	1
	It increases and decreases the number by one.	1
Ineffective element (43)	It is an ineffective number.	24
	If the number is multiplied by 1, the number does not change.	12
	It has no effect in the multiplication and division operations.	7
Uniqueness (32)	It is a unique number.	20
	It expresses the uniqueness of something.	10

	Something is unique.	1
	Uniqueness of God.	1
Number (44)	It is a number.	23
	It is the first of the numbers.	16
	It is the second of the numbers.	5
	It means the beginning.	14
Beginning (29)	It is the beginning of all numbers.	14
	It is the beginning of mathematics.	1
	It means unity.	9
Unity (12)	It can be used in the ones, tens, hundreds places.	3
	It means being the first.	9
First (14)	It means being the number 1.	4
	The number “1” always means being the first.	1
	While counting anything, it starts from 1.	5
Counting (7)	It comes after the number “0”.	2
	It is used to mean a number.	11
Number (23)	It is a natural number.	8
	It is the smallest natural number.	3
	A two-digit number can be written with “1”.	1
Being successful (6)	It means being a leader.	4
	It means being appreciated, being superior.	2
Priority (3)	It is the number that comes first.	2
	It means priority.	1
Others (3)	It is a number I like.	1
	It makes other numbers bigger.	1
	It doesn't evoke negative things.	1

Table 2. The opinions of the primary school third-grade pupils regarding the meaning of the number “1”

It can be seen in Table 2, from the responses of the primary school third grade pupils, the following categories of meaning for the number “1” were obtained: “number (f=44)”, “ineffective element (f=43)”, “uniqueness (f=32)”, “beginning (f=29)”, “four operations (f=25)”, “number (f=23)”, “first” (f=14)”, “unity (f=12)”, “counting (f=7)”, “being successful (f=6)”, “priority (f=3)” and “others (f=5)”. The category most frequently emphasized by the primary school third grade pupils for the meaning of the number “1” is “number” and in this category, the expression used the most is “It is a number”. The expression used the most in the category of “ineffective element” is “It is an ineffective number”. The expression used the most in the category of “uniqueness” is “It is a unique number”. The expressions used the most in the category of “beginning” are “It means beginning” and “It is the beginning of all numbers”. The expression used the most in the category of “four operations” is “It is used in the addition, subtraction, multiplication, and division operations”. The expression used the most in the category of “number” is “It is used to mean a number”. The expression used the most in the category of “first” is “It means being the first”. The expression used the most in the category of “counting” is “While counting anything, it starts from 1”. The expression used the most in the category of “being successful” is “It means being a leader”. The expression used the most in the category of “priority” is “It is the number that comes first”. In the category of others, for the meaning of the number “1”, the following expressions were stated; “It is a number I like (f=1)”, “It makes other numbers bigger (f=1)” and “It doesn't evoke negative things (f=1)”.

The primary school third-grade pupils' state of using the number "1" in the four operations is given in Graph 3.



Graph 3. Pupils' state of using the number "1" in the four operations

When the primary school third-grade pupils' state of using the number "1" in the four operations was examined, it was seen that 106 of them used it correctly while 8 of them used it wrongly in the addition operation. In the subtraction operation, 103 of the pupils used it correctly while 11 of them used it wrongly. In the multiplication operation, 97 of the pupils used it correctly while 17 of them used it wrongly. In the division operation, 99 of the pupils used it correctly while 15 of them used it wrongly. The pupils made the largest number of mistakes in the multiplication operation while the smallest number of mistakes in the addition operation. The pupil coded as Ö29 used the number "1" correctly in all the operations and the pupil coded as Ö78 used it wrongly in the division operation. Therefore, the photographs of the pupils showing the operations are given below.

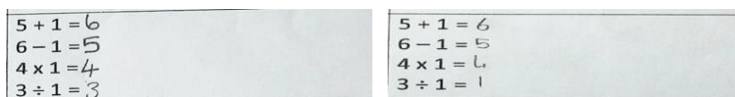
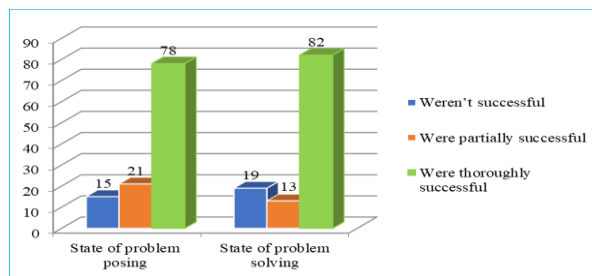


Figure 4. Ö29 and Ö78's state of using the number "1" in the four operations

Findings related to the primary school third-grade pupils' state of posing and solving word problems including the number "1" are given in Graph 4.



Graph 4. Pupils' state of posing and solving a problem including the number "1"

When the primary school third grade pupils' state of posing a problem using the number "1" was examined, it was seen that 78 of them were thoroughly successful in posing a problem; 21 of them were partially successful in posing a problem, while 15 of them weren't successful in posing a problem. When the pupils' state of solving a problem including the number "1" was examined, it was seen that 82 of them were thoroughly successful in solving a problem; 13 of them were partially successful in solving a problem, while 19 of them weren't successful in solving a problem. It was noted that the pupils were more successful in posing a problem including the number "1" than solving a problem including the number "1". The photos showing the correct use of the number "1" in posing and solving a problem by the pupil coded as Ö57, shows the correct use of the number "1" in posing a problem but is wrongly used in solving a problem by the pupil coded as Ö89. It also shows the wrong use of the number "1" in posing and solving a problem which is given below.

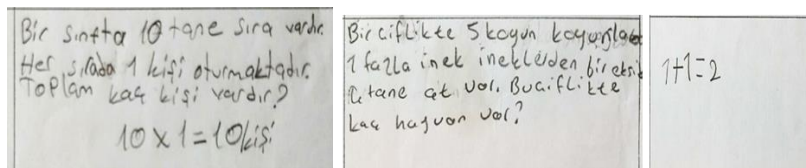


Figure 5. Ö57, Ö89 and Ö49's use of the number "1" in problem posing and solving

Discussion

The concepts of counting and numbering, which can be seen as the basis of arithmetic, are among the concepts in whose definitions mistakes are commonly made (Albayrak, 2010; Yenilmez & Demirhan, 2013). In terms of the concept of number, it is seen that students often make mistakes in the use of the numbers 0 (zero) and 1 (one) (Arslan & Ubuz, 2015; Dinç Artut & Tarım, 2006; Haylock & Cockburn, 2013; Hughes, 1986; Sadi, 2007; Tall & Razali, 1993). For this reason, this study was conducted to determine how the numbers 0 (zero) and 1 (one) are perceived by pupils, how these numbers were used in the four operations, and how these numbers were used in problem-posing processes.

In the current study, the category of "absence" was strongly emphasized, and the expressions used the most in this category are "It means absence" and "It means nothingness". When the meanings assigned to the number "0" by the pupils were examined, it was seen that the pupils generally had the perception of it as a cardinal number and that they did not emphasize its meaning related to place value. The reason why the cardinal meaning of 0 (zero) is emphasized intensely by the pupils can be shown because greater emphasis is placed on the multiplicity feature of the number in mathematics lessons. As a result of bringing the cardinal meaning of 0 (zero) to the fore, it is thought by the pupils that it has only the meaning of absence, causing them to have the perception that 0 (zero) in any place means absence and has no meaning. However, the presence of 0 (zero) in any digit is used instead of the absent digit and acts as a placeholder (Arslan & Ubuz, 2015; Olkun & Toluk Uçar, 2018). Chick and Baker (2005), in their study of primary school teachers' pedagogical content knowledge, examined how the teachers would react to some possible situations involving misconceptions and mistake by pupils. Consequently, they concluded that the placeholder property of 0 (zero) and the absorbing element property in the multiplication operation were given as operational information by the teachers and that it was emphasized by one teacher that 0 (zero) in a digit does not mean nothingness. The finding obtained from the study conducted by Chick and Baker (2005) with teachers shows the reason why the absence meaning of 0 (zero) was overemphasized in the current study.

In the study, it is seen that the primary school third-grade pupils have information about the two properties of 0 (zero); an ineffective element in the addition operation and an absorbing element in the multiplication operation. However, when the meanings that the pupils attributed to 0 (zero) are examined, it can be stated that they have a misconception. It was concluded that for the number 0 (zero), which is an effective element in the addition operation, the pupils also thought that it has no effect in the subtraction operation. However, the reason for their not being aware of the fact that the number 0 (zero) serves different functions depending on its being within the minuend or the subtrahend may be because of the generalization of the feature of 0 (zero) being an ineffective element in the addition operation to the subtraction operation.

On the other hand, the pupils were more successful in using 0 (zero) in the addition and subtraction operations than in the multiplication and division operations. This finding of the current study concurs with the finding reported by Sadi (2007). Sadi (2007) stated that many mistakes were made by pupils of all ages in the multiplication and division operations, and the use of zero in the multiplication and division operations was found to be the source of many mistakes and misunderstandings. On the other hand, in the current study, the pupils made the most mistakes in the multiplication operations and the fewest mistakes in the addition operations in the use of 0 (zero). In a study conducted on the use of 0 (zero) by pupils, it was concluded that the pupils found

a number other than zero as a result of multiplying a number by zero. Based on the reason for this situation, the pupils' difficulty in interpreting multiplication by zero was shown, and it was stated that zero represents nothingness for many pupils (Rees & Barr, 1984; as cited in Sadi, 2007). One of the mistakes made due to the use of zero in the subtraction operation is that when any number is subtracted from zero, the rest is zero and borrowing from zero (Brown & Burton, 1978; Hughes, 1989).

Another concept that is examined about pupils' opinions in the study is the number 1 (one). While it is difficult for children to learn the numerical meaning of "one" in the context of counting, "one" is more common in talking to children as a quantitative marker than being embedded in a counting routine. However, it is easy to grasp it in this way (Carey, 2009). The fact that the study was conducted on the primary school third-grade pupils and that the number of conversations in which these pupils encounter with the number of 1 is high can explain the meanings assigned to this number in the current study.

A pupil participating in the study said that the number 1 (one) "increases the number by one, decreases the number by one" and thus drew attention to a situation that allows the flexible use of the number and the better understanding of the number. According to the Peano axioms, each natural number has a successor and a predecessor, and it is possible to obtain this successor or predecessor number with 1 (one). Rips, Bloomfield and Asmuth (2008) expressed the ability to reach " $n + 1$ ", which is the successor of any " n " number in natural numbers, as forward counting and stated that this is the proof of the knowledge of the number system. It can be stated that one of the pupils participating in the study grasped that the number "1" is required to obtain the successor and predecessor of a number. In other words, he/she has the forward counting knowledge about numbers. In the current study, the following expressions were uttered by pupils within the category of "number"; "It is the first of the numbers" and "It is the second of the numbers".

These two expressions might show that the ordinal meaning of the number "1", which includes the ordering direction of this number, is not fully understood by the pupils. According to Rips, Bloomfield and Asmuth (2008), the succession-premise relationship between 0 and 1 is a relative situation. According to Rips et al., in many theories "1" is regarded as the first number term because of its position in the array of number terms and its role in counting. However, these assumptions do not fully explain that the "1" rules out "0" as the starting number. However, the objectives in the learning area of numbers and operations in primary schools in Turkey are limited to natural numbers and according to the Peano axiom, the number "0" is not the successor of any number but is the predecessor of the number "1" (Delil, 2010; MEB, 2018). In this case, it can be said that the primary school third-grade pupils participating in the current study have erroneous thoughts about the first element of the natural number set.

Conclusion

In the current study, it was concluded that the primary school third-grade pupils made sense of the number (zero) in association with the categories of four operations, ineffective element, absorbing element, number, natural number, meaningless, valueless, absence, even number, beginning, and letter. In the "absorbing element" category obtained for the meaning of the number 0 (zero), the following expressions were used by pupils to define it; "It is the absorbing element in the multiplication operation" and "Multiply by whatever number the result will be 0". In the category of "ineffective element", the following expressions were used by pupils to define it; "It means ineffective" and "It has no effect in the addition and subtraction operations". On the other hand, the pupils were more successful in using 0 (zero) in the addition and subtraction operations than in the multiplication and division operations. When the primary school third-grade pupils' state of posing a problem using the number "0" was examined, it was seen that 69 of them were thoroughly successful in posing a problem; 29 of them were partially successful in posing a

problem while 16 of them were not successful in posing a problem. Furthermore, the pupils were found to be more successful in posing problems including 0 (zero) than in solving such problems.

When the pupils' opinions about the meaning of 1 (one), which is another concept examined in the current study, were examined, a total of 12 categories were reached. The categories including the highest number of pupil opinions about the meaning of 1 (one) were found to be number, ineffective element and uniqueness, respectively. The expression used the most in the category of "number" is "It is a number"; the expression used the most in the category of "ineffective element" is "It is an ineffective number"; and the expression used the most in the category of "uniqueness" is "It is a unique number". Other expressions used in the category of "uniqueness" are "It expresses the uniqueness of something" and "Something is unique". When the pupils' state of using the number "1" in mathematical sentences including the four operations was examined, it was seen that they were more successful in the addition and subtraction operations than the multiplication and division operations as with the number "0". On the other hand, the pupils made the most mistakes in the multiplication operations and the fewest mistakes in the addition operations in the use of the number "1". When the primary school third-grade pupils' state of posing a problem using the number "1" was examined, it was seen that 78 of them were thoroughly successful in posing a problem; 21 of them were partially successful in posing a problem while 15 of them were not successful in posing a problem. The pupils were found to be more successful in solving problems including the number "1" than posing problems including the number "1".

Recommendations

Considering the findings of the current study, the following suggestions can be made. In the learning-teaching process, rich examples of the meanings of the numbers "0" and "1", its relationship with the properties of the four operations, and teaching about the use of the number "0" in multi-digit numbers can be given. In teaching the concepts of number and counting to primary school pupils, conversations and concrete objects including daily life situations can be used. Studies at other grade levels can also be conducted to determine the meanings attributed to the numbers "0" and "1" and the difficulties in using these numbers in arithmetic operations. It should be considered that a different learning style is required for each individual, and each student should be supported to attribute meaning to the numbers "0" and "1" in different ways. Studies that examine the relationship between students' interpretation of numbers "0" and "1" and their mathematics achievement can be conducted. Research can be conducted on students' understanding of numbers "0" and "1" and associating mathematics with daily life.

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Interpersonal Problem-solving Skills Analysis: 5–8 Years Old Children’s Different Variables

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Abstract

This study evaluates the interpersonal problem-solving abilities of 5-8 years old children in terms of different variables. The differentiation of interpersonal problem solving skills of 5-8 years old children attending preschool and 1st grade of primary school according to the demographic characteristics (child's gender, parents' age, parents' education, parents' occupation) was investigated. From among the quantitative research methods the survey model was employed. The research study group is composed of 5-8 years old children during the 2020-2021 school year in independent kindergarten, preschool and the first two grades of primary school, which are affiliated with the Directorate of National Education in Ercis District of Van-Turkey. The data of the research was collected by the “Personal Information Form” developed by the researcher and the “Child Interpersonal Relations and Attitudes Assessment (CIRAA)” developed by Holliman (2010) which was adapted to Turkish after being tested for validity and reliability. 452 children were subjected to the “Child Interpersonal Relations and Attitudes Assessment (CIRAA)” and “Personal Information Form” during the data collection process. Materials in the scale were directed to only one of the parents of 452 children and the answers given were marked. According to the research results, children’s interpersonal problem-solving abilities differ significantly in terms of gender as a variable. It has been observed that the interpersonal problem-solving abilities of children differs significantly in terms of the occupation of the father, as well as the the age and education level of the mother. In subsequent studies, comparative studies are recommended, together with the measurement tools applied by children.

Key Words: Interpersonal problem solving skills, interpersonal relationships, early childhood education

Introduction

The word problem is a concept based on the Latin word "Problema." Its meaning is derived from the word proballo, which is "prominent obstacle." As a world, the word problem is used as "issue" in Arabic (Kalaycı, 2001). There are many different definitions of the term, problem. According to Dewey, a problem is, "Everything that confuses the human mind structure, challenges our minds, and puts belief into uncertainty." Cuceloglu (1997) states that a problem occurs when a goal that an individual wants to reach is blocked. According to Bingham (2004), problems are obstacles against an individual's efforts to achieve a goal. Problems are situations or events that require time to solve (Sheffield & Cruikshank, 2005). In gaining a place in society, children should

acquire social skills such as solving the problems they encounter in their environment and maintaining interpersonal communication. According to Anlıak and Dincer (2005a), one of the skills required in social life is to communicate and interact with other people. It is normal for people to encounter interpersonal problems and difficulties during this communication. Since they are in the process of socializing, the children who start school encounter several interpersonal problems in the school environment (Cüceloğlu, 1997). Children who gain the skills to solve interpersonal problems in early childhood can establish high-quality and better relationships in their future lives (Anlıak & Dincer, 2005a; Dincer & Göktas, 2019; Yoleri, 2014).

Early childhood can construct a healthy future, but it can be the basis of the problems to be encountered in the future life as well (Anlıak, 2004; Çağdaş & Secer, 2002; Oktay, 1992). Children face various problems related to daily life in the preschool period (Yıldırım, 2019). They may encounter bad examples, and since they learn very fast unwanted behavior may occur due to these examples. In such a case, the reasons behind the unwanted behavior should be identified (Kargı & Erkan, 2004). Determining the causes of the encountered problems and developing solutions to solve them provides an opportunity for children to evaluate their efforts and come up with new ideas (Thornton, 1998). Preschool education programs' objectives should include providing interpersonal problem-solving skills and establishing healthy relationships (Anlıak & Dincer, 2005b). According to Dekovic, Slagt, Asscher, and Boendermaker (2011), supporting social skills in the early years of childhood helps exhibit positive behaviors and reduce problem status. With the social change of the world, children may face various problems due to decreasing social support, incorrect use of technology, stress, and difficulties in daily life (Battistich et al. 1989). However, children may not be adequately equipped to solve these problems (Atıcı, 2008). To solve social problems, children should gain communication skills and work collaboratively; express their feelings and thoughts; grasp and understand the perspectives of individuals with different lifestyles, daily needs, and characteristics; use effective problem-solving skills when their interests, needs, beliefs, and ideas conflict.

Children who have problem-solving skills cope better with the difficulties of daily life (Battistich et al. 1989). Also, children who receive adequate adult support in the face of these problems and can solve their problems will gain many competencies such as self-expression, entrepreneurship, creativity, and self-confidence (Yıldırım, 2019).

This study aims to determine and evaluate children's interpersonal problem solving skills in terms of different variables to develop them. Supporting interpersonal relationships in early childhood is important for the social development and improvement of academic skills in the following years. Problem-solving skills that people have are very important during their interactions with each other. According to Ocak (2010), early positive relationships between children and adults are critical in the acquisition of children's interpersonal problem-solving skills and has an important role in how a child negotiates the conflicts and manages relationships with peers. Regarding the relevant literature, the studies involving the support and development of children's interpersonal problem-solving skills in Turkey are limited (Alemdar-Coşkun, 2016; Anlıak, 2004; Bal, 2013; Dilber, 2015; Dinçer, 1995; Dincer and Göktac, 2019; Kaytez and Kadan, 2016; Kesicioğlu, 2015; Mercan, 2019; Özdiş, 2008; Yoleri, 2014), and the existing studies were conducted in recent years. Therefore, evaluating interpersonal problem solving skills in terms of different variables will reveal children's problem solving skills and help to support them.

Methodology:

In this study, the survey model, one of the quantitative research methods, was used. The survey model is a research model that aims to collect data for revealing certain characteristics of a group. (Buyukozturk et al. 2008). In this study, the differentiation of interpersonal problem solving skills of 5-8 years old children attending preschool and 1st grade of primary school according to the demographic characteristics (child's gender, parents' age, parents' education, parents' occupation) was investigated. For this purpose, the following question was addressed:

Do interpersonal problem solving skills of children attending preschool education institutions and 1st grade differ according to the following variables?

- a) Child's gender,
- b) Mother's age,
- c) Father's age,
- d) Mother's education,
- e) Father's education,
- f) Mother's occupation,
- g) Father's occupation

Study Group

The study group consists of 5-8 years old children in the Ercis district of Van in the 2020-2021 academic year, who were attending independent kindergartens affiliated to Ercis District National Education Directorate, kindergartens within the primary school, and 1st-grade students. The study aims to examine children's interpersonal problem solving skills in terms of different variables. The data collection tool of the study was the "Child Interpersonal Relationships and Attitudes Assessment (CIRAA)," and it should be filled by the parents of the children who were included in the study (mother or father). Accordingly, the "Child Interpersonal Relationships and Attitudes Assessment (CIRAA)" and "Personal Information Form" were administered to the parents of 452 children. The study group was selected using the convenience sampling method, which brings speed and practicality to the study. In this method, the researcher determines a working group close and easily accessible (Yıldırım & Simsek, 2006). Frequency analysis was conducted to measure the sociodemographic characteristics of the children in the study group and their families in Table 1.

Variable	Group	N	%
Child's gender	Female	236	%52.2
	Male	216	%47.8
Mother's Age	29-year-old or younger	150	%33.2
	30-39-year-old	251	%55.5
	40-49-year-old	49	%10.8
	50-year-old or older	2	%0.4
Father's Age	29-year-old or younger	33	%7.3
	30-39-year-old	286	%63.3
	40-49-year-old	117	%25.9
	50-year-old or older	16	%3.5
Mother's Education	Primary or Secondary School Graduate	241	%53.3
	High School Graduate	110	%24.3
	University Graduate	89	%19.7
	Post Graduate	12	%2.7
Father's Education	Primary or Secondary School Graduate	138	%30.5
	High School Graduate	147	%32.5
	University Graduate	145	%32.1
	Post Graduate	22	%4.9
	Housewife	377	%83.4

Mother's Profession	Civil servant	45	%10.0
	Worker	4	%9.0
	Self-employed	10	%2.2
	Other jobs	16	%3.5
Father's Profession	Unemployed	18	%4.0
	Civil servant	133	%29.4
	Worker	101	%22.3
	Self-employed	115	%25.4
	Other jobs	85	%18.8

Table 1. Demographic Information of the Children in the Study Group

Regarding the participants' answers, as seen in Table 1. 47.8% of the 452 children are boys, and 52.2% are girls. 50% attend preschool, and 50% are 1st grade. Regarding the ages of the mothers, there are 150 (33.2%) children whose mother is younger than 29, 251 (55.5%) children with 30-39-year-old mother, 49 (10.8%) children with 40-49-year-old mother, and 2 (.4%) children whose mother is older than 50. Regarding the ages of the fathers, there are 33 (%7.3) children whose father is younger than 29, 286 (%63.3) children with 30-39-year-old father, 117 (%25.9) children with 40-49-year-old father, and 16 (%3.5) children whose father is older than 50. The education of the mothers is as follows: 241 (53.3%) mothers are primary and secondary school graduates, 110 (24.3) are high school graduates, 89 (19.7%) are university graduates, and 12 (2.7%) of them have a master's degree. The education of the fathers is as follows: 138 (%30.5) fathers are primary and secondary school graduates, 147 (32.5) are high school graduates, 145 (%32.1) are university graduates, and 22 (%4.9) of them have a master's degree. The occupations of the mothers are: most of them, 377 (83.4%), are housewives, 45 (10%) mothers are civil servants, 4 (9%) of them are workers, 10 (2.2%) are self-employed, and the number of mothers doing other occupations is 16 (3.5%). The occupations of the fathers are: 18 (%4) of them are unemployed, 133 (%29.4) fathers are civil servants, 101 (%22.3) of them are workers, 115 (%25.4) are self-employed, and the number of fathers doing other occupations is 85 (%18.8).

Data Collection Tools

"Child Interpersonal Relationships and Attitudes Assessment (CIRAA)" developed by Holliman (2010) and "Personal Information Form" were used in the study to examine children's interpersonal problem solving skills in terms of different variables.

Child Interpersonal Relationships and Attitudes Assessment Instrument (CIRAA)

CIRAA was developed as a parent report instrument congruent with child-centered play therapy philosophy by Holliman (2010).

Holliman (2010) had studied, several steps in developing the Child Interpersonal Relationships and Attitudes Assessment (CIRAA): first procedures were taken to develop the instrument and generate items. Second, steps were taken to ensure face validity. Third, a pilot study and analysis of initial pilot study data were conducted. Fourth, a sample of 136 children from local elementary schools were administered a battery of instruments, including the CIRAA. Finally, analyses were conducted to establish factor structure, scale reliability, inter-item reliability, concurrent validity and scale sensitivity. Five categories were derived from the literature review and parent interviews and items were developed for the instrument. Cronbach's alpha was conducted for total scale and all subscales and reliability scores for the total score and subscales were acceptable, with an overall reliability coefficient of .93 (Holliman, 2010).

The categories/subscales are: ***social skills, self-concept, disruptive behaviors, self-direction/self-responsibility, and coping skills.***

The validity and reliability studies of the scale were conducted by Celebi and Seker (2020) in Turkey. The adaptation study of the scale was carried out, 300 parents in Van-Turkey and overall reliability coefficient (α) was 0.68; a scale with Cronbach's Alpha value between 0.60 and 0.79 is within acceptable limits except reliability (Alpar, 2016). And according to Celebi and Seker's

study, the scale results show that the CIRAA is a valid and reliable tool for evaluating the interpersonal problem solving skills of children in Turkey (2020). The CIRAA carries the evaluation criteria of interpersonal problem solving skills, it was chosen by taking expert opinions. The expert opinions about the scale items focused on three main titles; early childhood process, culture and language. The assesment scale CIRAA not only tend to be focused on problem behaviors of children, but also is focused on internal factors such as self-direction or self-acceptance (Holliman, 2010).

In this study the CIRAA scale is used to determine interpersonal problem-solving skills of the children. There are 30 items in the inventory, and the items are measured by a 5-point Likert-type scale consisting of the options "I strongly agree, agree, undecided, disagree and strongly disagree."The administration of the scale takes 8-10 minutes and is filled by the parents. Cronbach Alpha internal consistency coefficient was referred to in order to establish reliability of this study. As a result of the statistical analysis, Cronbach Alpha internal consistency coefficient was found as .82. According to Tezbasaran (1997) a reliability coefficient deemed satisfactory in a scale should be close to 1 as much as possible and so according to these results, reliability of the scale can be said to be at a high level.

Findings and Conclusion:

Independent t-test was performed to reveal the significance of the difference between interpersonal problem-solving skills according to the gender of the children in Table 2.

Group	N	Average	Standard Deviation	T	Df	P
Female	236	2.0373	.46752	-2.281	450	.023
Male	216	2.1422	.50985	-2.272	436.654	.024

Table 2. Children's Gender: T-test Analysis for Interpersonal Problem-Solving Skills

As seen in Table 2. the result of the t-test performed to compare children's Interpersonal Problem-Solving Skills, a significant difference was found between genders ($p > 0.05$). It was found that boys have higher interpersonal problem-solving skills than girls. A significant difference was found between the interpersonal problem-solving skills of the children according to gender. Kaytez and Kadan (2016) found in their study that boys' destructive problem-solving cases were higher than girls'. Similarly, in the study conducted by Dilber (2015), boys' average peer compelling solution scores were higher than girls'. On the other hand, according to Apaydin-Demirci, Arslan, and Temel (2020), girls are more successful in solving interpersonal problems than boys. Crombie and Gold (1989) have found that girls' problem-solving skills are higher than boys'. Walker, Irving, and Berthelsen (2002) reported that girls produce more perfect answers to social problems than boys. The reason for the different results in these studies may be due to working with different sample groups. Besides, when there is a problem among the boys, they do not think emotionally; they develop effective solutions and eliminate the problem without further ado. For example, Düz (2016) found that the average scores of the solutions that boys generated for the peer problems were higher than girls'.

Group	N	\bar{x}	SD	Var. K	KT	df	KO	F	P
29-year-old or younger	150	2.1686	.52387	Between Groups	2.424	3	.808	3.413	.017
30-39-year-old	251	2.0324	.46764	Within Group	106.070	448	.237		

40-49-year-old	49	2.1419	.46783	Overall	108.494	457			
50-year-old or older	2	1.5714	.00000						
Overall	452	2.0874	.49047						

Table 3. Child's Mother's Age: One-Way Variance Analysis for Interpersonal Problem-Solving Skills

As seen in Table 3. statistically significant difference was found in the One-Way Variance analysis performed to test whether the Interpersonal relationships and attitudes of the participants differed significantly according to the mother's age ($p < 0.05$). Since the variances of the groups were homogeneously distributed, the Tukey Test, one of the Post-Hoc tests, was used to reveal the source of the difference (95% confidence) in Table 3.1.

(I) Mother's Age	(J) Mother's Age	Average Difference (I-J)	Standard Deviation	P	95% Confidence Interval	
					Lower Limit	Upper Limit
29-year-old or younger	30-39-year-old	.13613*	.05022	.035	.0066	.2656
	40-49-year-old	.02669	.08006	.987	-.1798	.2331
	50-year-old or older	.59714	.34635	.312	-.2960	1.4903
30-39-year-old	29-year-old or younger	-.13613*	.05022	.035	-.2656	-.0066
	40-49-year-old	-.10944	.07599	.475	-.3054	.0865
	50-year-old or older	.46101	.34543	.541	-.4298	1.3518
40-49-year-old	29-year-old or younger	-.02669	.08006	.987	-.2331	.1798
	30-39-year-old	.10944	.07599	.475	-.0865	.3054
	50-year-old or older	.57046	.35102	.365	-.3347	1.4756
50-year-old or older	29-year-old or younger	-.59714	.34635	.312	-1.4903	.2960
	30-39-year-old	-.46101	.34543	.541	-1.3518	.4298

	40-49-year-old	-.5704 6	.35102	.36 5	- 1.4756	.3347
* The average difference is significant at 0.05 level.						

Table 3.1. Tukey Test Results

The comparison of Interpersonal Problem-Solving Skills according to mothers' age in Table 3.1. shows that the highest average belongs to the 29-year-old or younger mothers group ($X = 2.16$). This is followed by 40-49-year-old ($X=2,14$) and 30-39-year-old mothers ($X=2.03$); the lowest average is observed in the 50-year-old or older mothers group ($X=1,57$). The direction of the difference was found as (29-year-old or younger) > (30-39-year-old). Children whose mothers are 29-year-old or younger have higher interpersonal problem-solving skills than children whose mothers are 30-39-year-old.

A significant difference was found between children's interpersonal problem-solving skills according to the mother's age. Ozyürek et al. (2018) reported that problem-solving skills scale scores of the children whose mothers were 26-30-year-old were higher than those of children whose mothers were 31-35-year-old. The result of this study is in line with the result of the current study. On the other hand, in the study conducted by Dilber (2015), the scores that children whose mothers were 31-35-years-old achieved from the mother solution and total solution sub-dimensions of the interpersonal problem-solving test were higher than the scores of the children whose mothers were under 30-year-old. However, no significant difference was found in other sub-dimensions. The different results in the studies can be explained by the attitudes of mothers towards their children.

One-way analysis of variance was performed to determine the significance of the difference in interpersonal problem-solving skills by the children's fathers' age in Table 4.

Group	N	\bar{x}	SD	Var. K	KT	Df	KO	F	P
29-year-old or younger	33	2.2136	.62781	Between Groups	.572	3	.191	.791	.499
30-39-year-old	286	2.0798	.48605	Within Group	107.922	448	.241		
40-49-year-old	117	2.0716	.46948	Overall	108.656	452			
50-year-old or older	16	2.0804	.40095						
Overall	452	2.0874	.49047						

Table 4. Child's Father Age: One-Way Variance Analysis for Interpersonal Problem-Solving Skills

In view of Table 4. as a result of the variance analysis, no significant difference was found between children's interpersonal problem-solving skills according to the father's age. Mercan (2019) found in his study that there was no significant difference between the scores of children on the problem-solving scale according to the father's age, which supports the result of the current study. In the study conducted by Dilber (2015), the peer/mother total solution scores of children whose fathers were 31-35-year-old were higher than those whose fathers were 30-year-old and

younger. In the same study, no significant difference was found between the scores that children achieved in other sub-dimensions of the interpersonal problem-solving test and the father's age. The absence of a significant difference in the current study may be because most fathers (63.3%) were in the 30-39-year-old group.

One-way analysis of variance was performed to determine the significance of the difference in interpersonal problem-solving skills by the children's mothers' education in Table 5.

Group	N	\bar{x}	SD	Var. K	KT	Df	KO	F	P
Primary or Secondary School Graduate	241	2.1391	.51837	Between Groups	1.405	3	.468	1.960	.119
High School Graduate	110	2.0372	.44579	Within Group	107.089	446	.239		
University Graduate	89	2.0225	.46641	Overall	108.494	451			
Post Graduate	12	1.9921	.40398						
Overall	452	2.0874	.49047						

Table 5. Child's Mother's Education: One-Way Variance Analysis for Interpersonal Problem-Solving Skills

As seen in Table 5. the result of the variance analysis, no significant difference was found between children's interpersonal problem-solving skills according to the mother's education. In their study, Bozkurt-Yukcu and Demircioglu (2017) concluded that there is no significant difference between children's social problem-solving skills according to their mother's education. In their study, Serin and Derin (2008) found no significant relationship between problem-solving skill perceptions of primary school students according to their mother's education. The findings of these studies are consistent with the findings of the current study. On the other hand, Alemdar-Coşkun (2016) reported a significant difference between children's problem-solving skills according to their mother's education. They reported that problem-solving skills of children whose mothers were high school graduates or less were higher than children whose mothers were university graduates or more.

One-way analysis of variance was performed to determine the significance of the difference in interpersonal problem-solving skills by the children's fathers' education in Table 6.

Group	N	\bar{x}	SD	Var. K	KT	df	KO	F	P
Primary or Secondary School Graduate	138	2.1674	.52613	Between Groups	2.104	3	.701	2.953	.032
High School Graduate	147	2.1063	.48948	Within Group	106.390	448	.237		
University Graduate	145	2.0102	.46312	Overall	108.494	451			
Post Graduate	22	1.9697	.35194						

Overall	458	2.0874	.49047						
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Table 6. Child's Father's Education: One-Way Variance Analysis for Interpersonal Problem-Solving Skills

In view of table 6. statistically significant difference was found in the One-Way Variance analysis performed to test whether the interpersonal relationships and attitudes of the participants differed significantly according to the father's education ($p < 0.05$). Since the variances of the groups were homogeneously distributed, the Tukey Test, one of the Post-Hoc tests, was used to reveal the source of the difference (95% confidence) in Table 6.1.

(I) Father's Education	(J) Father's Education	Average Difference (I-J)	Standard Deviation	p	95% Confidence Interval	
					Lower Limit	Upper Limit
Primary or Secondary School Graduate	High School Graduate	.06110	.05776	.715	-.0878	.2101
	University Graduate	.15718*	.05795	.035	.0077	.3066
	Yüksek lisans	.19766	.11187	.291	-.0908	.4861
High School Graduate	Primary or Secondary School Graduate	-.06110	.05776	.715	-.2101	.0878
	University Graduate	.09607	.05704	.333	-.0510	.2432
	Yüksek lisans	.13656	.11140	.611	-.1507	.4238
University Graduate	Primary or Secondary School Graduate	-.15718*	.05795	.035	-.3066	-.0077
	High School Graduate	-.09607	.05704	.333	-.2432	.0510
	Yüksek lisans	.04048	.11150	.984	-.2470	.3280
Post Graduate	Primary or Secondary School Graduate	-.19766	.11187	.291	-.4861	.0908
	High School Graduate	-.13656	.11140	.611	-.4238	.1507
	University Graduate	-.04048	.11150	.984	-.3280	.2470

*. The average difference is significant at 0.05 level.

Table 6.1. Tukey Test Results

As seen in Table 6.1 the comparison of Interpersonal Problem-Solving Skills according to fathers' education shows that the highest average belongs to the Primary or Secondary School Graduates group ($X = 2.16$). This is followed by High School Graduates ($X=2,10$) and University Graduates groups ($X=2.01$); the lowest average is observed in the Post Graduates group ($X=1,96$).

The direction of the difference was found as (Primary or Secondary School Graduate) > (Post Graduate). Children whose fathers are primary or secondary school graduates have higher interpersonal problem-solving skills than children whose fathers are postgraduates. Kaytez and Kadan (2016) found that children whose fathers were primary school graduates had higher mean scores in the destructive problem-solving sub-dimension. Serin and Derin (2008) reported no significant difference between primary school students' problem-solving skills according to their father's education.

One-way analysis of variance was performed to determine the significance of the difference in interpersonal problem-solving skills by the children's mothers' occupation in Table 7.

Group	N	\bar{x}	SD	Var. K	KT	df	KO	F	P
Housewife	377	2.1060	.49359	Between Groups	1.344	4	.336	1.401	.233
Civil servant	45	1.9640	.47000	Within Group	107.151	447	.240		
Worker	4	1.9286	.27077	Overall	109.496	451			
Self- employed	10	2.2143	.64486						
Other jobs	16	1.9583	.35246						
Overall	452	2.0870	.49047						

Table 7. Child's Mother's Profession: One-Way Variance Analysis for Interpersonal Problem-Solving Skills

As seen in Table 7. a result of the variance analysis, no significant difference was found between children's interpersonal problem-solving skills according to the mother's occupation. It is thought that this situation arises because the majority of the mothers in the study group (83.4%) were housewives. Temiz (2019) found in his study that children's social problem-solving skills did not differ according to the mother's occupation. Dilber (2015) reported that the mother's occupation does not affect the child's interpersonal problem-solving skills. These results are in line with the result of the current study.

One-way analysis of variance was performed to determine the significance of the difference in interpersonal problem-solving skills by the children's fathers' occupation in Table 8.

Group	N	\bar{x}	SD	Var. K	KT	df	KO	F	P
Unem poye d	18	2.41 53	.671 41	Between Groups	5.443	4	1.3 61	5.9 02	.0 00
Civil servan t	133	1.96 10	.413 55	Within Group	103.0 51	44 7	1.2 31		
Work er	101	2.09 81	.437 21	Overall	108.4 94	45 1			
Self- emplo yed	115	2.07 95	.523 42						
Other jobs	85	2.21 40	.517 15						
Overa ll	452	2.08 74	.490 47						

Table 8. Child's Father's Profession: One-Way Variance Analysis for Interpersonal Problem-Solving Skills

In view of Table 8. statistically significant difference was found in the One-Way Variance analysis performed to test whether the Interpersonal relationships and attitudes of the participants differed significantly according to the father's occupation ($p < 0.05$).

Since the variances of the groups were homogeneously distributed, Tamhane's T2 test, one of the Post-Hoc tests, was used to reveal the source of the difference (95% confidence) in Table 8.1.

(I) Father's Profession	(J) Father's Profession	Average Difference (I-J)	Standard Deviation	p	95% Confidence Interval	
					Lower Limit	Upper Limit
Unemployed	Civil servant	.45437	.16227	.109	-.0597	.9684
	Worker	.31728	.16412	.504	-.1997	.8343
	Self-employed	.33584	.16561	.437	-.1836	.8553
	Other jobs	.20134	.16790	.939	-.3221	.7247
Civil servant	Unemployed	-.45437	.16227	.109	-.9684	.0597
	Worker	-.13709	.05638	.148	-.2966	.0224
	Self-employed	-.11853	.06057	.411	-.2898	.0528
	Other jobs	-.25303*	.06658	.002	-.4422	-.0639
Worker	Unemployed	-.31728	.16412	.504	-.8343	.1997
	Civil servant	.13709	.05638	.148	-.0224	.2966
	Self-employed	.01856	.06538	1.000	-.1664	.2035
	Other jobs	-.11594	.07099	.668	-.3174	.0855
Self-employed	Unemployed	-.33584	.16561	.437	-.8553	.1836
	Civil servant	.11853	.06057	.411	-.0528	.2898
	Worker	-.01856	.06538	1.000	-.2035	.1664
	Other jobs	-.13450	.07436	.527	-.3452	.0762
Other jobs	Unemployed	-.20134	.16790	.939	-.7247	.3221
	Civil servant	.25303*	.06658	.002	.0639	.4422
	Worker	.11594	.07099	.668	-.0855	.3174
	Self-employed	.13450	.07436	.527	-.0762	.3452

*. The average difference is significant at 0.05 level.

Table 8.1 Tamhanes T2 Test Analysis

As seen in table 8.1. the comparison of Interpersonal Problem-Solving Skills according to fathers' occupation shows that the highest average belongs to the Unemployed Fathers group ($X =$

2.41). It is followed by the Other Job owners (X=2,21), Workers (X=2.09), and Self-employed fathers (X=2.07); the lowest average is observed in the Civil servant fathers group (X=1,96).

The direction of the difference was found as (Other jobs) >(Civil servant). Children whose fathers have other jobs have higher interpersonal problem-solving skills than children whose fathers are civil servants. A significant difference was found between children's interpersonal problem-solving skills according to their father's occupation. It was concluded that children whose fathers have "*Other jobs*" have higher interpersonal problem-solving skills than children whose fathers are "*Civil servants*."

Temiz (2019) found no significant difference in Wally Social Problem-Solving Test scores according to the father's education and father's profession. In the study conducted by Bozkurt-Yükcü and Demircioglu (2017), no significant difference was found between the education and professions of the children's fathers and their Wally Social Problem-Solving Detective Game Test scores. Dilber (2015) concluded that the mean scores of non-peer compelling solutions of children whose fathers work in education are higher than the average scores of children whose fathers work in other occupational groups. In the same study, no significant difference was found between the other sub-dimensions of the interpersonal problem-solving test according to the father's occupation. Family structure and the interaction of other adults in the family with children can affect children's interpersonal problem-solving skills.

Conclusion:

Consequently, it was concluded that the interpersonal problem-solving skills of boys are higher than girls. Children whose fathers are primary or secondary school graduates have higher interpersonal problem-solving skills than children whose fathers are postgraduates. Moreover, children whose fathers have other jobs were found to have higher interpersonal problem-solving skills than children whose fathers are civil servants. Besides, children whose mothers are 29-year-old or young have higher interpersonal problem-solving skills than children whose mothers are 30-39-year-old.

Suggestions:

Cıraa was used as the study aimed to evaluate from an outside perspective. In subsequent studies, comparative studies are recommended, together with the measurement tools applied by children.

Based on the research results, the following suggestions were submitted to researchers, educators, and parents.

Suggestions for Researchers

- To administer supportive training programs in future studies.
- To plan longitudinal studies.
- To perform in-depth research by using mixed-method.
- To plan comparative studies involving family child-rearing attitudes.

Suggestions for Educators

- To organize seminars on problem solving and interpersonal problem solving for parents.
- To plan activities that support children's interpersonal problem-solving skills.
- To plan activities with family participation that support interpersonal problem-solving skills of children and parents.

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Misconceptions in Projectile Motion and Conceptual Changes via Geogebra Applications

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Abstract:

The purpose of this work is to examine the issue of pre-service science teachers' (PSST) Geogebra applications on misconceptions about projectile motion (PM) and the permanence of learning concepts. In this study, quantitative research method was used as scientific research method, and semi-experimental design with pre-test, post-test control group was used as a pattern. The accessible population of this study is PSST who study in a university located in Kayseri, Turkey in the 2019-2020 academic year. Sample of the study included 36 freshman PSST, studying at the university level in Kayseri. 18 of the participants are experimental-group (EG) and 18 of them are control-group (CG). Both groups learned the subject of projectile motion (PM) together in the classroom. In addition to the traditional teaching method, the EG participated eight-week in the Geogebra course based on the conceptual change model and prepared physics simulations with Geogebra. "Conceptual Questions on Projectile Motion" was used as a data collection tool and the data were analyzed by means of statistics (t-test) based on the difference between averages. The results revealed that both the post-test's and permanence test's mean scores of the EG PSST were significantly higher than the mean score of the CG PSST (post-test: $t=2.525$; $p<.05$) (permanence test: $t=5.466$; $p<.05$). Furthermore, in this study, many misconceptions about the PM were identified.

Key Words: (Science Education, Projectile Motion, Conceptual Change, Geogebra Applications.)

Introduction:

The basic premise of constructivism is that knowledge is constructed "from physical interaction with objects in the world" (Fosnot & Perry, 1996). Thus, it is integral for students to actively engage with the material, manipulate objects and construct new works and then that they can fully interpret the issue. Although real physical interaction is not possible in virtual environments, the virtual environment can also lead to a lifelike experience with facts and material and can significantly aid the learning process. The proposals for defining constructivist learning views (Fox, 2001) are as follows:

1. Learning is a dynamic, continuous, active process.
2. Knowledge is not inherent or passively assimilated. It is structured.
3. Cognitive knowledge, neither discovered, nor invented.
4. All knowledge is unique and personal.
5. All knowledge is socially structured.
6. Learning is the process of understanding how the universe works.

7. To solve students' meaningful, open-ended, challenging problems effective learning is needed.

The expectation of knowledge in the area of science education has gone beyond the actual knowledge. Mindful learning which structured via scientific experiences is more significant than the ability to quickly solved many types of multiple-choice problems. Nowadays, recall of knowledge is perceived as inadequate in science education. Students should relate their old knowledge to new knowledge for meaningful learning. Knowledge that is incompatible with scientific facts may have been acquired from informal sources of knowledge, some of their own experiences in the physical and social world, misplaced metaphors embedded in the language, teaching plan (Klammer, 1998) and textbooks (Cho, Kahle, & Nordland, 1985). In addition, teaching may inadvertently promote these concepts and even create these misconceptions during teaching.

Students usually come to science class with their established misconceptions. These misconceptions must be taken into account by science teachers in order to plan and teach meaningful and efficient lessons. Science teachers require to recognize the students' misconceptions and change their teaching style according to misconceptions of students'.

As a result of a study about students' misconceptions or "Alternative Concept Movement" research, the following seven propositions about misconceptions are mostly accepted (Millar, 1989).

1. Students get into science class with deep-rooted knowledge about natural phenomena,
2. Alternative concepts of students may vary according to ability, nationality, gender and age,
3. Traditional teaching strategies are not enough for alternative concepts of students to change,
4. Alternative concepts of students are frequently similar to the explanations of natural phenomena presented by former generations of scientists.
5. The origins of students' alternative understanding are personal experiences, culture, perceptual experience, their language and school.
6. Teachers also have misconceptions like their students,
7. Alternative concepts of students' dispute with the knowledge taught in formal education.

Some studies (Clement, 1982; Gilbert & Watts, 1983; Minstrell, 1984) have shown that many students have beliefs that are somewhat or entirely different from accepted scientific views. Students' misconceptions create obstacles to meaningful learning in science. Consequently, students' misconceptions must be revealed and eliminated to provide meaningful learning and a passing on general scientific concepts.

In the last 40 years, an active research literature on students' conceptual understanding in science has been constituted. These researches provided science education community with detailed knowledge about students' conceptions of natural phenomena in a broad range of science topics (mechanics, optics, electricity, energy, particle physics, heat and temperature, astronomy and many other fields) (Duit, 1993). Constructivist learning approach has been the strongest source of motivation for research on students' understanding (and also teachers') (Duit, 1993). It forms students' understanding of natural phenomena with all their experiences, both in and out of school.

In the first studies on students' concepts, educational scientists considered students' concepts according to the subject and separately from other aspects of learning such as metacognition (Duit & Treagust, 2003). Many studies (Driver & Erickson, 1983; Driver, Guesne, & Tiberghien, 1985; Driver, Squires, Rushworth, & Wood-Robinson, 1994; Duit, Goldberg & Niedderer, 1992; McDermott, 1984; Novak, 1987; Osborne & Freyberg, 1985) showed that students do not enter classes without prior knowledge of the natural phenomena to be taught. In

fact, students have deep-rooted concepts and ideas which are incompatible with contemporary scientific views and cannot be quenched by traditional teaching.

Since the 1970s, studies have been conducted investigating students' understanding of mechanics (Duit, 1993). A number of these studies have been reviewed in order to understand students' conceptual understanding of the concepts of the force and motion unit and the subject of the PM (Bayraktar, 2009; Clement, 1982; Clement, 1983; Dilber, Karaman, & Düzgün, 2009; Driver, Rushworth, Squires, & Wood-Robinson, 1994; Halloun & Hestenes, 1985a; Halloun & Hestenes, 1985b; Jimoyiannis & Komis, 2001; Klammer, 1998; Klein, Gröber, Kuhn, & Müller, 2014; McCloskey, 1983a; McCloskey, 1983b; McCloskey, Caramazza, & Green, 1980; Minstrell, 1982; Prescott, 2004; Prescott & Mitchelmore, 2005; Sadanand & Kess, 1990; Tao, 1997; Tao & Gunstone, 1999; Trowbridge & McDermott, 1980; Whitaker, 1983). Some of the misconceptions presented in these studies and their scientific equivalents are shown in Table 1 with references and more given Appendix-1.

Misconception	Scientific equivalent	Reference
1. An object released from constant horizontal velocity follows a linear path.	For an observer on the ground, the orbit of the object will be parabolic.	(Hallon & Hestenes, 1985b; McCloskey, 1983b)
2. An object falls back from the position where it was released with horizontal constant initial velocity.	For an observer on the ground, the orbit of the object will be parabolic.	(Hallon & Hestenes, 1985b; McCloskey, 1983b)
3. No force is applied to an object released from a moving carrier.	A force is applied by the gravitational field of the ground to an object making a horizontal PM.	(Hallon & Hestenes, 1985b; McCloskey, 1983b)
4. From the same height, a released object falls before the object at a horizontal constant velocity because the released object takes a shorter path. Or the thrown object falls first because it has a greater velocity than the object released.	An object that is released from the same height and the other thrown with a horizontal constant velocity hit to the ground simultaneously.	(Dilber et al., 2009; Jimoyiannis & Komis, 2001; Prescott & Mitchelmore, 2005; Whitaker; 1983)
5. The final velocity of an object which released to free fall depends on the force of gravity.	The final velocity of objects released to free fall depends on the height at which the objects are released and the gravitational acceleration.	(Dilber et al., 2009)
6. A ball with greater mass will have a greater velocity when released into free fall.	The acceleration of free-falling objects is the gravitational acceleration of the planet.	(Jimoyiannis & Komis, 2001)
7. The larger the mass, the greater the acceleration in free fall.	The acceleration of free-falling objects is the gravitational acceleration of the planet.	(Jimoyiannis & Komis, 2001)
8. The higher the ball of two balls of different heights, the acceleration is greater because it moves more.		(Jimoyiannis & Komis, 2001)

Table 1. *Misconceptions about projectile motion and the scientific equivalents of them.*

Knowing that students bring strong misconceptions into science classes (Dekkers & Thijs, 1998; Duit & Treagust, 2003; McDermott, 1991) that are difficult to quench through traditional teaching, researchers have been looking for theoretical frameworks to explain how students reconstruct their current concepts. Researchers from different area of study (e.g: science education

and educational psychology) have proposed different theoretical frameworks to explain the nature of students' misconceptions and how they replace them with scientifically accepted concepts.

Posner, Strike, Hewson, and Gertzog (1982) developed the Conceptual Change Model to provision explanations on how a student's existing understanding change when faced with recent understanding. The Conceptual Change Model has a common practice in the science education community since its development (Duit & Treagust, 2003). By the vision of Conceptual Change Model, a new understanding can be incorporated into the cognitive structure in two ways: if the student knows rare about the recent shown concept or if the recent concept can be adapted with the present conceptual structure new concept can be merged with the present concept. This process called as "assimilation" by Posner et al. (1982). By Hewson (1981) it is called as "conceptual capture". On the other hand, there is a possibility that students have alternative understanding of what they will learn that may conflict with new knowledge. In lodge to accept new knowledge, the students must reconstruct their existing understanding. This process has been named "conceptual change" by Hewson (1981), "accommodation" by Posner et al. (1982). The main focus of the Conceptual Change Model which is presented by Posner et al. (1982), is to clarify how accommodation takes place. There are four conditions that must be met for conceptual change to occur:

1. The student is not satisfied with the current understanding,
2. Finding that the new understanding is understandable,
3. The learner thinks that the new understanding is reasonable,
4. The learner should find the new understanding efficient and the new understanding should lead to new ones (Posner et al., 1982).

The learning view presented in Conceptual Change Model provides an explanation of how students can change their existing knowledge structures in a subject area. Different theoretical frameworks have been proposed to explain the nature of the change in students' current cognitive structure.

The proposed theoretical frameworks for explaining the improvement in students' understanding require that: reach an improvement in the current conceptual structure, students collocate existing concepts against the new concept, recognize existing and new concepts, and the relevant connection every day, integrate and evaluate. Planning lessons compatible with technology can facilitate conceptual change. In a technology-based lesson which is planned according to the conceptual change model, misconceptions can be eliminated by bringing students face to face with their misconceptions.

GeoGebra, developed in 2001 by Marcus Hohenwarter and Yves Kreis, is a free dynamic geometry software developed to teach and learn mathematics at primary, high school and university level (Hohenwarter & Preiner, 2007). Although the use of this software in the field of mathematics is quite common, it is very rare in science education (Erb, Wilhelm, & Kuhn, 2015; Hofmann, Klar, & von Aufschnaiter, 2012; Kerle, 2013; Solvang & Haglund, 2018; Völker, 2015; Walsh, 2017). However, some of them are limited to the use of graphics, figures and animations rather than the physics teaching process (Hofmann, Klar, & von Aufschnaiter, 2012; Völker, 2015). Moreover, Geogebra, where many applications can be made in terms of graphics and visuality, can also make up the ground for the elimination of misconceptions with the experience it will provide to students. Solvang and Haglund (2018) emphasized the importance of using digital tools in education for high school physics education in Sweden. Solvang and Haglund (2018) stated that they investigated the possibilities of using GeoGebra, which is very popular in mathematics education, in the teaching of physics subjects, and discovered the cognitive learning processes of students during their interactions with the software. They observed that there was a "high level of interaction" between students and Geogebra applications and that students came to different levels of understanding the subject of friction (Solvang & Haglund, 2018).

It is more common to use physics simulations where it can only change variables, and sometimes even not. However, Geogebra allows its users to manipulate it. Walsh (2017) states that when creating physics simulations in GeoGebra, Walsh can usually understand a subject or phenomenon more deeply. Furthermore, teaching a certain concept after many years, he can better understand the concept after figuring out how to simulate it with Geogebra.

Many studies (Jimoyiannis & Komis, 2001; Klein, et al.; 2014; Whitaker, 1983) have been conducted on the conceptual difficulties that students' mental models experience with regard to the phenomena of the PM. The motivation behind this study is to make up for the lack of studies on physical phenomena related to misconceptions of PM. Just a few studies have tried to change students' misconceptions about PM (Dilber et al., 2009; Gunstone, Gray & Searle, 1992; Thijs, 1992). In this study, it is aimed to define the misconceptions of PSST regarding the concepts of the PM and to examine the effectiveness of Geogebra applications based on conceptual change conditions on their understanding of the concepts of PM on traditionally designed physics education. In addition, in this study, it is aimed to reveal the misconceptions that PSST had in explaining the physical phenomena underlying the PM. For this purpose, in accordance with the nature of the study, in order to eliminate many misconceptions and to realize conceptual changes, lesson plans were prepared in Geogebra. Relatedly, an eight-week Geogebra course practice was made with PSST. Consequently, in this study, the misconceptions of PSST about PM were determined and Geogebra applications were used to overcome them by applying the conceptual change model.

METHOD

1. Research Model

The quantitative research method was applied in this study, in which the effect of the teaching carried out with Geogebra applications in the Physics lesson of PSST on the misconceptions of the "Force and Motion" unit of PSST on the subject of " Projectile Motion " was used. According to Fraenkel and Wallen (2006), since experimental research is the best way to establish cause-effect relationship, quasi-experimental design with control group was used to pre-test, post-test and permanence test to discover the effect of learning PM with Geogebra in the experimental group.

2. Population and Sample

The accessible population in this study is the PSST studying science education in Kayseri (Turkey). The sample of the study consists of 36 PSST, 18 in the EG and 18 in the CG, studying as a freshman in a university in Kayseri. The sample of the study was determined by the convenience sampling method.

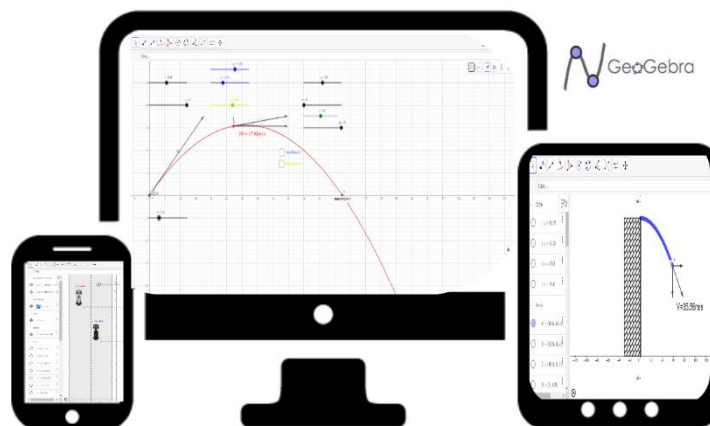


Figure 1. A few examples of the experimental group's Geogebra studies

Researchers choose convenience sampling; due to time, money and some limitations, the researcher determines the sample from easily accessible and practicable communities (Büyüköztürk, 2012). In this study, researchers included participants whom they could easily reach for logistical reasons. 36 students in the EG and CG took physics lessons together in the same class. In addition to these lessons, 18 students in the EG took an eight-week-long 16-hour course, practice using Geogebra in the computer laboratory, and at the end of this practice, they prepared simulations and animations on the subject of the PM. In Figure 1, some examples of physics simulations made by PSST in Geogebra course practice applied within the scope of this research are given.

3. Data Collection Tools

The "Conceptual Questions of Projectile Motion" (CQPM) scale consisting of seven open-ended question was used as a data collection tool in this study. This scale; was developed by Piten, Rakkapao, and Prasitpong (2017), it was translated into Turkish by the researchers and it was checked by taking the opinions of three experts (English, Physics and Turkish Language and Literature teachers). Seven open-ended questions with CQPM discuss the main ideas of the PM; velocity, acceleration and force (Q1, Q2, Q5), flight times (Q2), path (Q3, Q4, Q7), peak point, range and complementary angles (Q6). While Piten, et al. (2017) developed the questions, the consistency between an item and its behavioral goals was evaluated by eight physicists using the "item-goal fit form".

4. Data Collection and Analysis

SPSS 22.00 package program was used for the analysis of the data obtained in a period of three months. The obtained findings were evaluated at 95% confidence interval and 5% significance level. The minimum score that can be obtained from CQPM is null, the maximum score is 100. The detailed scoring made by the researcher for CQPM was checked by an expert in the field of physics education and found appropriate. Data collection process and applications are shown in Figure 2.

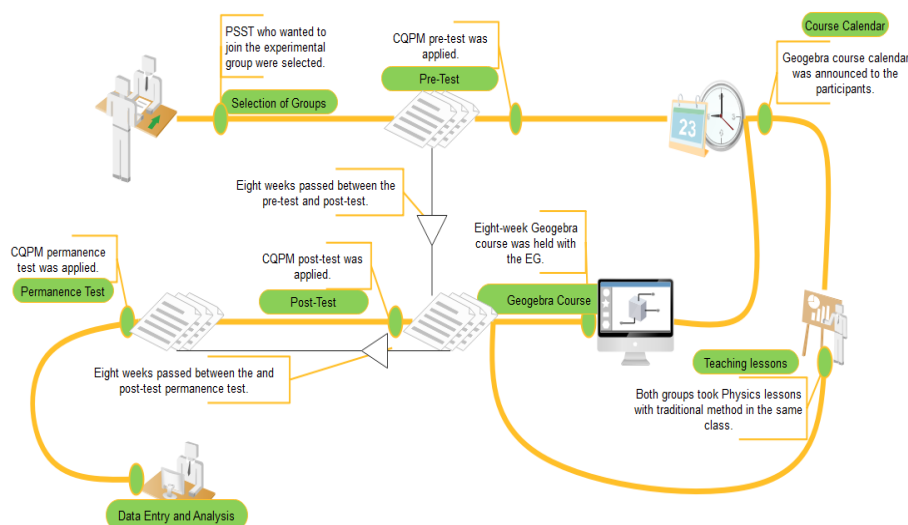


Figure 2. Flowchart diagram of data collection process and courses.

In descriptive statistics, the mean, median, mod, minimum and maximum test scores, standard deviation, skewness and kurtosis values of the pre-test, post-test and permanence test scores of the dependent variables were computed for both the EG and CG. In order to check whether there is a statistical difference between the groups, independent samples t-test was conducted as inferential statistics. All the assumptions of the tests were checked before testing.

FINDINGS

1. Descriptive and Inferential Statistics Results of Experimental Group and Control Group

In the study, t-test was applied to determine the effects of Geogebra applications on the misconceptions of PSST in physics lesson. The assumptions discussed in Pallant (2011) were checked before applying the independent samples t-test. These assumptions, normality and homogeneity of variances were checked for all test scores. The results of the descriptive analysis are included in Table 2-3. The normality of the data was evaluated by Kolmogorov-Smirnov and Shapiro-Wilk statistics and kurtosis, skewness, mod, median and mean values.

Group	Test	Skewness	Kurtosis	\bar{X}	Median	Mod
EG	Pre-test	.669	.202	26.72	24.50	19.00
	Post-test	.309	-.930	49.58	48.50	32.00
	Permanence	.746	-.158	30.69	28.00	16.50
CG	Pre-test	.153	-.882	27.38	27.50	16.00
	Post-test	-.086	-1.160	17.91	19.00	10.50
	Permanence	-.120	-.374	14.33	15.00	15.00

Table 2. Descriptive statistics values for the test scores of the groups

On the Kolmogorov-Smirnov, Shapiro-Wilk tests, the significance values of the pre-test PSST CQPM pre-test, post-test and permanence test results were greater than .05, and the kurtosis and skewness values were lower than 1, which indicates that the data showed normal distribution ($p > .05$). As can be seen from Table 3, the kurtosis value of the post-test of the CG is slightly higher than -1 (-1.160) and the Kolmogorov-Smirnov significance value of the permanence test of the EG is less than .05 ($p = 0.039$).

Group	Test	Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistic	df	p	Statistic	df	p
EG	Pre-test	.120	18	.200*	.961	18	.629*
	Post-test	.118	18	.200*	.959	18	.591*
	Permanence	.208	18	.039	.919	18	.124*
CG	Pre-test	.112	18	.200*	.974	18	.862*
	Post-test	.113	18	.200*	.954	18	.489*
	Permanence	.141	18	.200*	.959	18	.582*

* $p > .05$

Table 3. Kolmogorov-Smirnov and Shapiro-Wilk statistics for the test scores of the groups

On the Kolmogorov-Smirnov, Shapiro-Wilk tests, the significance values of the pre-test PSST CQPM pre-test, post-test and permanence test results were greater than .05, and the kurtosis and skewness values were lower than 1, which indicates that the data showed normal distribution ($p > .05$). As can be seen from Table 3, the kurtosis value of the post-test of the CG is slightly higher than -1 (-1.160) and the Kolmogorov-Smirnov significance value of the permanence test of the EG is less than .05 ($p = 0.039$). On the other hand, it was concluded that a normal distribution was shown by looking at the other results in the relevant tests. Based on these results, it was decided that the t-test results of the groups could be compared. The t-test results for the groups are given in Table 4.

Test	Group	N	\bar{X}	Sd	df	t	p
Pre-test	EG	18	26.722	10.814	-31.108	-.154	.878
	CG	18	27.388	14.817			
Post-test	EG	18	49.583	15.718	34	7.806	.000*
	CG	18	17.916	7.011			
Permanence	EG	18	30.694	11.582	34	5.466	.000*
	CG	18	14.333	5.207			

*p< .05

Table 4. t-test results for test scores of the groups pre-test, post-test and permanence

In order to check whether there is a significant difference between the misconceptions of the groups in terms of PM, the comparison of the CQPM pre-test, post-test and permanence test scores was performed by independent samples t-test. As can be seen from Table 4, the analysis results show that there is no statistically significant difference between the pre-test averages of the groups (pre-test: $t = -.154$; $p > .05$), there is a statistically significant difference in terms of post-test and permanence test. (post-test: $t = 2.525$; $p < .05$) shows (permanence test: $t = 5.466$; $p < .05$).

2. Misconceptions Detected on the Conceptual Questions of Projectile Motion Scale

In this section, the answers given by PSST to CQPM are presented as a percentage on the basis of questions. The pre-test, post-test and permanence test results of the answers given by the PSST were evaluated separately as a percentage and EG and CG and are given in Table 5. In Figure 3, some of the answers containing misconceptions detected in this study are given. In addition, the summary of the misconceptions detected in this study, their scientific equivalent and their references in the literature are presented in Appendix-2.

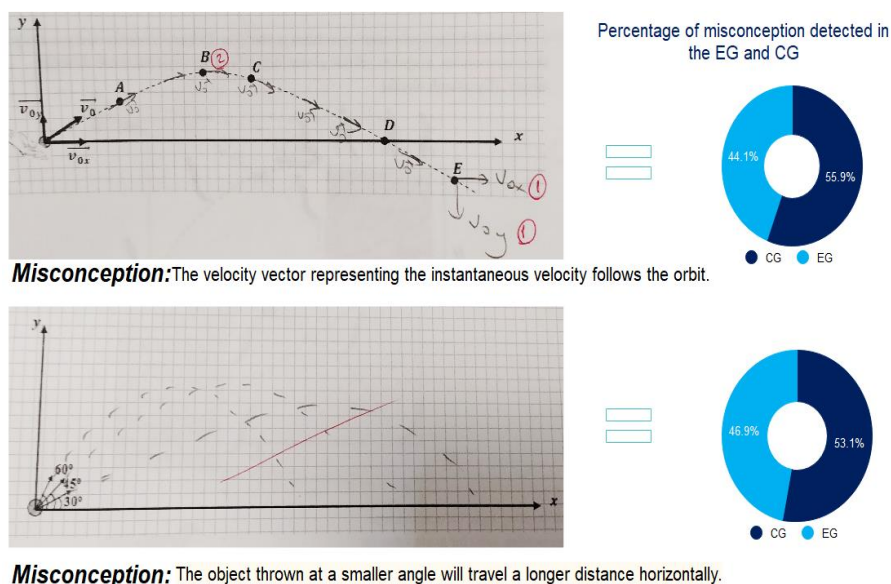


Figure 3. Examples of misconceptions detected in CQPM.



Table 5. Percentage results of the EG and CG PSST on the basis of CQPM total and questions

Conclusion and Discussion

The main purpose of this study is to investigate the effect and permanence of Geogebra applications on the detection and elimination of misconceptions of PSST about physics lesson PM. For this purpose, before comparing the experimental and control groups, independent samples t-test was used to determine whether the groups showed a significant difference in terms of misconception levels. There was no statistically significant difference in the CQPM pre-test results: $t = -.154$; $p > .05$ (Table 4). Accordingly, the groups' misconceptions before the Geogebra course are at the same level.

It is seen that there is a significant difference between the EG and the CG in terms of the mean CQPM post-test results: $t = 7.806$; $p < .05$ (Table 4). Thus, at the end of the Geogebra course in the EG, it was determined that the Geogebra applications in the physics lesson positively affected the misconceptions of PSST about the subject of the PM. Moreover, when we look at the pre-test and post-test averages of the PSST studying in the CG (Table 4), an increase of misconceptions observed. This might be resulted from the teaching plan and method, as reported by Klammer (1998) and Millar (1989). The traditional method supported the students' misconceptions and could not realize the conceptual change. While the PSST in the EG explained the physical phenomena, they encountered in the Geogebra course, they made many interactions with the PM while designing the simulation in Geogebra and discovered the scientific reality behind the PM subject. As Posner et al. (1982) mentioned, the EG interacting with the physical phenomenon with Geogebra was not satisfied with the existing understanding, found that the new understanding was understandable, thought it was reasonable, found it efficient, and the new understanding they acquired led to different new understandings. These are the necessary steps for conceptual change to occur. Furthermore, when the permanence test scores of the groups are examined, it is seen that the applied independent samples t-test is in favor of the EG: $t = 5.466$; $p < .05$ (Table 4). This result proves the effectiveness of simulations prepared with Geogebra applications in conceptual change.

Each of the question in CQPM tests one or a few misconceptions about PM in physics. The percentage of correct answers to these questions by the groups are given in Table 5. When Table 5 is examined, it is seen that the EG is successful in terms of questions compared to the CG. The

misconceptions of the PSST in the EG about speed, acceleration and force decreased (Q1, Q2, Q5 test these misconceptions). Especially if we look at the percentage of Q5, it is seen that it increased from 1.66% to 86.6%. In other words, the misconception of PSST that "The direction of acceleration is the same as the direction of movement" (Tao, 1997, Tao & Gunstone, 1999) has been largely eliminated. When the permanence test results of the same question are examined, it is seen that the gains obtained from the post-test are mostly lost, although there is a numerical increase compared to the pre-test (5.55%). Woods and Thorley (1993) stated that students turned to misconceptions even after "strong" teaching. Moreover, they stated that it is difficult to help a student gain a deep and strong understanding when analyzing case studies for students' understanding before and during and about two months after teaching. In the later interviews about the subjects that the students were very successful during and after the teaching of the lesson, it was revealed that the students returned to their previous "alternative concepts", in some cases, they could remember the "correct answer" but could not verify or in some cases their answers were seriously misconfigured. The first part of Q7 in CQPM is choosing the path the ball will follow (Figure 4). The percentage of those who prefer the B path in the EG is 83.3% for the pre-test and 100% of the post-test. In other words, each PSST in the EG gave the correct answer to the first part of this question. The second part of the question is the explanation of this answer. Here, there is a decrease in the percentage of correct answers given by the EG. The result, which was 33.3% of the pre-test, dropped to 22.2% in the post-test and to 5.5% on the permanence test.

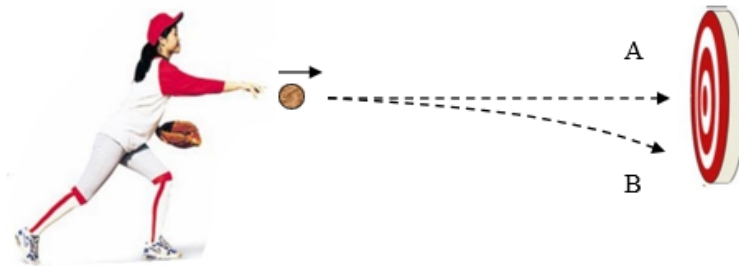


Figure 4. CQPM Q7: A girl throws the ball in a horizontal direction as shown in the figure. Which path does the ball follow? Why? (Piten, et al., 2017)

This result supports the idea of Woods and Torley (1993), that even if the students remember the correct answer, they cannot remember the reason and they go back to their old "alternative concepts" while explaining the physical phenomenon.

However, the misconceptions detected in this study on the subject of the PM are consistent with previous studies in the literature and contribute to the literature (Appendix-2). Since there was no previous study in the field of Geogebra applications and conceptual change in science education, it was compared with the results of the study conducted by Computer Aided Teaching in this area of science.

In a study conducted by Dilber et al. (2009) with 82 students (43 in the EG and 39 in the CG), results in favor of the EG were obtained. The EG was taught using conceptual change activities and computer simulations. The CG took traditional physics course. Conceptual change text and simulations were used as conceptual change applications in the EG. Simulations were used to represent the physical concepts in the EG. These simulations were used by the teacher for demonstration purposes only to visualize the concepts of PM in the class. According to Dilber et al. (2009), simulations and associated learning goals provide at least one answer to frequently asked questions about the purpose of learning the subject for which simulations are used. As a result of their study, it is shown that the conceptual change in the EG students' misconceptions compared to the CG has a positive and higher average ($p < .05$ and $t = 7.43$) (Dilber et al., 2009). In addition, computer simulations, which were used as an aid to conceptual change in Dilber et al. (2009) study, were used as a conceptual change tool to change the misconceptions PSST in this study. As can be seen from the results of this study, the simulations prepared with Geogebra applications will be effective in understanding the scientific reality behind the physical phenomenon in eliminating the misconceptions. As reported by Walsh (2017), a student can better

understand and avoid misconceptions while creating physics simulations in GeoGebra while thinking about how to simulate a subject or phenomenon mathematically and graphically.

Suggestions

Teacher training programs should give PSST an opportunity to improve their knowledge of using technology for educational purposes. Additionally, in teacher training programs, courses suitable for conceptual change should be planned in the education process of PSST so that they do not convey their misconceptions to students. Teachers who are free from misconceptions will prepare a course by taking care of the students' misconceptions in their classes.

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Appendixes

Appendix-1 Misconceptions about projectile motion and the scientific equivalents of these errors.

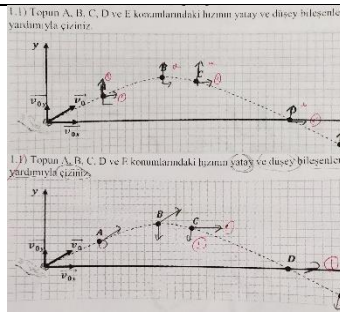
Misconception	Scientific equivalent	Reference
1 After a cannon ball leaves the cannon, an impressed force acts on it.	After losing contact with the cannon, there is no force acting the cannon ball, except the weight of the cannon ball.	(Bayraktar, 2008; Tao & Gunstone, 1999; Hestenes at al., 1992; Hallon & Hestenes,1985b; McCloskey,1983; Whitaker,1983;Clement,1982)
2 The object moves in the direction of a force greater than its downward weight. At the peak of the orbit followed by the object, this force is exhausted and the object starts to fall due to its weight.	The object moves under gravitational force in a parabolic orbit. Its horizontal velocity is constant, but its vertical velocity changes over time.	(Hallon & Hestenes, 1985b; McCloskey, 1983; Whitaker, 1983; Clement, 1982)
3 An object thrown up vertically moves upwards with a force greater than its weight.	The only force affecting the object is the gravitational force exerted by the ground.	(Clement, 1982; Hallon & Hestenes, 1985b; McCloskey, 1983; Whitaker, 1983)
4 An object that launches or rolls in the horizontal direction of the cliff follows the reversed L path.	An object thrown off a cliff moves at a constant horizontal velocity on a horizontal road and accelerates slowly downward.	(Hallon & Hestenes, 1985b; McCloskey, 1983)
5 An object released from constant horizontal velocity follows a linear path.	For an observer on the ground, the orbit of the object will be parabolic.	(Hallon & Hestenes, 1985b; McCloskey,1983)
6 An object falls back from the position where it was released with horizontal constant initial velocity.	For an observer on the ground, the orbit of the object will be parabolic.	(Hallon & Hestenes, 1985; McCloskey, 1983)
7 No force is applied to an object released from a moving carrier.	A force is applied by the gravitational field of the ground to an object making a horizontal PM.	(Hallon & Hestenes, 1985; McCloskey,1983)
8 Since an air resistance is applied to an object released from a moving carrier, the object traces backwards.	The object follows a parabolic path forward.	(Hallon & Hestenes, 1985; McCloskey, 1983)
9 From the same height, a released object falls before the object at a horizontal constant velocity because the released object takes a shorter path. Or the thrown object falls first because it has a greater velocity than the object released.	An object that is released from the same height and the other thrown with a horizontal constant velocity hit to the ground simultaneously.	(Dilber et al., 2009; Jimoyiannis & Komis, 2001; Prescott & Mitchelmore, 2005; Whitaker; 1983)
10 Objects that are released and thrown at the same height hit the ground at different times because the projectile has horizontal velocity, acceleration, or force.	The object that is released from the same height and thrown with a horizontal constant velocity falls to the ground simultaneously.	(Dilber et al., 2009; Whitaker, 1983)

11	Students have confusion between position and velocity, velocity and acceleration.	The displacement per unit time is called velocity, and the change in velocity per unit time is called acceleration.	(Bayraktar, 2008; Hestenes et al 1992; Hallon & Hestenes, 198; Jimoyiannis & Komis, 200; Whitaker,1983)
Appendix-1 (continued)			
Misconception		Scientific equivalent	Reference
12	In an environment where air resistance is neglected, objects with different mass values hit the ground at different times.	Objects that are released to fall hit the ground at the same time, because when the air resistance is neglected, only the force of gravity acts on the objects.	(Dilber et al., 2009)
13	The final velocity of an object which released to free fall depends on the force of gravity.	The final velocity of objects released to free fall depends on the height at which the objects are released and the gravitational acceleration.	(Dilber et al., 2009)
14	A ball with greater mass will have a greater velocity when released into free fall.		(Jimoyiannis & Komis, 2001)
15	The larger the mass, the greater the acceleration in free fall.		(Jimoyiannis & Komis, 2001)
16	Since the higher of two balls of different height has a greater acceleration, when it hits the ground, it has a greater velocity.	The acceleration of free falling objects is the gravitational acceleration of the planet.	(Jimoyiannis & Komis, 2001)
17	The higher the ball of two balls of different heights, the acceleration is greater because it moves more.		(Jimoyiannis & Komis, 2001)

Appendix-2 Summary of the misconceptions of pre-service science teachers revealed in this study

Q	Misconceptions	Examples of Student Answers	Scientific equivalents	References
11	The velocity vector representing the instantaneous velocity follows the orbit.	<p>1.1) Topan A, B, C, D ve F konumlarındaki hızını yatay ve düşey bileşen yardımcıyla çiziniz.</p> <p>1.1) Topan A, B, C, D ve F konumlarındaki hızını yatay ve düşey bileşen yardımcıyla çiziniz.</p>	To present the instantaneous velocity of a projectile, a vector is a line of contact with a parabolic path at a particular point. It consists of two vectorial components V_x and V_y .	Piten, Rakkapao, & Prasitpong, 2017

The higher the position, the greater the velocity of an object (velocity-position confusion)



Instantaneous velocity is the rate of change in position over time.

Hestenes et al., 1992

Appendix-2 (continued)

Q Misconceptions	Examples of Student Answers	Scientific equivalents	References																														
The components of the horizontal velocity V_x and the vertical velocity V_y of the projectile are the same at every point.	<p>I.1) Topun A, B, C, D ve E konumlarındaki hızın yatay ve düşey bileşenleri yardımıyla çiziniz.</p>	The horizontal velocity V_x of the object is constant. The vertical velocity V_y varies as much as the acceleration of gravity over time.																															
The velocity of the object has a vertical component at maximum height. (Point B)	<p>I.1) Topun A, B, C, D ve E konumlarındaki hızın yatay ve düşey bileşenleri yardımıyla çiziniz.</p>	The velocity of the object has no vertical component at maximum height. The horizontal component is the same as when it was first thrown and does not change during the motion.																															
When the object reaches the level at which it is thrown horizontally, the vertical component of its velocity ends.	<p>I.1) Topun A, B, C, D ve E konumlarındaki hızın yatay ve düşey bileşenleri yardımıyla çiziniz.</p>	When the object reaches the level at which it was thrown horizontally, the vertical component of its velocity is in the opposite direction of the same magnitude as when it was thrown.																															
The direction of acceleration follows the direction of motion.	<table border="1"> <thead> <tr> <th colspan="4">Topun ivmesinin yönü a_{top}</th> </tr> <tr> <th>Yukarı</th> <th>Asağı</th> <th>Yok</th> <th>Sebebi</th> </tr> </thead> <tbody> <tr> <td>X</td> <td></td> <td></td> <td rowspan="3">Konuma göre</td> </tr> <tr> <td></td> <td>X</td> <td>X</td> </tr> <tr> <td></td> <td>X</td> <td>X</td> </tr> <tr> <td></td> <td>X</td> <td>0,5</td> <td></td> </tr> <tr> <td></td> <td>X</td> <td>0,5</td> <td></td> </tr> <tr> <td></td> <td>X</td> <td>0,5</td> <td></td> </tr> </tbody> </table>	Topun ivmesinin yönü a_{top}				Yukarı	Asağı	Yok	Sebebi	X			Konuma göre		X	X		X	X		X	0,5			X	0,5			X	0,5		The direction of the acceleration does not change, since the object moves with the acceleration of gravity, the acceleration of the object is always towards the center of the earth.	Tao, 1997, Tao & Gunstone, 1999
Topun ivmesinin yönü a_{top}																																	
Yukarı	Asağı	Yok	Sebebi																														
X			Konuma göre																														
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	X	0,5																															
	X	0,5																															
The magnitudes of acceleration and instantaneous velocity are always the same parameter.	<table border="1"> <thead> <tr> <th rowspan="2">Pozisyon</th> <th colspan="3">Topun ivmesinin büyüklüğü a_{top}</th> <th rowspan="2">Sebebi</th> </tr> <tr> <th>= 0</th> <th>= g</th> <th>> g</th> </tr> </thead> <tbody> <tr> <td>A</td> <td></td> <td>X</td> <td></td> <td rowspan="5">Top yüksek hıza ulaşma yaratımı iken hızın düşmesi büyük olur aynı mertebe g ile aynıdır</td> </tr> <tr> <td>B</td> <td>X</td> <td></td> <td></td> </tr> <tr> <td>C</td> <td></td> <td>X</td> <td></td> </tr> <tr> <td>D</td> <td></td> <td>X</td> <td></td> </tr> <tr> <td>E</td> <td></td> <td>X</td> <td></td> </tr> </tbody> </table>	Pozisyon	Topun ivmesinin büyüklüğü a_{top}			Sebebi	= 0	= g	> g	A		X		Top yüksek hıza ulaşma yaratımı iken hızın düşmesi büyük olur aynı mertebe g ile aynıdır	B	X			C		X		D		X		E		X		The magnitude of the acceleration is the ratio of the change in speed to time. Acceleration for	Rosequist & McDermott, 1987	
Pozisyon	Topun ivmesinin büyüklüğü a_{top}			Sebebi																													
	= 0	= g	> g																														
A		X		Top yüksek hıza ulaşma yaratımı iken hızın düşmesi büyük olur aynı mertebe g ile aynıdır																													
B	X																																
C		X																															
D		X																															
E		X																															

Acceleration "instantly stops" at the highest point of the motion of the object.	<p>Topun ivmesinin büyüklüğü a (m/s²)</p> <table border="1"> <tr> <th>Pozisyon</th> <th>= 0</th> <th>= g</th> <th>< g</th> <th>> g</th> <th>Sebebi</th> </tr> <tr> <td>A</td> <td>✓</td> <td>0.5</td> <td></td> <td></td> <td rowspan="5">ortak durur</td> </tr> <tr> <td>B</td> <td>✓</td> <td>0.5</td> <td></td> <td></td> </tr> <tr> <td>C</td> <td>✓</td> <td>0.5</td> <td></td> <td></td> </tr> <tr> <td>D</td> <td>✓</td> <td>0.5</td> <td></td> <td></td> </tr> <tr> <td>E</td> <td>✓</td> <td>0.5</td> <td></td> <td></td> </tr> </table> <p>Topun ivmesinin yönü a (top)</p> <table border="1"> <tr> <th>Yukarı</th> <th>Aşağı</th> <th>Yok</th> <th>Sebebi</th> </tr> <tr> <td></td> <td>✓</td> <td>0.5</td> <td></td> </tr> <tr> <td></td> <td>✓</td> <td>0.5</td> <td></td> </tr> <tr> <td></td> <td>✓</td> <td>0.5</td> <td></td> </tr> <tr> <td></td> <td>✓</td> <td>0.5</td> <td></td> </tr> </table>	Pozisyon	= 0	= g	< g	> g	Sebebi	A	✓	0.5			ortak durur	B	✓	0.5			C	✓	0.5			D	✓	0.5			E	✓	0.5			Yukarı	Aşağı	Yok	Sebebi		✓	0.5			✓	0.5			✓	0.5			✓	0.5		projectile motion is the acceleration of gravity. The direction and magnitude of the acceleration do not change, the acceleration of the object is always towards the center (down) of the earth, its magnitude does not change.
Pozisyon	= 0	= g	< g	> g	Sebebi																																																	
A	✓	0.5			ortak durur																																																	
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Appendix-2 (continued)

Q Misconceptions	Examples of Student Answers	Scientific equivalents	References
The direction of the force vector follows the path of the object in the projectile motion.	<p>2.) A, B, C, D ve E pozisyonlarında topa etki eden kuvvetlerin yönünü ve belirtmek için okları tanımlayın ve çizim.</p>	The direction of force and acceleration are the same, which is towards the center of the earth.	McCloskey, 1983; Toa, 1997; Toa & Gunstone, 1999; Prescott & Michaelmore, 2005
After a hand force (or force thrown) loses contact with an object, it continues to affect the object.	<p>Topa etki eden kuvvetler yere atıldıktan ilk kuvvet Topa etki eden kuvvetler... YMC... kuvveti... gelmeye Topa etki eden kuvvetler yftr... srbkim... itace... ku</p>	There is only the gravitational force affecting the object in the projectile motion.	Bayraktar, 2008; Tao & Gunstone, 1999; Tao, 1997; Hestenes at al., 1992; Hallon & Hestenes, 1985b; McCloskey, 1983; Whitaker, 1983; Clement, 1982
Force means motion.	<p>2.) A, B, C, D ve E pozisyonlarında topa etki eden kuvvetlerin yönünü ve belirtmek için okları tanımlayın ve çizim.</p>	Force, velocity and motion are different concepts.	Clement, 1982
A body falling free from flat falling objects at the same height spends less time to reach the ground than an object moving in a curve.	<p>2.1) Hangi dalgaç suya ilk ulaşır? Sebbinizi yazınız. A Çukuk daha az mesafe vs</p>	Two objects, one released for free fall and the other shot horizontally from the same height, reach the ground at the same time.	Prescott & Michaelmore, 2004
At the same height, an object with initial horizontal velocity (faster) reaches the water in a shorter time than an object moving without initial velocity.	<p>2.1) Hangi dalgaç suya ilk ulaşır? Sebbinizi yazınız. B ymesi daha kısa</p>	Two objects, one released for free fall and the other shot horizontally from the same height, reach the ground at the same time.	Prescott & Michaelmore, 2005
From the same height, the velocity of the object released and launched into the water depends on the type of movement (straight or curved).	<p>2.2) Hangi dalgaç suya düşme hızı daha büyüktür? Açıklayınız. Dalga A önceki daha çok hız kazanır. 2.2) Hangi dalgaç suya düşme hızı daha büyüktür? Açıklayınız. A çukuk kendi ağırlığı ile daha ön kısa mesafe x 2.2) Hangi dalgaç suya düşme hızı daha büyüktür? Açıklayınız. B → Yol uzun hızlanma 2.2) Hangi dalgaç suya düşme hızı daha büyüktür? B → ismielli hareket var x</p>	The velocity of an object hitting water depends on the composition of its horizontal and vertical components. The vertical component of the velocities of both divers	

is the same. Since diver B also has a horizontal component, the velocity of falling into water is greater.

Appendix-2 (continued)

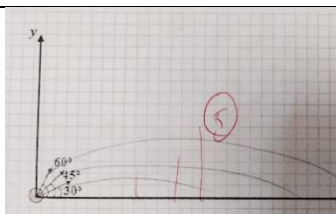
Q Misconceptions	Examples of Student Answers	Scientific equivalents	References
<p>Objects that are released and thrown at the same height hit the ground at different times because the object being thrown has horizontal velocity, acceleration, or force.</p>		<p>At the same height, bodies that are released and ejected have the same acceleration because the acceleration of both bodies is the acceleration of gravity.</p>	<p>(Whitaker, 1983; Dilber et al., 2009)</p>
<p>Since the acceleration of two balls of different height (if the height increases for this item) the higher one has greater velocity when it hits the ground.</p>		<p>If the altitude is increased, the velocity of hitting the ground will increase as the flight time will increase.</p>	<p>(Jimoyiannis & Komis, 2001)</p>
<p>The impulsive force acting on the fired ball more than the weight causes it to move in a straight line, then the initial impulse slowly decreases, and the downward gravitational force gradually moves over the ball so that the net force keeps the ball moving in a curved path.</p>		<p>The fired shell moves in a curved trajectory, this trajectory is not dependent on the initial firing velocity, and only gravitational force acts on it.</p>	<p>Whitaker, 1983; McCloskey, 1983; Halloun and Hestenes, 1985; Hestenes et al., 1992; Prescott & Michaelmore, 2005</p>

<p>Observed by a person on the ground, the object dropped from an airplane moving at a constant velocity will move backward and land behind the point where it was released, or an object released from a constant horizontal velocity follows a linear path.</p>		<p>An object falling from a plane moving at a constant velocity is seen by a stationary observer on the ground, following a curved trajectory as in a projectile motion.</p> <p>Hallon & Hestenes, 1985; McCloskey, 1983; Whitaker, 1983</p>
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Appendix-2 (continued)

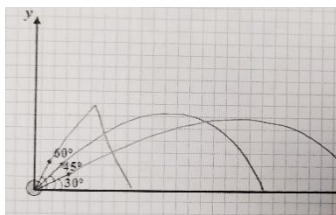
Q Misconceptions	Examples of Student Answers	Scientific equivalents	References
<p>The object released from an airplane moving at a constant velocity will be observed by an observer on the plane that it will move backwards and land behind the release point.</p>		<p>The object released from a plane moving at a constant velocity will be observed by an observer on the plane as if it is moving linearly.</p>	
<p>Any object suspended in air will remain in air until made aware of its situation.</p>		<p>The object falling from the plane moves in a curved orbit, which will be seen by a person on the plane in a linear direction.</p>	<p>McCloskey (1983),</p>
<p>The direction of acceleration indicates the lower position from the upper position.</p>		<p>The direction of acceleration is towards the center of the earth.</p>	<p>Whitaker, 1983; Hestenes et al., 1992;</p>
<p>The direction of acceleration is the same as the direction of motion.</p>		<p>The direction of the acceleration does not change, since the object moves with the acceleration of gravity, the acceleration of the object is always towards the center of the earth.</p>	<p>Tao, 1997, Tao & Gunstone, 1999</p>

The object thrown at a greater angle will travel a longer distance horizontally.



A projectile launched in 45° , at the same level of the starting point, will give the maximum horizontal distance.

The object thrown complementary angles will travel different horizontal distances.



The object to be thrown from the same level, at complementary angles, will travel the same horizontal distance.

6

Appendix-2 (continued)

Q Misconceptions	Examples of Student Answers	Scientific equivalents	References
<p>Hand force (impetus) embedded in the ball directs the ball to hit the target straight.</p>		<p>After the ball thrown, there is no hand force embedded in the ball.</p>	<p>Whitaker, 1983; McCloskey, 1983; Hestenes et al., 1992; Halloun & Hestenes, 1985; Hestenes et al., 1992; Prescott & Michaelmore, 2005</p>
<p>If the initial velocity given to the ball is fast enough, the ball will move in a straight line unaffected by gravity. However, if its velocity is low, it will be affected by gravity.</p>		<p>A horizontally thrown ball as it will be affected by gravity regardless of the initial velocity given to the ball.</p>	

7

Is Global Quality Assurance System of Higher Education in United States, Vietnam and Japan Possible?

Japan Foundation
Japan Studies Through Collaboration

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Abstract

Higher education has jumped into the quality movement with expectations of enhancing the excellence of education being received by students. The total quality management philosophy that dominated the manufacturing industry has found its way into the education industry. W. Edwards Deming developed a set of 14 quality management principles, which can be applied to the education sector (Hughey, 2000; Prasad, 2017). Accreditation is a mechanism to inform the employers, the public and students that a university or program has met the minimum standards for quality. The injection of accountability and accreditation into the educational system has raised the expectations of an institution. External accreditation has been growing worldwide in importance. This paper looks at the development of accreditation within the United States, Vietnam, and Japan. An educational curriculum was seen to be a pillar needed for growth for each country. It became apparent that all three countries realize the importance of quality and are heavily involved in the assessment process. There are some differences in who controls the curriculum and the assessment process. However, continuous improvement is universally shared among the three countries. Developing an understanding of the accreditation process will contribute to the literature surrounding accreditation and quality assurance.

Keywords: Accreditation, Institutional Accreditation, United States Accreditation, Vietnam Accreditation, Japan Accreditation

Introduction

In the United States, accreditation is about quality assurance and quality improvement (Council for Higher Education Accreditation, 2018). Accreditation is administered through the Council of Higher Education (private body) and the United States Department of Education (government body). The Council of Higher Education guidelines assures that institutions are maintaining and improving academic quality whereas the United States Department of Education guidelines assures that institutions have the minimum quality requirements in order to receive Federal funding. Neither of the organizations accredit institutions. However, both of the organizations approve the accrediting bodies deemed to be authoritative as to the quality of higher

education in the United States (Harman et al., 2010). After World War II, postsecondary education became of heightened interest of the Department of Education because of the military veterans expected to be attending college through the Servicemen's Readjustment Act (GI Bill).

North Vietnam's model of education was shaped after the French educational system, which was vocational schools. After the reunification of North and South Vietnam, the educational system in Vietnam shifted towards the Soviet Union educational model of specialization and research. Overtime, Vietnam's government made modifications to the educational system, and Vietnam academic structure began to move away from the Soviet Union model. By 2020, Vietnam plans to have a competitively advanced higher educational system that will meet international quality standards. Today, the new set of 25 standards with 111 criteria are being applied for accreditation at the institutional level. The economy of Vietnam has been rapidly growing by leaps and bounds. Vietnam experienced a massification of universities in the higher education industry. Today, the quality and relevance of higher education and the skills being developed with adequacy to the market needs is a concern. Quality assurance has entered the educational arena. Vietnam is experiencing what was seen earlier in Japan.

Japan's model of education was patterned after the United States higher education system. After a series of transformations, the volunteer reporting system witnessed in the United States transpired into a governmental reporting system in Japan. The main difference between United States and Japan accreditation is that the United States accreditation is concerned with enabling an institution to qualify for Federal support programs, whereas Japanese governmental recognition relates to the legitimacy of higher education institutions (Mori, 2009). After World War II, higher education in Japan exploded to meet the demands of the growing economy. Japan experienced a massification of universities in the higher education industry. Today, the Japanese educational system and the quality assurance system is being reformed. Japan followed the developments seen in the United States.

Quality has undergone many transformations over the years. Quality dominated the manufacturing and engineering industries from 1940-1980. In 1990's, quality emerged as its own profession, and spread from business into the public sector, including health care and higher education (Nair et al., 2010). Although the quality movement is relatively young in the history of higher education, its footprint is significant and persistent. Higher education institutions must continuously create, review, and renew its systems of quality assurance in its endeavors to ensure relevance, marketability, reliability, and stature. External quality assurance in higher education has been growing worldwide. As the internationalization and massification of higher education flourishes, higher education institutions must also be prepared to meet both domestic and global quality standards and expectations.

The objective of accreditation is to reassure stakeholders (such as employers, the public and students) that a university has attained a high level of quality instruction as evidenced by the degrees being granted by those institutions. A Ministry of Education does not exist in the United States and there is no Federal control over the quality of higher education. A Ministry of Education does exist in Vietnam and Japan. In the United States, national accreditation has the reputation of having lower quality standards for education as compared to regional accreditation. In Vietnam and Japan, national accreditation is required. Similar regional accrediting bodies exist around the world, further reinforcing its impact and scale. Quality is difficult to define, so it is natural to establish a standard as replacement for quality. The United States educational system receives many international students each year. In 2020, Vietnam and Japan were among the top ten countries with international students studying in the United States. The United States has a responsibility to promote opportunities for Vietnamese and Japanese students to study in the United States (and vice versa for U.S. students studying abroad). This paper begins with an overview of the higher education system in the United States. Personal interviews were conducted with representatives from Vietnam and Japan concerning the higher education system and accreditation within Vietnam and Japan. A comparison can be made between the United States,

Vietnam, and Japan. The manuscript concludes with the recommendations to consider for future research among United States, Vietnam and Japan.

UNITED STATES

Higher Education Act:

President Lyndon Johnson had a belief that “higher education [was] no longer a luxury, but a necessity”, and that opinion prompted the Senate and House of Representatives to pass the Higher Education Act (Association of Centers for the Study of Congress, 2018). On November 8, 1965, President Johnson formally signed into law the Higher Education Act. The higher education legislation was meant to “strengthen the educational resources of our colleges and universities and to provide financial assistance for students in postsecondary and higher education” (Public Law 89-329, 2018). The act designated Federal funding that was intended for university improvements (such as libraries and equipment); the act created scholarships (such as work study and fellowships); the act provided for low interest student loans, the establishment of an Advisory Council on Quality Teacher Preparation and the establishment of the National Teacher Corps.

The goal of the act was to advance colleges, expand college libraries and to provide financial funding for low and middle-income families. President Johnson identified the Higher Education Act as one of the “keystones of the great, fabulous 89th Congress” and the act was “the roots of change and reform” in the United States. (Association of Centers for the Study of Congress, 2018). President Johnson alleged that the Higher Education Act planted the seeds and education was the path to achievement and fulfillment for an individual; for the Nation, education was the path for a society that is free and civilized; and for the world, education was the path to peace (Association of Centers for the Study of Congress, 2018). A quality education is important for all stakeholders.

National Accreditation:

The Secretary of Education controls the Department of Education, and the Secretary of Education makes recommendations to the President of the United States on Federal policies and programs. The Secretary of Education is a member of the President’s Executive Cabinet and is fifteenth in line for the presidency of the United States. The Higher Education Act authorizes the Department of Education to approve the accreditors whom the Secretary of Education concludes as being authoritative as to the quality of higher education being provided by higher education institutions (U. S. Department of Education, 2018).

The Secretary of Education is advised by the National Advisory Committee on Institutional Quality and Integrity on matters regarding “accrediting agencies that monitor the academic quality of postsecondary institutions and educational programs for Federal purposes” (U.S. Department of Education, 2018). The objective of accreditation is to reassure stakeholders (such as employers, the public and students) that a university has attained a high level of quality instruction as evidenced by the degrees being granted by those institutions. An institution needs to be nationally recognized in order for its students to receive Federal financial aid. The Department of Education posts a list of nationally and regionally recognized accreditors whom are considered authorities as to the quality of higher education.

The United States Department of Education recognizes ten national accrediting bodies, of which nine bodies are active (U.S. Department of Education, 2018). According to the United States Department of Education (2018), the national accrediting bodies are listed in Table 1.

Table 1 – National Accrediting Bodies

- Accrediting Commission of Career Schools and Colleges
- Accrediting Council for Continuing Education and Training
- Association for Biblical Higher Education

- Association of Advanced Rabbinical and Talmudic Schools
- Association of Institutions of Jewish Studies
- Council on Occupational Education
- Distance Education Accrediting Commission
- New York State Board of Regents
- Transnational Association of Christian Colleges and Schools
- Accreditation Council for Independent Colleges and Schools (Inactive)

A Ministry of Education does not exist in the United States and there is no Federal control over the quality of higher education. The Department of Education “does not accredit individual educational institutions and/or programs and is not directly involved” in the accrediting process. Instead, the Department of Education provides oversight over the accreditation for higher education. The ten national accreditors review institutions based upon guidelines that permit those higher institutions to be included in the Federal student aid program. In order to ensure some level of quality in higher education, nongovernmental, peer reviewed processes are used. National accreditation has the reputation of having lower quality standards for education as compared to regional accreditation. A perceived lower quality education makes it difficult for students to transfer academic credit from a national accredited institution to a regional accredited institution. Regional accreditation is considered by stakeholders as being the more prestigious form of accreditation in the United States because regional accreditation has additional guidelines that are very stringent and have been utilized for a very long time (since 1885).

Regional Accreditation:

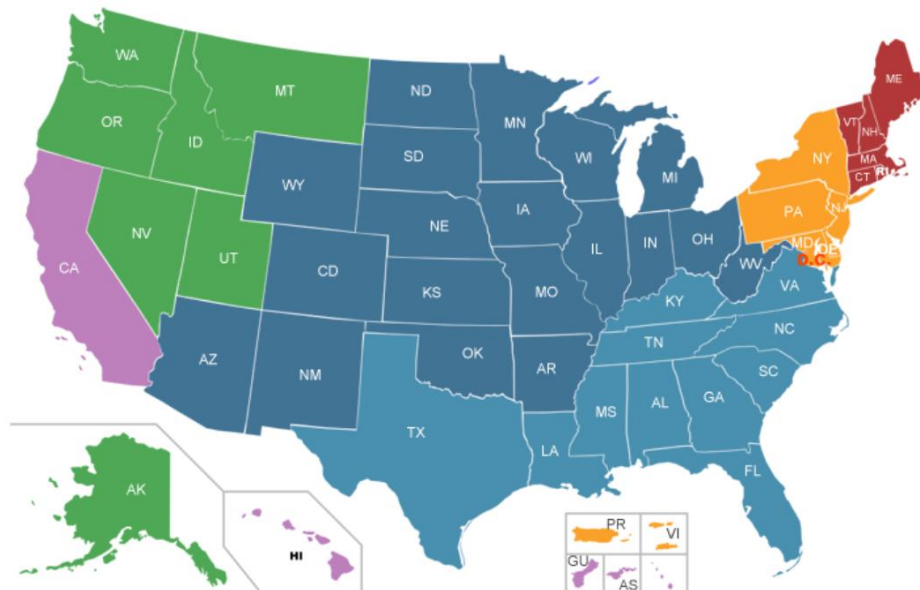
Originally, regional accreditation focused on accreditation of secondary schools in order to provide consistent college admission standards. Over time, representatives from the regional accreditation agencies expanded its responsibilities to include accrediting higher institutions. Today, over 100 full time regional commissioners oversee the regional accreditation in the United States. Approximately 15 percent (one out of seven) of the regional commissioners must be a public interest member (such as business or government). The field work associated with accreditation is carried out by over 3,500 peer colleagues who serve on a visiting team. Peer volunteers include a diverse group of university employees, such as academic officers, faculty, finance experts, presidents, and student services, among others. Regional accreditation oversees “the quality of research universities; community colleges; liberal arts colleges; state colleges; religiously affiliated institutions; special purpose institutions in the arts, sciences, and professional fields; military academies; historically black and Hispanic-serving institutions; and tribal colleges” (Commission on Institutions of Higher Education, 2018).

It is the choice by a university to become regionally accredited. The quality standards are more stringent with regional accreditation as compared to national accreditation. Regional accreditation makes the transferability of course credits more likely between regional accredited universities. In October 2005, the Government Accountability Office published a report about transfer students. The Government Accountability Office found that 84 percent of institutions consider accreditation when determining to accept transfer credit (U.S. Government Accountability Office, 2018). Furthermore, about 63 percent of the institutions stated that regional accredited coursework would be accepted for transfer, and only 14 percent would accept national accredited coursework. The inability of a student to transfer credits can negatively impact a student. For instance, a student will need to retake courses, which can add length to his/her total degree, and this creates an additional tuition burden that a student needs pay. If an institution is regionally accredited, transfer credit is more likely to be accepted by the receiving institution.

In the United States, regional accreditation is split into territorial regions, as defined by the Department of Education. The regional accreditation responsibility in the United States is divided into six geographic regions (as indicated on the map below – Figure 1) with seven separate commissions. The seven regional organizations form the Council of Regional Accrediting Commissions. The Council of Regional Accrediting Commission “encourages and assists in the improvement, effectiveness and excellence of affiliated educational institutions” (Commission on Institutions of Higher Education, 2018). A university in the United States does not need to be regionally accredited, however regional accreditation demonstrates to stakeholders that the university has met a minimum quality standard for their degrees beyond the requirements for national accreditation. Moreover, about 69 percent of postsecondary regional accredited institutions have entered into voluntary agreements with each other for transferability of coursework (U.S. Government Accountability Office, 2018). Accreditation provides assurance to stakeholders that institutions have met a level of quality and the value of the degree is confirmed. According to the Commission on Institutions of Higher Education (2018), the seven regional accrediting bodies (Table 2) along with its regional accreditation responsibility area (Figure 1) (color coded to align with the regional map below) in the United States are below.

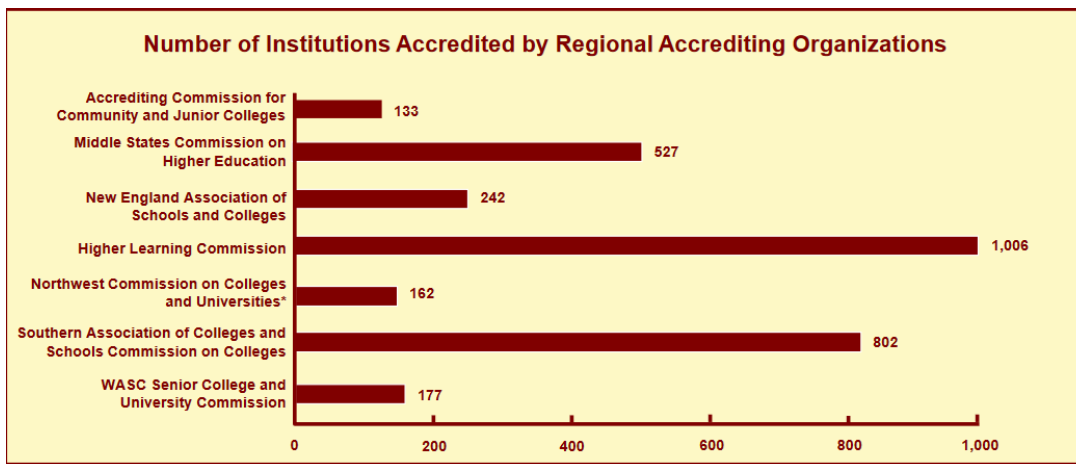
Table 2 – Regional Accrediting Bodies

- Accrediting Commission for Community and Junior Colleges
- Higher Learning Commission (formerly North Central Association of Colleges and Schools)
- Middle States Commission on Higher Education
- New England Association of Schools and Colleges
- Northwest Commission on Colleges and Universities
- Southern Association of Colleges and Schools
- Western Association of Schools and Colleges



Map Source: college-usa.org
Figure 1 – Regional Accreditation Territories

Regional institutional accreditors accredit 3,049 public and private institutions as can be seen in the chart below (Figure 2). The Higher Learning Commission granted 33 percent (1,006) of the total regional accreditations within the United States. In addition to regional accreditation, national faith and career related accreditors accredited 4,847 institutions in 2013. In total, 7,896 institutions were accredited in 2013.



Source: CHEA 2013 External Quality Review

Figure 2 – Number of Institutions Accredited by Regional Accrediting Organizations

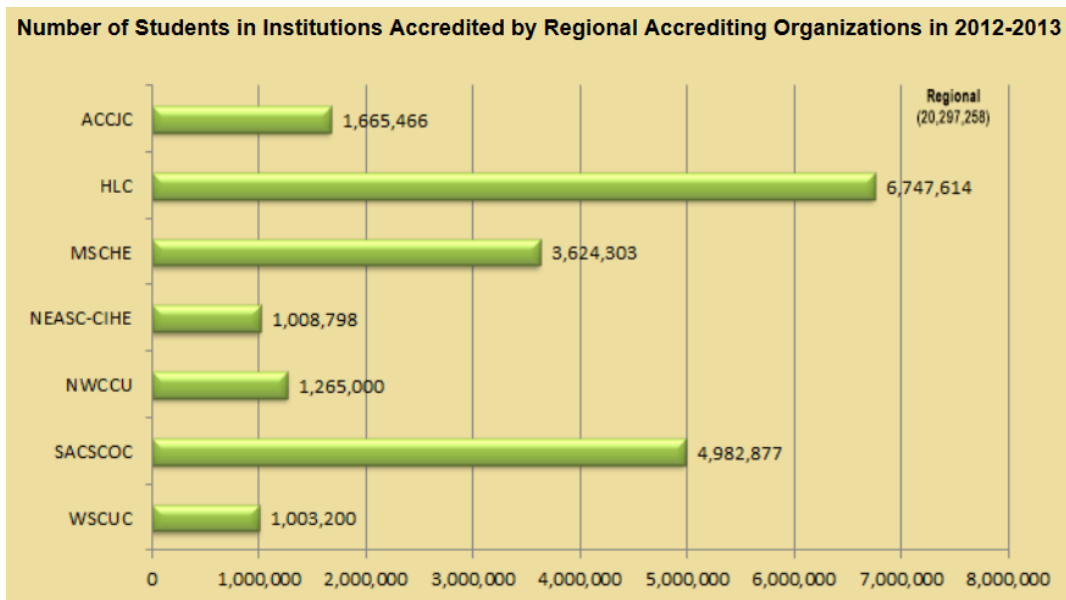
Programmatic accreditors accredit 42,686 specific programs, professions or schools as shown below (Figure 3).

	Public	Private Nonprofit	Private For-Profit	Institutional Control Not Indicated	Total
Degree	9,587	5,904	4,522	18,715	38,728
Non-Degree	1,190	532	445	1,791	3,958
Programmatic Total	10,777	6,436	4,967	20,506	42,686

Source: CHEA 2013 External Quality Review

Figure 3 – Programmatic Accreditors by Degree or Non-Degree Status

As seen below (Figure 4), in 2013, the Council for Higher Education Council (2015) reported more than 23,994,000 students were enrolled in accredited institutions. Regionally accredited institutions enrolled 85 percent (20,297,258) of the students (Council for Higher Education Accreditation, 2015). The other 15 percent of the students (3,697,483) attended schools with only national accreditation. The students attending regional accredit schools were primarily enrolled in institutions under the accreditation oversight of the Higher Learning Commission.



Source: CHEA 2013 External Quality Review

Figure 4 – Number of Students Accredited by Regional Accrediting Organizations in 2012-2013

Accreditation:

Accreditation in the United States arose from the need to protect public health and safety, and to serve the public interest (Eaton, 2018). Accreditation is a mechanism to inform the employers, the public and students that a university or program has met the minimum standards for quality. Accreditation is required for students to access Federal and State funding. Accreditation is important to employers when evaluating the credentials of job applicants or deciding to reimburse employees for tuition. Accreditation is important for the transferability of college credits. According to the United States Department of Education (2018), the important functions of accreditation are to:

- Assess the “quality of academic programs at institutions” of higher education.
- Create a “culture of continuous improvement of academic quality at colleges and universities and stimulate a general raising of standards among educational institutions”.
- Involve “faculty and staff comprehensively in institutional evaluation and planning”.
- Establish “criteria for professional certification and licensure and for upgrading course offerings such preparation”.

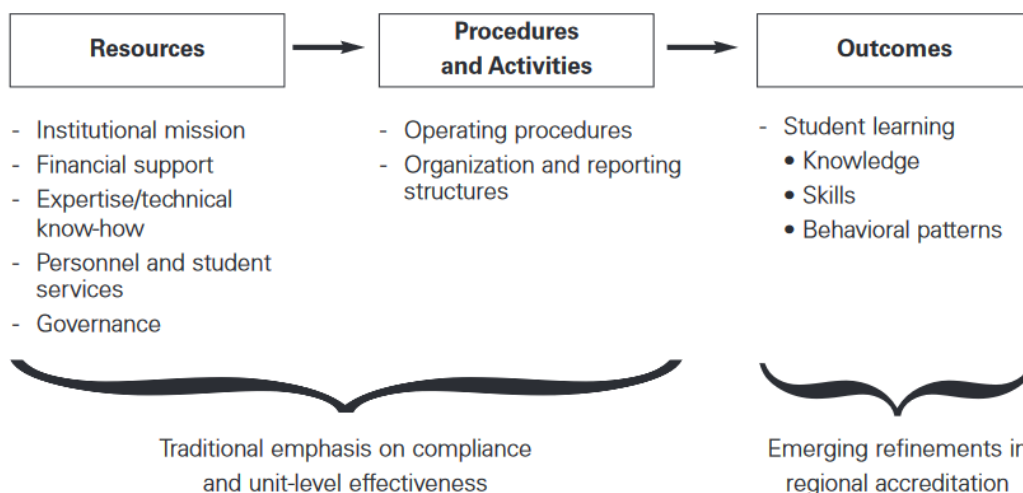
Accreditation in the United States is a “means to assure and improve higher education quality, assisting institutions and programs using a set of standards developed by peers” (Council for Higher Education Accreditation, 2018). Private, non-governmental and non-profit organizations carry out the accreditation process. An accredited institution or program signifies that the facility has the necessary resources available for student success, such as student support. There are two basic forms of regional accreditation. One form is institutional accreditation in which the accreditation applies to the entire university. The other form is a specialized or programmatic accreditation in which specific programs and/or departments are accredited.

Institutional Accreditation:

Regional accreditation is a non-governmental, peer-to-peer evaluation on institutional quality. The regional associations are located in different geographic regions and reflect “historical and cultural differences in these regions” (Jackson et al., 2010). Institutional accreditation came about as the structure for institutions to deal with college credit transferability and student admittance into graduate studies. Institutional accreditors include: a) National Faith Based who accredit religiously affiliated universities; b) National Career Based who accredit for-

profit, career based institutions; and c) the six Regional Accreditors who accredit public and private, degree granting, 2 and 4 year institutions (Busby, 2015). The accreditation process has evolved overtime. The institutional process went from adhering to a set of strict standards to a process that demonstrates the effectiveness of the quality education towards meeting an institutions mission. Assessment surrounding student learning is a component of the regional standards.

The institutional accrediting bodies consider institutional quality as a whole during the accreditation process (Millard, 1984). As a result, institutional accreditors pay attention not only to the educational offerings of an institution, but also to its institutional characteristics, such as administrative strength, effective management, financial conditions, learning resources, library resources and student personnel services (Millard, 1984). The diagram below (Figure 5) illustrates the connection between accreditation methods and assessment outcome trends.



Source: Planning for Higher Education

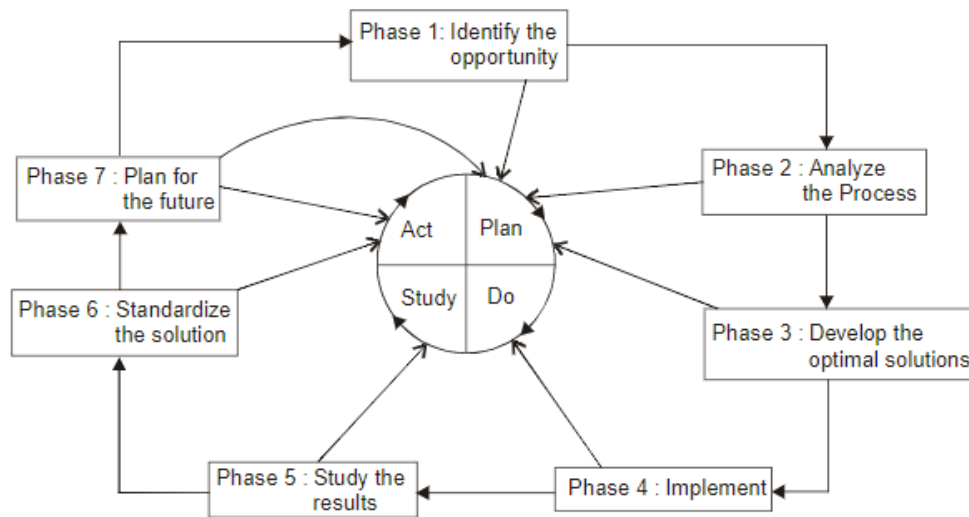
Figure 5 – Connection Between Accreditation Methods and Assessment Outcome

Specialized Accreditation:

Special accreditation was developed in some professions (such as Accounting) because the public had concerns about the adequacy of education being delivered in preparation for a professional field of study (Millard, 1984). As a result, specialized accreditation is concerned with specific professional, occupational, or disciplinary areas within institutions or as free standing professional or occupational school (Millard, 1984). Specialized accreditation bodies require an institution to have institutional accreditation in order to be eligible for specialized accreditation. If an institution loses its institutional accreditation, it will also lose its specialized accreditation. Special accreditation is recognized as being reputable by the Department of Education.

Theory:

The origin of quality stems from business. In the 1950s, Walter Shewhart developed the plan-do-study-act system that introduced cycles for strengthening quality and the system still influences the field. The plan-do-study-act chart below (Figure 6) illustrates the foundation of assessment processes in place of most higher leaning institutions today. This movement expanded its focus from products and manufacturing, and entered the management and service sectors.



Source: N.R., Babu, & Rajengra, 2006
Figure 6 – Plan-Do-Study-Act Chart

W. Edwards Deming was one of the most notable figures behind the total quality management movement after World War II. Deming developed a set of 14 guiding principles aimed at improving quality and productivity of organizations by holding management accountable within the organization. His philosophy demanded that all employees within an organization should be focused on satisfying the customer demands by providing high quality at a low cost. Deming focused on businesses but his strategies can be applied to higher education. Higher education witnessed a push for accountability as evidenced by the Higher Education Act and accreditation expectations. By raising the quality standards expected of an institution, this should raise the quality level of the students graduating from an institution. The quality of education received by students is connected to the dedication of administration, faculty and staff of the institution (Hughey, 2000). Employee involvement is at the roots of total quality management.

According to The Deming Institute (2018), Dr. Deming's 14 points for management are listed in Table 3.

Table 3 – 14 Principles for Management

1. Create constancy of purpose for improvement of product and service.
2. Adopt the new philosophy.
3. Cease dependence on inspection to achieve quality.
4. End the practice of awarding business on the basis of price tag.
5. Improve constantly and forever the system of production and service.
6. Institute training on the job.
7. Institute leadership.
8. Drive out fear.
9. Break down barriers between departments.
10. Eliminate slogans, exhortations and targets for the work force.
11. Remove barriers that rob the hourly worker of his right to pride of workmanship.

12. Remove barriers that rob people in management and in engineering of their right to pride of workmanship.
13. Institute a vigorous program of education and self-improvement.
14. The transformation is everybody's job.

According to Prasad (2017) and Hughey (2000), the Deming 14 points for management can be restated in the terms required for higher education. The restatement is as follows in Table 4.

Table 4 – 14 Principles for Higher Education

1. Create constancy of purpose towards improvement of students and service. Exceptional customer satisfaction will give the institution an advantage and benefits will carry forward into the future. Everyone in the organization must be on board with the mission of the university or college.
2. Adopt a new philosophy. What was acceptable in the past is no longer acceptable for the future. Students and their concerns should be upfront in every decision at the university or college.
3. Decrease the dependence on examination testing to achieve quality. Instead offer learning experiences designed to meet the education desired, which will create the quality education experience.
4. Work for the proper match of backgrounds, interest areas and the specialization chosen. Quality is not related to the large dollars being spent, instead a university or college should focus on the long term goals for the academic programs.
5. Improve constantly and forever to improve quality and productivity without increasing costs. Higher education should monitor the needs of students and offer services that will meet those needs. Continuous improvement should be a priority at universities or colleges.
6. Institute education and training on the job for administrators, faculty, staff, and students. Training is “key to the successful implementation of TQM within the academic environment” (Hughey, 2000).
7. Institute leadership. Upper leadership should reinforce their commitment to quality and empower those closest to students to make decisions.
8. Drive out fear by encouraging people to speak freely. Supervisors should not rely on formalized evaluations (i.e. peer-evaluations and self-evaluations) as a way to motivate employees to adhere to the departments' goals.
9. Break down barriers between different departments and increase cooperation among groups. Students should be of concern and improvements should be welcome by everyone, no matter of the originating department.
10. Eliminate slogans, exhortations and targets for faculty and students asking for a perfect performance and new levels of productivity. When administration sets unrealistic goals, employees become unmotivated, morale decreases and performance is hindered. Unrealistic goals, such as 100% student satisfaction, can lead to employee frustration and burnout.
11. Eliminate work standards on faculty and students. Holding individuals with different abilities to the same performance standards can be counterproductive.

12. Remove barriers that rob the faculty, management and students of their right pride and joy of workmanship. Higher education should be flexible in order to respond to individual needs for establishing priorities. Focus should be on quality instead of quantity.
13. Institute a vigorous program of learning and self-improvement for everyone. Total quality management can mean additional training for employees will be needed in order for the university or college to achieve customer satisfaction.
14. Put everybody in the institution to work to accomplish the transformation. The higher quality standards should be the efforts of all employees reaching for the same set of goals.

There can be no dispute that quality matters. Quality embraces all facets of higher education institutions, locally, regionally, and internationally. As evidenced, it is appropriate to utilize Dr. Deming's total quality management philosophy within higher education. Higher education could benefit from implementing Deming's 14 principles of management. The assessment process in the United States can provide the framework that higher education requires in order to ensure quality and enhance customer satisfaction. Variation in quality was thought by Dr. Deming as a disease that could threaten the survival of an organization. The more variation in the quality, the greater the threat. Accreditation can provide a method to ensure a minimum standard of quality is being achieved by institutions. Benchmarking against peer institutions can be seen as an opportunity for universities to freely share values, ideas, and practices (Prasad, 2017). "The Deming philosophy looks at the world through a lens that is different from all others" (The Deming Institute, 2018). It is a holistic approach to leadership and management that will benefit any organization, including higher education. "The end goal? To teach students how to think – not what to think, which is inherently a 21st century skill" (The Deming Institute, 2018).

Methodology and Analysis:

A qualitative case study method was used in order to gather data surrounding the accreditation process and agencies in Vietnam and Japan. In order to understand accreditation within the higher education for Vietnam and Japan, personal interviews were conducted in Vietnam and Japan with faculty members, university department heads, higher administration personnel, or authoritative figures on accreditation within that country. For instance, the researchers had the honor to personally speak with several representative from National Institution for Academic Degrees and Quality Enhancement of Higher Education, Japan University Accreditation Association, Kobe University, Chiba Institute of Science, and University of Social Sciences and Humanities, among others. The researchers are very appreciative of the time, assistance, and superior hospitality during the lovely office visits. It was wonderful how all parties were able to accommodate their busy calendars in order to accommodate the researchers needs.

The researchers first sought approval from the university's IRB committee in order to conduct the research. The university's IRB granted its approval. A review of the literature was completed in order to gain a better understanding of the accreditation process within higher education for Vietnam and Japan. From that review of literature, the researchers identified some interview questions that they wished to have further clarification on. This led to the development of 16 questions related to the accreditation process and agencies; and 16 questions related to national accreditation. With the help of the researcher's contacts, personal interviews were arranged during the researcher's visits to Vietnam and Japan. The interview questions were translated into Japanese language and sent ahead of time to some of the Japanese contacts. An interpreter was available during the Japanese interviews. The interview questions were not translated into Vietnamese language because the contacts could read and speak English. Interviewing the representatives allowed the researchers to confirm and clarify facts found with the review of literature.

A case study was used in order to gather real-life background to provide meaningful evidence as to the accreditation process within higher education in Vietnam and Japan. The preparation in which every organization engaged to; not only arrange such a superb presentation

for each of the visits; but also, preparing so intensely for the time together by compiling the invaluable handouts was deeply appreciated. Each organization's diligent preparation allowed us to cover a lot of ground in such a short period of time. The researchers learned so much from each meeting and conversation. The interviews were transcribed and read several times in order to compare and contrast the information shared from the interviewees. The data is documented in a research journal and is supported with the literature review in order to validate the research findings.

VIETNAM

Context:

In the period before the French rule, the wealthy residents of the Vietnamese society invited teachers to reside in their houses in order to educate their children. The children of the nobles were sent to schools to study how to become a mandarin (civil administrator). The teachers were one form of mandarin. After Vietnam received its independence from China in 938, Vietnam would setup its own examination system for civil administrators. In 1075, Vietnam had its first exam designed for the civil administrators (Kinh & Chi, 2008). For the next 1,000 years, the Vietnamese people learned Chinese for writing, with a slight variation in the way words were pronounced (Kinh & Chi, 2008). At the end of the 19th century, the French colonized Vietnam and Indochina. The education system that Vietnamese people underwent was replaced by French-Vietnamese. Under this system, French became the dominant language and the language of instruction within higher education. As a result of the French dominance, 95 percent of Vietnamese people became illiterate (Kinh & Chi, 2008).

In 1917, France reformed Vietnam's educational system to mirror that of the French, which was a professional (vocational) education or a command education system. The educational system was primarily a mechanism to train students to serve the colonial system. In 1945, the Vietnamese government issued Decree No 17-SL: "Everyone in the country has to be literate" was issued in order to rehabilitate the country (Kinh & Chi, 2008). Vietnam's President Ho Chi Minh wanted to fight against illiteracy, invaders, and poverty while preserving its independence (Kinh & Chi, 2008). Within a year, Vietnam had about 75,000 literacy classes and 96,000 educators to assist the 2.5 million people in becoming literate (Kinh & Chi, 2008).

In 1950, the government declared that the Vietnamese language would be used in higher education instruction. Furthermore, some national fundamentals were being included within the curriculum. However, the French curriculum would continue to be used within the institutions in Northern Vietnam for a short period until 1954 or 1955, when the curriculum was changed with the Soviet Union influence. In Southern Vietnam, education transitioned from European and French influence towards that of North America. After 1975, South Vietnam began to nationalize private schools and remove the religious influence on the schools.

Educational Reform:

The second educational reform occurred after peace was achieved in Northern Vietnam. The Vietnamese government desired "people who had all-round development in all aspects, and were good citizens and officials" and provided "linkages between theory and practice, and school and social life" (Kinh & Chi, 2008). The educational system became a 10-year program and resembled the educational system of Union of Soviet Socialist Republics (USSR). The professional educational system was dominant in North Vietnam (Le & Nguyen, 2009). In Southern Vietnam, the North America educational systems was an influencer. Education consisted of 12 year curriculum, with many subject areas, such as administration, economy, laws, and science (Kinh & Chi, 2008).

After the reunification of North and South Vietnam in 1976, the French presence left the Vietnam educational system and higher education in Vietnam began to be modeled after the Soviet Union. This would be the third educational reform within Vietnam. Education was transformed

into a 12-year general education and a few specialized universities were developed (Kinh & Chi, 2008). Government wanted to focus education towards developing an all-round individual, instead of a military (command) education. Universities under the Soviet Union model began to become highly specialized in professional studies while research was conducted at research universities (London, 2006). The biggest challenge in reforming the educational system was the lack of financial resources and graduate's inability to find suitable employment. There was a need in Vietnam for higher quality and improved training that meets employer needs. The mismatch between training and employer needs created high levels of under-employment in Vietnam (Dao, 2015).

National System:

In 1993, the Soviet Union model of small specialized colleges was abandoned, and the government moved to a unified national system of large, comprehensive, research orientated universities (Harman et al., 2010). The five major universities were located in Danang, Hanoi, Ho Chi Minh City, Hue, and Thai-Nguyen (Kinh & Chi, 2008). The reform permitted higher institutions to charge tuition, with strict limitations, and the reform created semi-public and non-public institutions. Semi-Public institutions are State owned, whereas Non-Public are community owned and privately owned (Harman et al., 2010). The training programs became diverse and were being developed so that graduates would be able to find suitable employment.

The Ministry of Education and Training would require higher institutions to continuously screen students during their entire college education experience. As a result, two national quality centers were developed in the 1990's: Vietnam National University Hanoi and Vietnam National University Ho Chi Minh City (Le & Nguyen, 2009). In 2013, the two national university locations were considered as key locations because they accounted for 67 percent of student enrollment (Dao, 2015). In 2015, a third quality center regionally located at Danang University was established (Do et al., 2017). Followed by Thai Nguyen University and Vinh University joining regionally. According to Circular 61/2012/TT-BGDĐT, the three national agencies and two regional agencies should be independent of the higher education institutions.

In 2002, the Ministry of Education and Training implemented a policy called "Three Things in Common", which called for institutions to use common exam items, common organization of exams, and common use of exam results for admission (Tran et al., 2011). The intent of the three things in common policy was to standardize admission entrance into higher education thereby providing equal access to higher education for the citizens. Graduating high school students would enroll into cram sessions to prepare for the demanding college entrance exams. These stressful college entrance exams were discontinued in 2015 in order lower costs for universities and students.

Today, the college entrance exam is incorporated into the secondary graduation exam. The secondary graduation exam includes five testing areas: foreign language, mathematics, natural science, social science, and Vietnamese language. Students wishing to attend college will take a minimum of four testing exams, whereas three testing exams are needed for secondary graduation. The minimum college entrance score is established by Ministry of Education and Training to be 15 out of 30 in three testing areas. After 2020, admission exams will be abolished, and college admission will be based upon how well a student performs during his/her senior year of high school. Today, some prestigious universities have developed its own admission exam to become more selective in the admission process. Recently universities have been developing competence-based testing based upon the U.S. Scholastic Assessment Test and the U.K. Thinking Skills Assessment.

Quality Assurance System:

Today, total independence is almost achieved, and most of the quality assurance system is financially independent. Additionally, licensure and public provision of data is also in place within the quality assurance program in Vietnam. Circular 08/2011/TT-BGDĐT specified the

requirements for quality assurance at higher education institutions. Requirements included minimum campus area, equipment resources, facilities, quantity and qualifications of full-time teaching staff, library resources, and teacher-student ratio to name a few (Do et al., 2017). If a university or program does not meet the minimum requirements, it could be closed. Vietnam is experiencing a large influx of students into its institutions of higher learning. The growth is expected to continue, and as a result, quality of education has been highlighted (Maddison, 2014). The government predicts that by 2020, enrollment could be 4.5 million students, which represents 99 percent increase from 2013 (2.26 million students) (Dao, 2015).

The quality assurance system in Vietnam is modeled after other institutions in Asia and Europe. Vietnam's model of quality assurance include accrediting agencies, external quality assurance and internal quality assurance. The government has developed a legal framework for the quality assurance system. The State management includes the evaluation standards, procedures and cycles of accreditation, establishment and operation of the accrediting agencies (Nguyen et al., 2017). The government assigns the Ministry of Education and Training to be in charge of maintaining and supervising accrediting activities. A subunit of the Ministry, the General Department of Education Testing and Accreditation, is responsible for guiding the individuals, institutions, and organizations to implement quality assurance programs (Nguyen et al., 2017).

Established by the Ministry of Education and Training, Vietnam has five accrediting agencies. The five agencies are: Center for Education Accreditation – Vietnam National University (Hanoi), Center for Educational Accreditation – Vietnam University (Ho Chi Minh City), Center for Education Accreditation – Da Nang University, Center for Education Accreditation of the Association of Vietnam Universities and Colleges; and Center for Educational Accreditation – Vinh University (Ministry of Education and Training, 2019). These five agencies are granted authorization by the Ministry of Education to conduct accreditation in Vietnam. Additional agencies could be developed in the future to undertake the external quality assessment. The expansion is because of the volume of institutions (over 700 campuses and over 1,000 programs) that will be expected to be reviewed for accreditation (Nguyen et al., 2017).

Most Vietnamese institutions have established an internal quality assurance division. The internal division reviews quality assurance behaviors within the institution. In 2012, a survey conducted by the Ministry of Education revealed that the institutions' internal assessment division was intensely involved in: building and managing a testing bank center; collaborating to organize exams; collecting feedback from employers, graduates and students; conducting institutional and program self-evaluation; developing guidelines for internal quality assurance; evaluating teaching activities; among other various activities (Nguyen et al., 2017). Vietnam has established a new accreditation and quality assurance procedure and is heading towards a national qualification framework that is aligned with ASEAN Qualification Reference Framework on a region-wide basis for ASEAN members. The ten ASEAN members consist of Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam (The ASEAN Secretariat, 2018). Vietnam institutions clearly demonstrate the importance of accreditation and quality assurance within the educational system.

JAPAN

Context:

Modern Japanese schools began in 1872 after the governments' declaration of the Educational System. The fundamental law of education and the school education law were enacted in 1947 to ensure equal opportunities for citizens in education (NIAD-UE, 2014). Accreditation of universities in Japan began after World War II and continues yet today. Japan is known to have the oldest accreditation system in Asia. The Japanese system of accreditation was formed after the United States educational system, with the exception that Japanese accreditation is controlled by the Ministry of Education.

The Ministry of Education supervises the curriculum, textbook, and classes in order to provide a uniform standard of education. Students are expected to work in groups, and they are responsible for keeping the classrooms, cafeterias, etc. clean. This work responsibility teaches students to work in groups and to be respectful of each other's work. Almost all students wear school uniforms in order to remove the social barriers. Universities are required to be endorsed every 7 years, with the reaffirmation process performed by an accreditation body recognized by the Ministry of Education. Professional programs need to be endorsed every 5 years. The term *Daigaku*, which means “university” or “college” can only be used by institutions licensed by the Ministry of Education (Mori, 2009).

Accreditation Agency:

In 1947, Japan's first accreditation agency was formed, the Japan University Accreditation Association (JUAA) (Mori, 2009). Japan formed its higher education system after the United States educational system for quality assurance. JUAA has “functioned as a driving force of quality enhancement of Japanese higher education” (Mori, 2009). However, even though the Japanese system was designed after the United States, accreditation in JUAA is very selective. According to Mori (2009), institutions accredited by JUAA have met beyond a minimum standard for membership and a university is deemed an emblem of excellence to have JUAA accreditation. The Japanese government plays a role in the quality of higher education, and the licensing of institutions, which is common for European universities (Mori, 2009).

The Ministry of Education evaluates an institution, it licenses the institution and it limits the number of students admitted into the institutions. Public schools have enrollment mandated and private schools enrollment is suggested. The Japanese strategy to improve the quality of higher education is to admit fewer students, which therefore meant that students would be of a higher quality entering into the educational system. Graduating high school students would enroll into cram sessions to prepare for the demanding college entrance exams. The Ministry of Education conducts the initial application for institutional licensure. After licensure, the institutions self-regulate the quality of the curriculum, teaching and research (Mori, 2009). Temple University of Japan started in Tokyo in 1982, along with other U.S. universities. Temple University is the only foreign university that remains in Japan. Until 2005, Temple University was not recognized as a university in Japan. The lack of official recognition created various challenges, such as graduation school applications, VISA issuance for foreign students, and etc. Temple University is now recognized by the Ministry of Education as a Japan branch of a foreign university. The official recognition permits Temple University to sponsor student VISAs, etc. Accreditation is important!

In 1987, the Ministry of Education created the Council for Higher Education (NIAD-UE, 2014). The Council for Higher Education conducts reviews of the entire education system. The Council of Higher Education made several recommendations, including the establishment of new degree awarding organizations. In 1991, the National Institution for Academic Degrees (NIAD) emerged under the direction of the Ministry of Education. NIAD was established to “confer academic degrees to learners outside the university on the basis of matriculation and recognition of educational institutions outside the jurisdiction of the Ministry of Education” (Mori, 2009). In 2000, the NIAD was reorganized as the National Institution for Academic Degrees and University Evaluation (NIAD-UE). Higher education accreditation was the purpose of this new committee and it is under the guidance of the government. Today, three accreditation bodies exist in Japan. Those bodies are: Japan Institution for Higher Education Evaluation (JIHEE), Japan University Accreditation Association (JUAA), and National Institutional for Academic Degrees and University Evaluation (NIAD-UE) (Ramadan et al., 2013). NIAD-UE merged in 2016 with Center for National University Finance and Management (CUFM) and was renamed NIAD-QE.

In order to ensure quality within the educational system, the Ministry encouraged institutions to complete a self-evaluation of its quality (in 1991), which later became mandatory (in 1999), and then stipulated by law (in 2004) (Higher Education Bureau, 2018). Each Japanese higher educational institution develops its own guidelines for academic assessment. As of 2018,

there were 1,113 universities, 57 college of technology, 2,776 professional training colleges, and 3 educational institutions operated by government ministries and agencies (NIAD-QE, 2020). As of 2020, there are three university accreditation bodies in Japan: JUAA, NIAD-QE, and JIHEE. JIHEE was created in 2004 by a group of private educational institutions. These three accreditation organizations (JUAA, NIAD-QE and JIHEE) have additional responsibilities which includes the accreditation of special fields. Universities are permitted to seek foreign accreditation, when a domestic accreditation does not exist. Since institutions do not pay a membership fee to an accreditation agency, Japanese universities can seek reaccreditation from any of the three accreditation agencies, because the three agencies are under the control of the government.

Conclusion:

Although the quality movement is relatively “young” in the history of higher education, its footprint is significant and persistent. Higher education institutions must relentlessly create, review, and renew their systems of quality assurance in their endeavors to ensure relevance, marketability, reliability, and stature. As the internationalization and massification of higher education flourishes, higher education institutions must also be prepared to meet both domestic and global quality standards and expectations. Academic quality is essential to an institution’s wellbeing, resilience, and sustainability. Decades of quality studies generally focused on product quality, such as W. Edwards Deming. Defining quality in the context of providing a service and as a managerial responsibility are rather new concepts. This paper concentrated on obtaining an understanding of the development of higher education, accreditation and quality assurance systems in the United States, Vietnam, and Japan. An educational curriculum was seen to be a pillar needed for growth for each country. It became apparent that all three countries realize the importance of quality and are heavily involved in the assessment process. There are some differences in who controls the curriculum and the assessment process. However, the final quality outcomes are universally shared among the three countries.

Some potential research areas for investigating would include looking more deeply into the accreditation process for the United States, Vietnam, and Japan. Additionally, exploring the quality assurance regulations for establishing a university or program (such as traditional live verses distance learning) would be of interest to further our understanding such a complex task. There are many emerging themes that could be brought into research as well. Themes such as 21st century skill set needed, lifelong learning, transparency and accountability, and development of international quality assurance standards. Further research studies could have a significant influence on the development of quality assurance.

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Teacher Candidates' Cyberloafing Behaviors in Terms of Different Variables²

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Abstract

This is a descriptive study in the survey model conducted to examine teacher candidates' cyberloafing behaviors in terms of different variables. The study population consists of teacher candidates attending different departments of a state university in the academic year 2017-2018. To create the sample, students from all grade levels in randomly chosen fields of study from different departments of Education Faculty. Research data were collected using the "Scale of Cyberloafing Activities" and the "Personal Information Form". The data collection tools were delivered from a total of 918 teacher candidates who participated in the study voluntarily. Descriptive statistics, the Mann-Whitney U, and the Kruskal-Wallis tests were applied for data analysis. As a result of the study, it was detected that the teacher candidates' level of cyberloafing in the educational setting was "low," and that they usually accessed social networks and news sites. With regard to gender, it was observed that male teacher candidates, and with regard to departments that Science, Social and Turkish Education students, engaged more in cyberloafing. More than half of the participants defined their internet usage skills on an advanced and expert level, and it was detected that the level of cyberloafing increased as expertise increased. It was determined that the level of cyberloafing increased in conjunction with an increasing frequency of teacher candidates' usage of the internet on their mobile phones during the lesson and increasing grade levels.

Key Words: Cyberloafing, teacher candidates, mobile phone, internet usage.

Introduction

Nowadays, information and communication technologies are developing rapidly and technological devices as well as the internet have become important parts of people's lives. The rapid proliferation of information and communication technology tools, especially the integration of the internet and mobile devices into the daily life, provide people with great convenience in doing their daily work; e.g. visiting daily news sites to obtain information, using social media networks (Facebook, Twitter, Instagram, etc.) to obtain and share information, using mobile or web tools such as WhatsApp and Facebook Messenger to communicate, and doing many daily tasks such as banking transactions and shopping with technological tools. In addition to personal use, the internet is used extensively by employers and employees in the management of business

² This study is based on Yusuf Tarık Tatlı's master's thesis, which was completed under the supervision of Fatma SADIK.

processes such as information sharing, human resources management, or purchasing as stated by Demir and Tan (2018). In modern educational settings, the Internet makes notable contributions to education providing students with opportunities to learn languages, access online journals, do research, and visit virtual libraries (Rayan et al., 2016). In other words, the internet, which helps students to obtain the information they need, also enables them to be active and take responsibility in accessing information. However, with the start of utilizing internet access of institutions for personal purposes, a new concept called "cyberloafing, cyberslacking" entered the literature in the 2000s.

The concept of cyberloafing, which was first used by Lim (2002), is generally defined as individuals' usage of the internet access provided by the institution for issues not related to their work or for personal purposes. Cyberloafing is also specified as inefficient time spent on the internet (Ugrin, Pearson & Odom, 2008), using e-mail and the internet for purposes not related to their work (Blanchard & Henle, 2008), and junk computing (Bock & Ho, 2009). Cyberloafing includes different activities such as personal e-mail exchange, surfing the internet, online shopping, engaging with social networks such as Facebook or Twitter, blog pages, accessing news and sports sites, sending and receiving messages, and accessing entertainment as well as gaming sites, and new dimensions continue to be added due to continuous advancements in technology (Candan & İnce, 2016). The undesirable effects of cyberloafing in the workplace are generally described as delaying the completion of work, reducing productivity, and disturbing the environment (Andreassen, Torsheim & Pallesen, 2014; Koay, Soh & Chew, 2017). Therefore, in recent years, the features of workplaces (environment, workload, employees) pushing employees in public and private workplaces to cyberloafing and the demographic characteristics of individuals (such as age and gender) and their psychological needs, habits, as well as computer and internet usage skills have widely been examined (Ahmad & Omar, 2017; Andreassen et al., 2014; Candan & İnce, 2016; Demir & Tan, 2018; Holguin, 2016; Huma, Hussain, Thurasamy, & Malik, 2017; Koay et al. 2017).

In educational settings, cyberloafing is generally defined as students' usage of information technologies for extracurricular purposes during lessons (Akbulut et al. 2016). Cyberloafing behaviors in schools have appeared with the introduction of information technologies and internet usage in educational institutions, and it has been detected that students use the internet for activities that are not related to the lesson especially in computer laboratories (Arabacı, 2017; Şenel et al. 2019). According to recent studies, students' usage of the internet during the lesson for personal purposes distracts them, reduces their interest in the lessons, causing them to deal with extracurricular work, therefore adversely affecting their learning performance. This behavior also affects the effectiveness of the teacher in the lesson and complicates classroom management (Heflin, Shewmaker, & Nguyen, 2017; Lepp, Barkley & Aryn (2015). Therefore, the number of studies on cyberloafing conducted in the educational field has been increasing (Alanoğlu & Karatabak, 2021; Soh, Koay & Lim, 2018; Hayıt & Dönmez, 2016, Sarhangpour, Baezzat & Akbari, 2018; Wu, Mei & Ugrin, 2018). Reviewing related literature reveals that, so far, studies were generally carried out with students enrolled in departments where computer technologies are taught. However, nowadays, it is possible to connect to the internet anytime and anywhere with mobile phones (Baert et al. 2020). According to TURKSTAT (2018) reports, 98% of adults have a mobile phone and 77% use smartphones. The report also reveals that 62% of the population connect to the internet with their mobile phones. Therefore, it is possible to observe students' tendency to do cyberloafing with their mobile phones during classes without the need for a computer in the classroom setting (Çınar & Cınıslı, 2018; Hayıt & Dönmez, 2016; Seçkin & Kerse, 2017).

Today, one of the important educational goals is to train qualified teachers (Jiang, Lin & Mariano, 2016). Students' tendency to cyberloafing during lessons may negatively affect not only their own performance but also the performance of others by diverting their attention resulting in a decrease of the effectiveness of the teaching process. This might be an issue in training qualified teachers as well. However, when the related literature was reviewed, it was observed that there is a limited number of research on teacher candidates or teacher candidates enrolled at education faculties (Arıkan & Özgür, 2019; Doğusoy et al., 2020) and existing studies were mostly carried out with computer and instructional technology teacher candidates (Çınar & Cinisli, 2018; Şenel et al., 2019; Varol & Yıldırım, 2018; Yıldırım, 2016). For these reasons, it was necessary to conduct research examining teacher candidates' cyberloafing behavior by using their mobile phones during the lesson based on different variables to find answers to the following questions:

1. What are teacher candidates' habits of using the internet on their mobile phones (MP)?
2. What is the level of teacher candidates' cyberloafing behavior during the lesson?
3. Do teacher candidates' cyberloafing levels during the lesson show significant differences according to gender, age, department, grade level, and their habits of using the internet on their mobile phones?

Method:

Research Design

This is a descriptive study examining teacher candidates' cyberloafing behaviors in terms of different variables in the survey model. In descriptive research, the reality is objectively observed, measured, and analyzed. The important thing is to observe and determine the reality appropriately.

Population and Sample

The study population consists of teacher candidates enrolled at different departments of an education faculty at a state university, namely Primary Education, Mathematics and Science, Turkish and Social Sciences, Fine Arts Education and Educational Sciences during the academic year 2017-2018. In order to form the sample of the population, students were randomly chosen from all class levels of single program departments or from randomly chosen class levels of multiple program departments. The questionnaires were delivered to the participants during their classes by the department instructors, and participation was voluntary. A total of 918 teacher candidates participated in the study. Demographic information of the participants of the study is presented in Table 1.

Variable	Groups	f	%
Gender	Male	268	29.2
	Female	650	70.8
	Total	918	100.0
Age	18-20 years	394	42.9
	21-23 years	446	48.6
	24-27 years	78	8.5
	Total	918	100.0
Department	Primary School Education	112	12.2
	Preschool Education	170	18.5
	Science Education	113	12.3
	Social Sciences Education	135	14.7

	Turkish Education	136	14.8
	Art-work Education	79	8.6
	Guidance and Psychological Counseling	173	18.8
	Total	918	100.0
Grade level	1 st grade	231	25.2
	2 nd grade	230	25.1
	3 rd grade	284	30.9
	4 th grade	173	18.8
	Total	918	100.0

Table 1.

Teacher Candidates' Demographic Information

As seen in Table 1, more than two thirds of the participants are female. Approximately half of the participants (48.6%) are aged 21-23, followed by the 18-20 age group with 42.9% and the 24-27 age group with 8.5%. There are more participant students from Guidance and Psychological Counseling (% 18.6) and Preschool Education (% 18.5) departments compared to other departments and the lowest number of participants is 79 from Art-work Education (%8.6). Of the participants, more than half are younger students (25.2% first-grade and 25.1% second-grade) while 30.9% are enrolled at third-grade and 18.8% are fourth-grade students.

Data Collection Tools

The Scale of Cyberloafing Activities (SCA); developed by Blanchard & Henle (2008), adapted into Turkish by Kalaycı (2010) and updated by Yaşar (2013), and the Personal Information Form developed by the researchers were used to collect the data.

The Scale of Cyberloafing Activities. Consists of four subscales including Personal Business (9 items), Search (4 items), Socialization (6 items) and News Follow-up (4 items), in total 23 items. As a result of a confirmatory factor analysis performed by Yaşar (2013), the fit indices between the four-factor model and the data were as follows: GFI=0.92; CFI=0.92; NNFI=0.90; RMSEA=0.08. The item load value of an item in the socialization subscale is .30, while the item load values of all items in the other subscales vary between .41-.88. The scale's Cronbach's alpha reliability coefficients are .94 in the "Personal business" subscale, .77 in the "Search" subscale, .84 in the "Socialization" subscale, and .76 in the "News follow-up" subscale. A 5-point Likert spectrum (never, rarely, occasionally, usually, always) was used for the Rating. The scale includes statements such as "I visit social networks (Facebook, Twitter, etc.), I pursue interesting topics in search engines." The scale's Cronbach's alpha reliability, recalculated in line with the data obtained with this study, is .84 in the "Personal business" subscale, .84 in the "Search" subscale, .80 in the "Socialization" subscale, and .85 in the "News follow-up" subscale.

The Personal Information Form. It was designed to obtain information about teacher candidates with a total of 13 questions determining the demographic information of the students (gender, age, department, grade level) and their general mobile phone usage habits.

Data Collection

The research data was collected during the fall semester of the Academic Year 2017-2018. The data collection process was performed in a way that would not disrupt the lectures. The students were asked to respond voluntarily in approximately 20 minutes.

Data Analysis

First of all, the obtained results from the SCA and the arithmetic mean as well as standard deviation of these scores were calculated to determine the cyberloafing behavior levels of teacher candidates. The results obtained were interpreted by evaluating them according to intervals of 1.00–1.80 as "Never", 1.81–2.60 as "Rarely", 2.61–3.40 as "Sometimes", 3.41–4.20 as "Usually", and 4.21–5.00 as "Always". Then, a Kolmogorov-Smirnov test was performed on the scale scores, and it was examined whether their distribution met the assumption of normality or not. Table 2 presents the normality test analysis results of the data obtained from the SCA.

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Personal business	.120	918	.000	.920	918	.000
Search	.076	918	.000	.960	918	.000
Socialization	.048	918	.000	.989	918	.000
News follow-up	.070	918	.000	.964	918	.000
Scale total score	.040	918	.001	.985	918	.000

Table 2.

Normality Test Analysis for the SCA scores

As seen in Table 2, the significance levels of the Kolmogorov-Smirnov and Shapiro-Wilk tests are less than .05. Therefore, non-parametric tests instead of parametric tests were used for comparing the scale scores of the participants, a Mann-Whitney U test was performed for paired comparisons, and a Kruskal-Wallis test was conducted for multiple comparisons (Büyüköztürk, 2020). To see in favor of which groups the difference was in cases when there were significant differences as a result of the Kruskal-Wallis test, the Mann-Whitney U test was repeated on the paired comparisons of the groups, and the level of significance was accepted as .05.

Findings:

1. Teacher candidates' Behavior of Using the Internet on a Mobile Phone (MP)

Descriptive statistics on the internet usage behavior on MP of the teacher candidates participating in the study are presented in Table 3.

	Groups	f	%
The duration of internet service usage on MP	1-4 years	430	46.8
	5-9 years	444	48.4
	10-13 years	44	4.8
	Total	918	100.0
Data connection time to the internet on MP	Less than 1 hour	62	6.8
	2-3 hours	326	35.5
	4-5 hours	266	29.0
	More than 5 hours	264	28.8
	Total	918	100.0
Internet usage skills on MP	Medium	425	46.3
	Advanced	368	40.1
	Expert	125	13.6
	Total	918	100.0
	Never	139	15.1

The frequency of using the internet on MP during the lesson	1-2 times	542	59.0
	3-4 times	134	14.6
	5-6 times	32	3.5
	At each opportunity	71	7.7
	Total	918	100.0
The time spent on the internet (without interruption) using MP during the lesson	Less than 1 minute	359	39.1
	2-3 minutes	299	32.6
	3-4 minutes	136	14.8
	5-6 minutes	55	6.0
	More than 6 minutes	69	7.5
Total	918	100.0	
Perception of the appropriateness of using the internet on MP behavior during the lesson	Definitely inappropriate	307	33.4
	Inappropriate	402	43.8
	Undecided	139	15.1
	Appropriate	47	5.1
	Definitely appropriate	23	2.5
Total	918	100.0	

Table 3.

Descriptive Statistics on Teacher Candidates' Internet Usage Behavior on MP

As seen in Table 3, 48.4% of the teacher candidates have been using internet service on MP for 5-9 years. While 35.5% of the participants stated the daily internet access time from MP as 2-3 hours, 29.0% stated that they used the internet for 4-5 hours, and 28.8% for more than five hours a day. 46.3% of the participants described their internet usage skills on MP as "medium," 40.1% as "advanced," and 13.6% as "expert." 59.0% of the participants stated that they use the internet on MP during the lesson 1-2 times, 14.6% 3-4 times, and the percentage of those who stated that they did not use the internet on their mobile phones at all during the lesson was 15.1%. While 39.1% of the students defined the time spent on the internet using MP during the lesson as less than 1 minute, 32.6% stated that it took 2-3 minutes. When Table 3 is examined, it is observed that more than three quarter of the teacher candidates do not find it right to use the internet on MP during the lesson.

2. Teacher candidates' Cyberloafing Levels

Table 4 demonstrates the descriptive statistics of the participants' scores from the SCA.

	\bar{x}	Sd
Personal business	1.87	.74
Search	2.51	1.02
Socialization	2.73	.86
News follow-up	2.73	1.08
Scale total score	2.36	.76

Table 4.

Descriptive Statistics of The SCA Scores (N=918)

Upon examining Table 4, it is observed that teacher candidates obtained the highest score in the scale's "Socialization" ($\bar{x}=2.73$) and "News follow-up" ($\bar{x}=2.73$) subscales, which was followed by the "Search" ($\bar{x}=2.51$) subscale. Teacher candidates received the lowest score in the "Personal business" subscale ($\bar{x}=1.87$), and the arithmetic mean of the scale total score was 2.36.

This indicates that cyberloafing behaviors are mostly in the form of socializing and following the news.

Investigation of Teacher candidates' Cyberloafing Levels According to Different Variables

Table 5 presents the results of the Mann-Whitney U test of the participants' SCA scores according to gender.

	Group	N	Mean Rank	Rank Sum	U	P
Personal business	Male	268	540.57	144872.50	65373.500	.000*
	Female	650	426.07	276948.50		
Search	Male	268	549.67	147312.00	62934.000	.000*
	Female	650	422.32	274509.00		
Socialization	Male	268	531.87	142540.50	67705.500	.000*
	Female	650	429.66	279280.50		
News follow-up	Male	268	562.21	150672.50	57056.500	.000*
	Female	650	417.15	271148.50		
Scale total score	Male	268	562.21	150672.50	59573.500	.000*
	Female	650	417.15	271148.50		

Table 5.

The Mann-Whitney U Test Results according to Gender

When Table 5 is examined, it is observed that the mean scores of male teacher candidates in all subscales as well as overall are statistically higher than the mean scores of female teacher candidates ($p < .05$). The Kruskal-Wallis test results of the participants' SCA scores according to age are given in Table 6.

	Group		N	Mean Rank	χ^2	Sd	p	Sign. difference
Personal Business	18-20 (A)	years	394	421.63	16.474	2	.000*	A < B, C
	21-23 (B)	years	446	495.34				
	24-27 (C)	years	78	445.84				
Search	18-20 (A)	years	394	432.94	7.865	2	.020*	A < B
	21-23 (B)	years	446	484.03				
	24-27 (C)	years	78	453.40				
Socialization	18-20 (A)	years	394	442.73	9.969	2	.007*	A, C < B
	21-23 (B)	years	446	485.08				
	24-27 (C)	years	78	397.92				

News follow-up		18-20 (A)	years	394	426.45	12.148	2	.002*	A < B
		21-23 (B)	years	446	489.98				
		24-27 (C)	years	78	452.17				
Scale score	total	18-20 (A)	years	394	425.37	14.268	2	.001*	A < B
		21-23 (B)	years	446	493.30				
		24-27 (C)	years	78	438.62				

Table 6.

Kruskal-Wallis Test Results According to Age

As seen in Table 6, the mean scores of the teacher candidates in the 18-20 age range were significantly lower compared to the others ($p < .05$). Table 7 shows the Kruskal-Wallis test results for the SCA scores of the participants according to their departments.

	Group	N	Mean Rank	χ^2	Sd	P	Significant difference
Personal business	PSE (1)	112	430.92	16.997	6	.009*	1,2,6,7 < 3 2,6 < 5 6 < 4
	PE (2)	170	431.00				
	SE (3)	113	513.62				
	SSE (4)	135	489.67				
	TE (5)	136	496.40				
	AE (6)	79	399.17				
	GPC (7)	173	445.66				
Search	PSE (1)	112	440.49	18.000	6	.006*	1,2,6,7 < 5 6 < 4
	PE (2)	170	423.76				
	SE (3)	113	465.60				
	SSE (4)	135	485.01				
	TE (5)	136	527.29				
	AE (6)	79	399.87				
	GPC (7)	173	456.97				
Socialization	PSE (1)	112	421.96	13.500	6	.036*	1,6 < 2,3 7 < 2
	PE (2)	170	496.66				
	SE (3)	113	502.76				
	SSE (4)	135	449.79				
	TE (5)	136	474.22				
	AE (6)	79	405.23				
	GPC (7)	173	439.83				
News follow-up	PSE (1)	112	399.91	21.517	6	.001*	1,6 < 3,4,5 7 < 4,5
	PE (2)	170	449.56				
	SE (3)	113	498.90				
	SSE (4)	135	505.38				
	TE (5)	136	501.29				
	AE (6)	79	392.96				
	GPC (7)	173	443.84				
Scale	PSE (1)	112	417.02	18.816	6	.004*	1,6 < 3,4,5

PE	(2)	170	445.78				2,7<5
SE	(3)	113	506.35				
SSE	(4)	135	486.81				
TE	(5)	136	505.85				
AE	(6)	79	387.34				
GPC	(7)	173	445.09				

Table 7.

Kruskal-Wallis Test Results According to Departments

PSE= Primary School Education, PE= Preschool Education, SE= Science Education, SSE= Social Sciences Education, TE= Turkish Education, AE= Art-work Education, GPC= Guidance and Psychological Counseling Department

Table 7 shows that the department attended creates a significant difference in the participants' cyberloafing levels. According to the results of the Kruskal-Wallis test conducted on the binary combinations of the groups, the mean scores of SE, SSE, and TE students in the "Personal business," "News follow-up" subscales and overall of the scale and the mean scores of TE, SSE students in the "Search" subscale and the mean scores of PE and SE students in the "Socialization" subscale were statistically significantly higher ($p<.05$). Table 8 presents the Kruskal-Wallis test results of the participants' SCA scores according to grade levels.

	Group	N	Mean Rank	χ^2	Sd	P	Significant difference
Personal business	1 st grade	231	394.98	27.332	3	.000*	1<2,3,4
	2 nd grade	230	495.27				2<3
	3 rd grade	284	446.81				3<4
	4 th grade	173	518.92				
Search	1 st grade	231	412.35	12.979	3	.005*	1<2,4
	2 nd grade	230	483.08				
	3 rd grade	284	455.17				
	4 th grade	173	498.22				
Socialization	1 st grade	231	420.54	8.374	3	.039*	1<2,4
	2 nd grade	230	483.92				
	3 rd grade	284	456.98				
	4 th grade	173	483.19				
News follow-up	1 st grade	231	415.43	16.246	3	.001*	1<2,4
	2 nd grade	230	480.07				3<4

		3 rd grade	284	444.99				
		4 th grade	173	514.83				
Scale score	total	1 st grade	231	402.54	22.140	3	.000*	1<2,3,4
		2 nd grade	230	490.47				3<4
		3 rd grade	284	446.73				
		4 th grade	173	515.35				

Table 8.

Kruskal-Wallis Test Results According to Grade Levels

According to the Kruskal-Wallis results in Table 8, as the grade levels increase, the mean scores of students in the "Personal business" subscale also increase statistically significant ($p < .05$). The significant difference observed in the "Search" and "Socialization" subscales is in favor of 2nd and 4th grade students among 1st, 2nd and 4th grade students ($p < .05$). The significant differences observed in the "News follow-up" subscale were in favor of 2nd and 4th grade students among 1st, 2nd, and 4th grade students and in favor of 4th grade students among 3rd and 4th grade students ($p < .05$). When Table 8 is examined in terms of the total score of the scale, it is observed that the mean scores increase significantly toward the upper grades ($p < .05$). In Table 9, the Kruskal-Wallis test results of the teacher candidates' SCA scores are given according to the duration of using internet service on MP.

		Group	N	Mean Rank	χ^2	Sd	P
Personal business		1-4 years	430	455.27	2.675	2	.262
		5-9 years	444	457.31			
		10-13 years	44	522.99			
Search		1-4 years	430	460.83	2.153	2	.341
		5-9 years	444	452.83			
		10-13 years	44	513.81			
Socialization		1-4 years	430	450.07	5.437	2	.066
		5-9 years	444	459.89			
		10-13 years	44	547.74			
News follow- up		1-4 years	430	474.51	5.119	2	.077
		5-9 years	444	440.31			
		10-13 years	44	506.53			
Scale score	total	1-4 years	430	458.12	4.623	2	.099
		5-9 years	444	452.61			
		10-13 years	44	542.49			

Table 9.

Kruskal-Wallis Test Results According to The Duration of Using Internet Service on MP

As observed in Table 9, the duration of internet service usage on MP did not create statistically significant differences in the cyberloafing levels of teacher candidates ($p > .05$). The Kruskal-Wallis test results of the participants' SCA scores according to the daily connection time to the internet with MP are shown in Table 10.

	Group	N	Mean Rank	χ^2	Sd	p	Sign. difference
Personal business	Less than 1 hour (A)	62	420.90	6.227	3	.101	
	2-3 hours (B)	326	458.12				
	4-5 hours (C)	266	440.11				
	More than 5 hours (D)	264	489.81				
Search	Less than 1 hour (A)	62	391.69	11.210	3	.011*	A,B,C < D
	2-3 hours (B)	326	448.56				
	4-5 hours (C)	266	448.76				
	More than 5 hours (D)	264	499.76				
Socialization	Less than 1 hour (A)	62	377.10	27.485	3	.000*	A < C, D B, C < D
	2-3 hours (B)	326	425.60				
	4-5 hours (C)	266	455.44				
	More than 5 hours (D)	264	524.80				
News follow-up	Less than 1 hour	62	434.76	5.176	3	.159	
	2-3 hours	326	456.10				
	4-5 hours	266	440.52				
	More than 5 hours	264	488.64				
Scale total score	Less than 1 hour	62	396.75	12.641	3	.005	A, B, C < D
	2-3 hours	326	447.88				
	4-5 hours	266	443.73				
	More than 5 hours	264	504.48				

Table 10.

Kruskal-Wallis Test Results According to The Daily Connection Time to The Internet with MP

When Table 10 is examined, it is observed that the daily connection time with MP to the internet creates significant differences in the "Search" and "Socialization" subscales and the total score of the scale. According to the analysis conducted, the significant differences observed in the "Search" subscale and the total score of the scale are in favor of teacher candidates with more than five hours of daily connection to the internet with MP ($p < .05$). Similar results were obtained in the "Socialization" subscale, and it was determined that the significant differences observed between the scores were in favor of students who were connected to the internet with MP for 4-5 hours and longer during the day ($p < .05$). Table 11 demonstrates the Kruskal-Wallis test results of the participants' SCA scores according to their perception of their internet usage skills on MP.

	Group	N	Mean Rank	χ^2	Sd	p	Significant difference
Personal business	Medium	425	422.18	16.496	2	.000*	M < A, E
	Advanced	368	484.86				
	Expert	125	511.04				

Search	Medium	425	432.95	12.311	2	.002*	M, A < E
	Advanced	368	467.97				
	Expert	125	524.83				
Socialization	Medium	425	400.38	50.577	2	.000*	M < A, E A < E
	Advanced	368	487.32				
	Expert	125	578.60				
News follow-up	Medium	425	425.03	15.063	2	.001*	M, A < E
	Advanced	368	480.43				
	Expert	125	515.10				
Scale total score	Medium	425	411.68	31.117	2	.000*	M < A, E A < E
	Advanced	368	484.59				
	Expert	125	548.20				

Table 11.

Kruskal-Wallis Test Results According to Internet Usage Skills on MP

As seen in Table 11, significant differences were observed in all sub-scales among the participants based on their internet usage skills. The participants who perceive themselves as advanced level and users who perceived themselves as expert level skilled users tend to perform more cyberloafing behavior during lectures ($p < .05$). The Kruskal-Wallis test results of the teacher candidates' SCA score according to the frequency of using the internet during the lesson are given in Table 12.

	Group	N	Mean Rank	χ^2	Sd	p	Significant difference
Personal business	1-2 times (A)	542	360.60	31.313	3	.000*	A<B,C,D
	3-4 times (B)	134	446.55				
	5-6 times (C)	32	460.97				
	At each opportunity (D)	71	475.74				
Search	1-2 times (A)	542	355.29	56.376	3	.000*	A<B,C,D B,C<D
	3-4 times (B)	134	428.65				
	5-6 times (C)	32	460.28				
	At each opportunity (D)	71	550.36				
Socialization	1-2 times (A)	542	359.65	35.166	3	.000*	A<B,C,D
	3-4 times (B)	134	438.74				
	5-6 times (C)	32	487.58				
	At each opportunity (D)	71	485.75				
News follow-up	1-2 times (A)	542	369.20	23.309	3	.000*	A, B < D
	3-4 times (B)	134	407.30				
	5-6 times (C)	32	425.92				
	At each opportunity (D)	71	499.92				
Scale total score	1-2 times (A)	542	355.44	47.599	3	.000*	A<B,C,D B<D
	3-4 times (B)	134	441.72				
	5-6 times (C)	32	471.27				
	At each opportunity (D)	71	519.58				

Table 12.

Kruskal-Wallis Test Results according to the Frequency of Using the Internet on MP in The Educational Setting

As Table 12 represents, the frequency of using the internet on MP in the educational setting creates significant differences in the SCA scores of teacher candidates ($p < .05$). According to the

analysis, the cyberloafing behavior levels of the students who used the internet on MP 1-2 times during the lesson were significantly lower compared to the teacher candidates using the internet more frequently in the all subscales ($p < .05$). The Kruskal-Wallis test results of the SCA scores of the participants according to how much time without interruption they spend on the internet using MP in the educational setting are shown in Table 13.

	Group	N	Mean Rank	χ^2	Sd	p	Significant difference	
Personal business	Less than 1 min (A)	359	389.68	46.774	4	.000*	A<B,C,D,E	
	2-3 min (B)	299	484.87					B<E
	3-4 min (C)	136	511.71					
	5-6 min (D)	55	512.91					
	6 min + (E)	69	567.35					
Search	Less than 1 min (A)	359	401.40	47.296	4	.000*	A<B,C,D,E	
	2-3 min (B)	299	463.07					B,C,D<E
	3-4 min (C)	136	503.89					
	5-6 min (D)	55	516.05					
	6 min + (E)	69	613.78					
Socialization	Less than 1 min (A)	359	399.39	43.503	4	.000*	A<B,C,D,E	
	2-3 min (B)	299	480.52					B,C<E
	3-4 min (C)	136	476.19					
	5-6 min (D)	55	518.22					
	6 min + (E)	69	601.49					
News follow-up	Less than 1 min (A)	359	391.13	54.234	4	.000*	A<B,C,D,E	
	2-3 min (B)	299	478.64					B,C,D<E
	3-4 min (C)	136	494.94					
	5-6 min (D)	55	522.02					
	6 min + (E)	69	612.57					
Scale total score	Less than 1 min (A)	359	386.13	61.038	4	.000*	A<B,C,D,E	
	2-3 min (B)	299	478.27					B,C,D<E
	3-4 min (C)	136	505.74					
	5-6 min (D)	55	522.77					
	6 min + (E)	69	618.33					

Table 13.

Kruskal-Wallis Test Results according to the Time Spent on the Internet on MP in the Educational Setting

As seen in Table 13, as the time that teacher candidates spend on the internet using MP in the educational setting increases, their cyberloafing levels also increase in all subscales and the overall scale ($p < .05$).

Discussion:

As a result of this study, it was determined that 48.4% of the teacher candidates had been using the internet service on their mobile phones for 5-9 years, 35.5% accessed the internet for 2-3 hours during the day, and 28.8% used the internet on MP for more than five hours a day. Of the participants, 46.3% expressed their internet usage skill on MP as "medium," and 40.1% as

"advanced." These results were similar to the results of the research by Çakmak and Yalçın (2013), which detected that the mobile phone usage experience of university students was an average of seven and a half years, and by Doğan, Kalkan and Aydın (2017), which determined that 80 % of the participants used the internet for 5-6 years. Furthermore, many studies show that university students spend an average of 1-5 hours a day on the internet (Alan, 2019; Yazgan & Yıldırım, 2020; Salıcı & Öcal, 2020) and define their internet usage skills on mobile phone as medium and advanced (Çok & Kutlu, 2018). Therefore, it can be said that nowadays, when information and communication technologies are developing rapidly, technological devices and the internet have become an important part of daily lives, and the usage of mobile phones and the internet in daily life is spreading rapidly.

The findings demonstrate that 77.2% of the teacher candidates do not approve of using the internet on MP instead of dealing with the lesson in the educational setting; however, more than 90 % of the participants used the internet at least 1-2 times during the lesson. Similar results were found in the research studies done by Arabacı, 2017; Tindell and Bohlander, 2012. In addition to communication services, modern mobile devices also provide opportunities such as accessing social networks, e.g. Facebook or Twitter, playing online and offline games, and surfing the internet. The constant updating of both mobile phones and social media, being open to multiple usage, and allowing virtual sharing have made them one of the most effective tools in terms of interpersonal communication. Therefore, mobile phones and social media have become an indispensable part of life for individuals of almost every age in almost every field and environment, from the social environment to the business environment, from politics to education (Akgün, 2020; Altay& Özerbaş, 2020; Büyükbayraktar, 2020).

According to the results obtained from the overall scale, teacher candidates rarely do cyberloafing during the lesson. It is an expected behavior for the participants, who will take a significant place in shaping the future, to be sensitive about cyberloafing, which is generally accepted as an undesirable behavior. The reviewed studies indicate that the cyberloafing level of university students was medium and above medium (Çok & Kutlu, 2018; Seçkin & Kerse, 2017; Şenel et al., 2019). These differences in the results might originate from the fact that the studies were conducted with students from different universities, faculties, and departments. It can be said that this result is due to direct interaction with computers, considering that most studies on cyberloafing behavior in the educational setting are carried out with students from programs in which computer technologies are used extensively.

The findings demonstrate that teacher candidates' cyberloafing behavior mostly occur in the form of socializing (visiting virtual communities and social networks such as Facebook or Twitter) and following news (visiting news sites and newsgroups). Relatively more frequent behavior in the "Personal business" subscale includes downloading files and reading blog pages, while in the "Search" subscale, searching for interesting topics and searching for interesting sites (pictures, videos, quotations) not related to the lesson are included. Many studies indicate that university students mostly do cyberloafing within the areas of messaging, visiting social networking sites and news sites (Arabacı, 2017; Cha & Seo, 2018; Çok & Kutlu, 2018; Seçkin & Kerse, 2017; Şenel et al. 2019; Twum, Yarkwah, & Nkrumah, 2021; Yıldırım, 2016). In the study conducted by Özdem and Demir (2015), the most frequent cyberloafing behavior of school administrators was to participate in social networks like Facebook and Twitter. In the study carried out by Bağrıaçık Yılmaz (2017) with graduate students, the majority of whom were teachers, the most frequent cyberloafing behavior was visiting Facebook. In the study performed by Örucü and Yıldız (2014) among academicians, it was observed that the behavior of visiting news websites (newspapers, online news TV, and other news websites) on the internet was at a high level. Therefore, the reason for the fact that the most frequently observed cyberloafing activities in the

studies are messaging and visiting social networking sites may be the desire of people to check their social media accounts and to follow what is happening by staying online. This view is supported by a significantly higher cyberloafing level of students with a greater number of social media accounts who are more frequently checking their social media accounts during the lesson compared to other students (Arıkan & Özgür, 2019; Gezgin, et al. 2018). The fact that students regarded short-term internet access as an unimportant/ordinary behavior that could not adversely affect learning or the classroom environment may have led to this result. As stated by Şenel et al. (2019), students see the internet as a savior when they are bored during the lesson to distract them or when they are curious about something. Considering that mobile phones are nowadays always with students, notification sounds/or signals coming from mobile phone may be unconsciously directing students to cyberloafing.

As a result of this study, it was observed that the cyberloafing level of male participants was significantly higher than that of female teacher candidates. This can be interpreted as male students' reflecting their fondness for technology and the internet (Salıcı & Öcal, 2020) in the classroom environment. However, there are no definite results indicating whether cyberloafing differs by gender or not. In related literature, there are studies reaching results similar to this study (Arıkan & Özgür, 2019; Çok & Kutlu, 2018; Hayıt & Dönmez, 2016) while other studies indicate that women's cyberloafing levels are higher (Knight, 2017) or that cyberloafing does not depend on gender (Bağrıaçık Yılmaz, 2018; Doğusoy et al., 2020; Tanrıverdi & Karaca, 2018).

Another important result obtained from the study is that the cyberloafing level of teacher candidates who are aged 18-20 and in their first year are lower than those in other age groups and grade levels. Students in this age group (18-20 years) are at the beginning of their university education. Their high motivation, being more interested in the lessons, and possibly being more careful about obeying the classroom rules, or their hesitation to do cyberloafing in the classroom may have caused this result. In related literature, there are further studies showing that university students in the 21-23 age group are more dependent on their mobile phones (Kuyucu, 2017) and that excessive use and virtual-oriented relationships are more common among people aged 21-25 (Minaz & Çetinkaya Bozkurt, 2017). In their study performed on university students, Seçkin and Kerse (2017) concluded that lower-grade students do less cyberloafing than upper-grade students. Similar results were obtained in studies carried out by Arabacı (2017) and Yaşar (2013), and it was determined that 4th-grade students engage more in cyberloafing than students at other grade levels. This result may be caused by the fact that students toward the end of their studies think that they have basic knowledge about their profession or that their interests change and diversify with increasing age. However, there are also studies indicating that grade levels do not have a significant effect on cyberloafing behavior (Keser et al., 2016; Gezgin et al., 2018).

While there were no statistically significant difference in the participants' cyberloafing behavior levels according to the duration of using internet service on their mobile phones, the level of cyberloafing was higher for teacher candidates whose daily connection time to the internet from their mobile phones was more than five hours. As a result of their study, Kumar and Mondal (2018) observed that individuals with internet addiction stayed online for 3-4 hours per day. Sağar and Kök Eren (2018) stated that 46.7% of university students used the internet for 4-6 hours, 18.4 % for 7-9 hours, and 16.9 % used it for 10 hours and more. Approximately 37% of the participants used the internet for 5 hours and more a day. Another finding obtained in the research is that the participants who defined their internet usage skill on mobile phones as "advanced" or "expertise" had higher levels of cyberloafing in the "Personal business" and "Socialization" subscales as well as the overall scale. In other words, students with higher skill levels can easily perform their daily personal business activities (banking transactions, online shopping, etc.), e-mail control, and file-sharing on their mobile phones when they have access to the internet. According to the studies

carried out by Yaşar (2013) and Kalaycı (2010) with university students, students with "expert" internet usage skills exhibit more "Personal business" and "News follow-up" cyberloafing behavior than students with "medium" skills. In this case, it can be concluded that internet access as well as students' internet usage habits and skills trigger cyberloafing. The fact that as the frequency of using the internet during the lesson and the duration of staying on the internet increase, the cyberloafing behavior level of teacher candidates also increase, according to the findings of this study, supports this view and shows that the research findings are consistent. According to the study performed by Gökdaş et al. (2014) with teacher candidates, 80.1% of the participants use mobile phones during the lesson and 46.5% of them frequently check their messages. In line with these results, it is expected that even having a smartphone is sufficient to increase cyberloafing (Seçkin & Kerse, 2017), that students who have more features/applications on their mobile phones spend more time on the internet and that students with higher internet skills do more cyberloafing.

This study revealed that students at the Science Education, Social Sciences Education, and Turkish Education Departments did relatively more cyberloafing during the lesson than teacher candidates from other departments. While there is no significant difference in most related literature regarding the cyberloafing scores of teacher candidates according to their departments and their department satisfaction levels (Arıkan & Özgür, 2019; Doğusoy et al., 2020; Polat, 2018), the study carried out by Çok & Kutlu (2018) concluded that the cyberloafing behaviors of university students varied significantly according to their level of satisfaction with the department. This result may be due to differences in career plans, educational objectives, and academic satisfaction with their education of the students in the study sample and the structural characteristics of the curricula of the departments where the study was conducted.

Conclusion:

As a result, this study revealed that more than half of the teacher candidates used their mobile phones at least 1-2 times during the lesson and stayed on the internet for 2-3 minutes, that more than half of the participants defined their internet usage skills as advanced or expert, and as their expertise increased, the level of cyberloafing also increased. Furthermore, it was determined that the more experienced teacher candidates in the third and fourth year have a higher frequency of using the internet on the mobile phone during the lesson and the level of cyberloafing increased compared to younger students. Accordingly, it may be recommended that instructors try to reduce teacher candidates' desire to engage in cyberloafing by planning activities that will activate their internet usage skills within the teaching process (such as doing research on the internet, game-based learning, encouraging them to search on the internet by asking curious questions). The correct use of the internet in the educational setting may be effective in controlling cyberloafing behavior and increasing the efficiency of the lesson. To reduce the frequency of mobile phone usage during the lesson, it may be suggested to review the rules and procedures regarding mobile phone usage and to reorganize them in line with the activities. Especially in the third and fourth grades, it may be suggested to focus on teaching practices rather than theoretical knowledge, and activities such as discussions, brainstorming, and evaluation of school practices to involve students actively in the process and share their thoughts and experiences.

The results of this study should be evaluated to the extent of its limitations. This study was conducted with students attending different departments of the education faculty at a state university. To achieve generalizations on this subject, comparative studies could be carried out with students attending different faculties and departments of the same university. The condition regarding the Turkish sample can be revealed by collecting data from state and private universities. The data in this study were collected from teacher candidates by applying a survey/scale to them.

The opinions of instructors with regard to students' cyberloafing level in the educational setting could also be examined.

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Comparatively Investigation of the Quality of Preschool Education Environments in Turkey and the US

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Abstract

A quality preschool education plays a key role in achieving its objectives. To benefit from this effect of preschool education in a positive way, countries should investigate education systems and the educational methods and practices of other countries so as to understand the problems of education and the factors affecting it. This brings about the need to examine the indicators in regard to processes and structural elements in preschool education institutions. This paper focuses on examining the quality of preschool education classes in Turkey and in the United States comparatively. Descriptive research method was used in the research. Data were collected with ECERS-R in each three classes selected with convenience sampling from three kindergartens in Turkey and three kindergartens in the US. Total score achieved in this instrument and individual scores for seven subscales were examined. In line with the data obtained in this study, the total score of the three classes in kindergartens in the US was found to be higher than those in Turkey. As for the subscales, the classes of the kindergartens in Turkey were found to have higher scores of Language-Reasoning and Program Structure which are two subscales of the instrument. The findings were discussed in the light of the related literature.

Keywords: ECERS-R, Turkey, United States (US)

Introduction

Education systems aim to train qualified individuals that countries need. The quality of education is recognized as the achievement of educational objectives and functions or the way and degree of such achievement (Uysal, 1998; Karşlı, 1998). Quality refers to performing an evaluation for the achievement degree of educational objectives and to an assessment on how studies ensure achievement, the activity in accordance with certain norms, criteria and goals, and whether the graduates possess the desired characteristics. Thus, quality in education means the degree of achievement of the objectives, and the assessment and determination of achievement. It is also an assessment on whether activities and outputs are desirable according to some criteria or objectives (Bakioğlu & Baltacı, 2010).

It is necessary to properly set quality standards and maintain the process in accordance with standards in preschool education, which is the first and most important step of education. The crucial point in preschool education given to children is the fulfillment of the principles in regard

to quality. The right outcome can be delivered through extensive identification of these principles and performance of applications under these principles (Ball, 1994).

A systematic, well-equipped, planned, and programmed aid should be provided for children to gain appropriate behaviors, value judgments, and develop basic habits in preschool years of which the child is a major beneficiary. Hence, preschool education institutions need to be prepared in the most ideal way to meet this kind of need in a more conscious and appropriate manner (Oğuzkan & Oral, 1997). Preschool is a period that forms the basis of other periods in the human life. Accordingly, it is of utmost importance to go through the preschool period in the best way possible and with appropriate experiences as in every period of human life (Oktay, 1999). A qualified preschool education is possible with a well-planned and prepared education program and a well-organized educational environment (Özdemir Beceren, 2012; Koçyiğit, 2012). To that end, a systematic, wide-term, planned, and programmed aid should be provided for children and preschool education institutions should be prepared in the most ideal way to respond to the need in a more conscious and appropriate manner (Güleş, 2013). The perspective of the Ministry of National Education on the concept of quality in education is to ensure that children are raised with rich learning experiences, support their development in all fields, and ensure that they achieve the highest level of development (MEB, 2013). All studies state that the investment made in children at an early age has positive effects on them.

In order to offer high-quality educational support, teachers should be able to support children's use of language, direct it towards their thinking processes, and provide appropriate feedbacks. Moreover, teachers need to interact with children in an appropriate manner and give them a wide range of feedback instead of providing them with the right answer directly (Curby et al., 2009). A quality feedback in preschool education classes means that the feedback should expand learning processes and understanding and encourage children to participate (Pianta, 2003).

Qualification or quality indicators in preschool education are defined differently by different stakeholders (e.g., parents, auditors, administrators) who want to measure quality (Işıkoğlu, 2007). In Turkey, the Ministry of National Education has emphasized in the preschool curriculum that quality needs to be taken into account in parental participation, characteristics of preschool institutions, educational environments, curriculum, staff, and assessment of education (MEB, 2006). The National Association for the Education of Young Children, which is one of the institutions providing accreditation of quality to preschool education institutions, set indicators that determine the quality of the institution based on its suitability for development. Therefore, the association categorizes the institutional quality in 10 domains in this accreditation process: adult-child communication, curriculum, adult-parent communication, teacher competences, staff, physical environment, health and safety, nutrition and food services, and assessment (NAEYC, 2009).

In general terms, given the literature concerning the quality indicators and their definition, quality indicators are discussed in structural and functional domains (Howes et al., 2008; Peisner-Feinberg & Yazejian, 2010). In the structural quality domain, elements such as teacher competences, teacher-child ratio, and indoor per child are addressed. Teacher-child relationship, education environments rich in stimulants and activities are discussed in the functional quality domain (Howes et al., 2008). In addition, while some researchers (Hujala, Fonsen & Elo, 2012) argue that structural, mediator, process and effect factors indicate quality in preschool education, most of the researchers agree on the dual construct of quality as structure and process. Over the past two decades, quality scales that contribute to educational and policy decisions have started to be used for sound preschool curricula in several countries (Li et al., 2014). Measuring the global

quality of early childhood programs, ECERS-R (Keys et al., 2013) consists of 7 subscales: Space and Furnishings, Personal Care Routines, Language-Reasoning, Activities, Interactions, Program Structure, and Parents and Staff. ECERS-R is an instrument used to measure the quality of preschool education in the United States and in international contexts (Göl-Güven, 2009). To date, different versions of ECERS-R have been applied in more than 30 countries with different socioeconomic backgrounds (Hadeed, 2014; Li et al., 2014). Research findings on the use of ECERS-R have had a major impact on preschool practice, research and policy development (Fenech, 2011).

The education systems affect the integrity and development of the society. Therefore, to benefit from this effect of preschool education in a positive way, countries should investigate education systems and the educational methods and practices of other countries so as to understand the problems of education and the factors affecting it. Furthermore, education systems of different countries should be investigated comparatively to expand people's understanding of culture and to offer international communication and understanding (Korkmaz, 2005). Countries create and develop their own education systems. It is thought that other samples should be examined in this formation and development process. In this context, this research aimed to examine the quality of preschool education classes in Turkey and in the US comparatively.

Research Model

This research utilized the descriptive survey model (Büyüköztürk et al., 2015) which describes a given case as fully and carefully as possible to examine the education environments in preschool institutions in Turkey and the US.

Study Group

One of the most widely used sampling types in social sciences is convenience sampling. In convenience sampling, researchers select participants from among easy to reach, eligible and volunteered individuals (Gravetter & Forzano, 2012). In short, convenience sampling is the selection of the convenient sample for the researcher. To this end, schools in close locations to the researchers were selected. The study group of the research was composed of three schools in Turkey and three schools in the US (six preschool education institutions in total). The schools from which the data were collected in both countries are formal preschool education institutions. These institutions are located in similar moderate socioeconomic circles in both countries. The data were collected in the first term of the academic year in both countries.

Instrument

The research utilized the *Early Childhood Environment Rating Scale - Revised (ECERS-R)* as the data collection instrument. The original version of ECERS was developed by Harms and Clifford (1980). The scale was adapted to Turkish language and its validity and reliability studies were conducted by Kler Klodya Tovim (1996). The version revised by Harms, Clifford and Creyer (1998) is widely used (Feyman, 2006; Aksoy, 2009). The Early Childhood Environment Rating Scale (ECERS-R) consists of 7 subscales and 43 indicators. These are:

1. *Space and Furnishings*: Indoor space; Furniture for routine care, play and learning; Furnishings for relaxation and comfort; Room arrangement for play; Space for privacy; Child-related display; Space for gross motor play; Gross motor equipment
2. *Personal Care Routines*: Greeting/departing; Meals/snacks; Nap/rest; Toileting/diapering; Health practices; Safety practices
3. *Language-Reasoning*: Books and pictures; Encouraging children to communicate; Using language to develop reasoning skills; Informal use of language
4. *Activities*: Fine motor; Art; Music/movement; Blocks; Sand/water; Dramatic play; Nature/science; Math/number; Use of TV, video, and/or computers; Promoting acceptance of diversity

5. *Interaction*: Supervision of gross motor activities; General supervision of children (other than gross motor); Discipline; Staff-child interactions; Interactions among children

6. *Program Structure*: Schedule; Free play; Group time; Provisions for children with disabilities

7. *Parents and Staff*: Provisions for parents; Provisions for personal needs of staff; Provisions for professional needs of staff; Staff interaction and cooperation; Supervision and evaluation of staff; Opportunities for professional growth

The scoring of the scale is marked on the scoring sheet as “yes”, “no” and “not applicable” for each item. The item scores are ranked from 1 (inadequate) to 7 (very good). The researcher can take explanatory notes when necessary. The scoring of the indicators is determined as follows:

1. If any indicator below 1 is marked "Yes", the indicator is rated 1 point.
2. When all indicators below 1 are marked "No" and at least half of the indicators below 3 are marked "Yes", the indicator is rated 2 points.
3. When all indicators below 1 are marked "No" and all indicators below 3 are marked "Yes", the indicator is rated 3 points.
4. When all indicators below 3 are marked "Yes" and at least half of the indicators below 5 are marked "Yes", the indicator is rated 4 points.
5. When all indicators below 5 are marked "Yes", the indicator is rated 5 points.
6. When all indicators below 5 are marked "Yes" and at least half of the indicators below 7 are marked "Yes", the indicator is rated 6 points.
7. When all indicators below 7 are marked "Yes", the indicator is rated 7 points.
8. Where the application of the item is not possible, the score of that item shall be indicated by “NA” (not applicable). Any indicator marked “NA” is ignored in the rating of an item, and items marked “NA” are not used in the calculation of subscale and total scale scores.

The points given in the assessment of the test are defined as follows:

1: inadequate/ 2: inadequate to barely adequate/ 3: barely adequate/ 4: barely adequate to good/ 5: good/ 6: good to very good/ 7: very good

Score of each subscale is the average value achieved by the division of the sum of every item's score by the number of items. Score of the total score is calculated by the division of the sum of subscale scores by the number of items.

Data Collection

The data of the study were collected by the researcher by means of observation in the institutions included in the study group and face-to-face interviews with the teachers working in the institutions. To perform observations and interviews, the researcher called the selected institutions and got appointments from the administrations. After having informed the administrators of the study and received permission, the teachers were interviewed and informed. Furthermore, the volunteered teachers were observed and interviewed on the days and at the hours decided by them.

Data Analysis

The research utilized descriptive analysis in the study. In this approach, the data are summarized and interpreted in accordance with predefined themes. The data can be arranged according to the themes achieved by the research results or can be presented by taking into account

the questions or dimensions used in the interview and observation processes. Associating and making meaning of themes and future predictions in regard to the themes can be among the aspects of interpretations to be made by the researcher (Yıldırım & Şimşek, 2011). In this study, the data obtained with ECERS-R were interpreted through the support of observations and interviews conducted during the data collection process.

FINDINGS

This section presents the data obtained with the instrument.

Schools	Turkey			US		
	A	B	C	D	E	F
Space and Furnishings	2.5	3.5	2.2	2	4.8	4.3
Personal Care Routines	4.3	4.0	5.8	6.8	4.3	5.5
Language/Reasoning	3.2	2.7	5.5	1.7	3.7	5.5
Activities	2.4	2.5	2.1	2.5	2.6	4.0
Interaction	4.2	5.4	7.0	6.4	5.8	7.0
Program Structure	3.0	3.0	1.3	1.0	2.3	3.6
Parents and Staff	3.1	3.3	3.3	3.8	4.8	4.6
Total	3.0	3.3	3.4	3.2	3.9	4.5

Subscales of ECERS-R

Table 1. Scores of the Subscales of ECERS-R and the Total Scale

The values of the classes selected from the kindergartens in Turkey and the US are given in Table 1. According to Table 1, the class of the school A in Turkey was rated between inadequate and barely inadequate for *Space and Furnishings* (2.5); between barely inadequate and good for *Personal Care Routines* (4.3); barely inadequate for *Language/Reasoning* (3.25); between inadequate and barely inadequate for *Activities* (2.4); between barely inadequate and good for *Interaction* (4.2); barely inadequate for *Program Structure* (3.00); and barely inadequate for *Parents and Staff* (3.16).

The class of the school B in Turkey was rated barely inadequate for *Space and Furnishings* (3.5); between barely inadequate and good for *Personal Care Routines* (4.00); between inadequate and barely inadequate for *Language/Reasoning* (2.75); between inadequate and barely inadequate for *Activities* (2.5); good for *Interaction* (5.4); barely inadequate for *Program Structure* (3.00); and barely inadequate for *Parents and Staff* (3.33).

The class of the school C in Turkey was rated between inadequate and barely inadequate for *Space and Furnishings* (2.25); good for *Personal Care Routines* (5.8); good for *Language/Reasoning* (5.5); between inadequate and barely inadequate for *Activities* (2.1); very good for *Interaction* (7.00); inadequate for *Program Structure* (1.33); and barely inadequate for *Parents and Staff* (3.33).

The class of the school D in the US was rated between inadequate and barely inadequate for *Space and Furnishings* (2.00); between good and very good for *Personal Care Routines* (6.8); inadequate for *Language/Reasoning* (1.75); between inadequate and barely inadequate for *Activities* (2.5); between good and very good for *Interaction* (6.4); inadequate for *Program Structure* (1.00); and barely inadequate for *Parents and Staff* (3.83).

The class of the school E in the US was rated between inadequate and barely inadequate for *Space and Furnishings* (4.87); between barely inadequate and good for *Personal Care Routines* (4.3); barely inadequate for *Language/Reasoning* (3.75); between inadequate and barely inadequate for *Activities* (2.6); good for *Interaction* (5.8); between inadequate and barely inadequate for *Program Structure* (2.3); and between barely inadequate and good for *Parents and Staff* (4.83).

The class of the school F in the US was rated between barely inadequate and good for *Space and Furnishings* (4.37); good for *Personal Care Routines* (5.5); good for *Language/Reasoning* (5.5); between barely inadequate and good for *Activities* (4.00); very good for *Interaction* (7.00); barely inadequate for *Program Structure* (3.66); and between barely inadequate and good for *Parents and Staff* (4.66).

The mean score of the three classes in Turkey for all of the subscales was calculated to be 24.82. The respective subscale scores of these schools were calculated to be as follows: 2.75 for *Space and Furnishings*; 4.7 for *Personal Care Routines*; 3.83 for *Language/Reasoning*; 2.3 for *Activities*; 5.53 for *Interaction*; 2.44 for *Program Structure*; and 3.27 for *Parents and Staff*.

The mean score of the three classes in the US for all of the subscales was calculated to be 29.12. The respective subscale scores of these schools were calculated to be as follows: 3.74 for *Space and Furnishings*; 5.53 for *Personal Care Routines*; 3.66 for *Language/Reasoning*; 3.03 for *Activities*; 6.4 for *Interaction*; 2.32 for *Program Structure*; and 4.44 for *Parents and Staff*.

CONCLUSION, DISCUSSION AND RECOMMENDATIONS

This research examined the quality of three preschool classes in Turkey and three preschool classes in the United States (six in total) comparatively. The data obtained to this end indicated that total quality rating of the three schools in the US were higher than the total quality rating of the three schools in Turkey. In other words, it can be argued that the preschool education institutions located in the United States are of higher quality than the ones located in Turkey.

Other than two subscales (*Language/Reasoning* and *Program Structure*), the preschool education institutions in the US had higher scores of all subscales. With steps to be taken for the quality of preschool education in Turkey once preschool education will become mandatory by 2020, it is expected that Turkey will compete with other countries both qualitatively and quantitatively. The 2023 Vision of Education announced on 23 October 2018 states that the quality, scope, and accessibility of early childhood education will be increased within three years and that early childhood education will be mandatory for the 5-year-old group. The fact that a written document was published is one of the most important steps taken in recent years on the matter in terms of drawing attention to early childhood and emphasizing its value. Thus, it will pave the way for discussing short- and long-term supportive effects of preschool education in Turkey.

Space and Furnishings: This subscale rates the suitability of physical structure and the material used in the classroom. A well-prepared physical environment and educational program in preschool education institutions enables children to acquire social skills such as taking

responsibility, interaction with their friends, taking role within group, and cooperation (Demiriz, Ulutaş & Karadağ, 2011).

The classroom should be inviting and supportive for all children (Bucholz & Sheffler, 2009). A well-organized classroom environment encourages the development of children's play, their independence, socialization, and helps them to solve the problems they face (Coughlin et al., 1997). It is necessary to provide psychological safety through which students will feel safe and at ease when ensuring the physical safety which is the most basic condition in the physical environment (Weinstein, 1996). In her doctoral thesis, Kurşunlu (2018) explored that the legal physical standards of preschool education institutions in Turkey are not adequately qualified compared to international standards. As for the scores of this subscale, the three schools in the US were found to be in better condition than those in Turkey (the difference between the scores = 0.99). This can be explained by different amounts of budget allocated for preschool classes in the two countries.

Personal Care Routines are activities performed at the same hours at all times such as going to/coming from the school, gathering, cleaning, breakfast, eating, going to toilet, and resting, etc. The adult attitude during the satisfaction of such needs of children serves as foundation based on their perspective of the world, i.e., confidence or lack of confidence in others. A school environment that allows them to know themselves, to tolerate their mistakes with sensitivity, will also affect the self-perception of the child positively (Oktay, 1999). It can be argued accordingly that a better routine is run in the three classes in the US than in the three classes in Turkey (the difference between the scores = 0.83).

Language activities are important in ensuring children's linguistic development as well as providing them with the skills of using the language to express their own feelings and thoughts according to rules and with listening skills (Girgin, 2003). Concerning Language/Reasoning and Program Structure, the mean score of the three schools in Turkey were slightly higher than the mean score of the ones in the US. Therefore, one can say that three classes of the kindergartens in Turkey pay attention to the standards in the Language/Reasoning subscale more or similarly (difference = 0.17).

As for the activities subscale, preschool period covering the first six year of children is the period in which the child's development is the fastest. The education received by the child in this period increases his/her strength of perception and help him/her improve his/her skills and express his/her feelings (Macaroğlu Akgül, 2004). There should be activities which the child can make use of in real life, and the existing activities should be prepared in a way that complies with children's interests and needs and ensures that they achieve meaningful successes and support learning by having fun. For this subscale, the activities in the three kindergarten classes in the United States were found to be higher (difference between the scores = 0.73). This difference can be explained by the regular and supportive implementation of activities in the US classrooms.

Interaction refers to studies that promote the development of relationships between adults and children, among teachers themselves, and between teachers and families (NAEYC, 1996). Communication in the classroom is the multifaceted flow of knowledge, skills, and news between teacher and student, student and student, and parent and environment to achieve targeted gains. The quality of communication allows the child to feel safe, to increase positive behavior, to reduce dropping out of school or absenteeism (Bullard, 2014). For interaction, it can be argued that there is a more positive and supportive climate in the three classes in the US compared to the three classes in Turkey (difference between the scores = 0.93).

Program Structure affects the disciplinary development and individual development of the child in social life. A program soundly based on the existing foundations of the child increases his/her knowledge capacity and brings new skills to him/her. A suitable program should cover all areas of the child's development (physical, emotional, social, etc.). Thus, the needs of each age group should be met with different programs (NAEYC, 1996). The programs adopted in education should help children to know themselves, develop awareness of their own culture and other cultures, and should support several skills such as social skills, analytical thinking, problem solving, creativity, and aesthetics (Yurtal & Yaşar, 2008). Therefore, one can say that the three classes of the kindergartens in Turkey pay attention to the standards in the Program Structure subscale more or similarly (difference = 0.12).

Parental participation affects social and emotional development of children positively and plays a key role in children developing positive attitudes and behaviors (Bilgin, 2013). Ensuring the continuity between school and home, strengthening the role of parents in their children's education in the after-school learning process, and making it effective is one of the most important purposes of parental participation (Yaşar-Ekici, 2016). The three kindergarten classes in the US had their highest mean score in the Parents and Staff subscale. Based on this finding, it can be stated that schools in the US give more importance to Parents and Staff. It is accordingly possible to argue that more active participation of parents in preschool education is supported in the three classes of the kindergartens in the US.

As for the total scores, the scores of the three kindergarten classes in the US were higher than the scores of the classes in Turkey (difference between the scores = 4.24). It can be argued that investments for increasing the quality are needed for getting the desired productivity from preschool education in Turkey. However, declared on 23 October 2018, in the 2023 Education Vision, the quality, scope, and access of early childhood will be increased within three years. And also it is stated that early childhood education will be compulsory for 5 years. To be a written document, to draw attention to early childhood, and to emphasize its value in terms of the most recent in this regard is one of the important steps. Turkey is also considered by making all of this work to come to the desired level of the quality of early childhood educational settings.

In the light of the results and limitations of this research, some suggestions were made. The data in this research were collected from a small number of schools with similar socioeconomic backgrounds both in Turkey and the United States. It is recommended that certain concrete steps should be taken to increase quality standards in preschool education following a general survey study to be performed with preschool education institutions with different socioeconomic backgrounds across Turkey. Comparative preschool education studies between different countries can be carried out with the data to be collected from large samples with different socioeconomic backgrounds. In addition, national and international preschool education studies can be conducted to explore the relationship between the quality of current early childhood environments and the preparedness levels for primary school. The 7 subscales addressed in this study can be planned as individual studies to achieve more detailed results.

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Organizational Image and its Relation with Leader-member Exchange and Organizational Justice in Schools

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Abstract

This study aims to reveal the relationship between organizational image and leader-member exchange (school principal-teacher) and organizational justice in schools. 213 teachers working in secondary schools in Hatay, who were selected via the disproportionate cluster sampling method, constitute the sample of this research. The research data were gathered by using the “Organizational Image Scale”, the “Leader-Member Exchange Scale” and the “Organizational Justice Scale”. The Structural Equation Modeling Analysis and descriptive analysis were implemented in the research. Measurement modelling has shown that variables are statistically positively and significantly correlated to each other. A structural model has been suggested in conformity with the theoretical framework. According to the outcomes of structural equation analysis, organizational image positively affects the leader-member exchange. Teachers’ perceived organizational image positively affects perceived organizational justice with the partial mediating effect of leader-member exchange. The findings of this study were discussed and some recommendations were given.

Key Words: Organizational image, leader-member exchange, organizational justice, teacher, school

Introduction

It is known that employees believing that they work in a hostile work environment are not proud of working in such an environment as they lose their job satisfaction, work motivation, organizational commitment, and psychological contract and intend to leave the organization (Paşamehmetoğlu & Yeloğlu, 2014). If employees have a high perceived organizational justice, their positive attitudes and behaviors as key factors for organizations are enhanced (Cohen-Charash & Spector, 2001). On the contrary, if employees perceive injustice in the practices in work places, they have negative feelings and attitudes towards their colleagues, managers, and the organization as a whole. This disturbs the positive work environment and well-being within the organization (Eren, 2015). It is essential to reveal the variables related to perceived organizational justice and to determine the effects of these variables on perceived organizational justice. In this context, the image of schools as institutions transferring values and shaping characters is believed to have an impact on the relationships between administrators and teachers as well as teachers’ perceived justice.

Organizational Image

Image refers to the thoughts of individuals about an object, person or organization (Genç, 2012). Organizational image refers to the beliefs about how members of the organization and other

individuals view the organization (Dutton & Dukerich, 1991). Dutton, Dukerich, and Harquail (1994) define organizational image as the entire beliefs that the members of the organization and groups outside the organization have towards the organization. Birkigt, Stadler, and Funck (1995) emphasize that organizational image is related to how the organization reflects its organizational identity, which expresses itself, to the masses. In other words, the image of the organization is the social reflection of the organizational identity that defines the picture of the organization (Şenturan, 2014).

The organizational image that reflects how the organization is perceived and viewed (Şenturan, 2014) should not be considered separately from the stakeholders of the organization. Indeed, stakeholders can affect or be affected by the success of the institution (Freeman, 1984). Corporate image, subsequently, becomes a stakeholder's overall perception of the organization, at least partially based on its ability to meet or provide for his/her particular needs and interests (Riordan, Gatewood, & Bill, 1997). The allocation of time and resources to fulfil the wishes of the stakeholders that may affect the direction and legitimacy of the organization contributes to the strengthening of perceived organizational image among the stakeholders (Freeman, 1984). If corporate image is positive, employees' motivation (Altun, 2019; Büyükgöze, 2012), empathy, performance, and organizational commitment is enhanced (Altun, 2019). Therefore, a strong and positive perceived image emerging over the years can have an impact on the organizational behaviors management of managers and employees. Smidts, Pruyn and van Riel (2001) report that members may feel proud of being part of a well-respected company, as it strengthens their feelings of self-worth.

Leader-Member Exchange

It is widely agreed that leadership is a relationship that is jointly produced by leaders and followers (Howell ve Shamir, 2005). The leader-member exchange, a modern leadership theory, focuses on joint relationships between the leader or the manager and employees (Graen and Uhl-Bien, 1995; Scandura, 1999). Leaders develop different quality relationships with their employees (Hooper ve Martin, 2008). In other words, this theory suggests that the bilateral relationships between subordinates and superiors are different and the leader does not treat all subordinates in the same way (Graen and Schimann, 1978). As a result of these bilateral relations between the leader and the members, two separate groups of members are formed. Members having quality interaction with the leader are called in-group members (in-groups) while members having a weak and more formal relationship with the leader are called out-group members (out-groups) (Liden & Graen, 1980; Lunenburg & Ornstein, 2012). The leader-member exchange theory encourages leaders to put aside the distinction between the two groups and endeavour to make all members a part of the in-group by building trust and respect (Northouse, 2013). In-groups are more compatible in the work environment and have higher productivity, job satisfaction, and work motivation (Chen, Lam, & Zhong, 2007; Ilies, Nahrgang, & Morgeson, 2007).

The leader-member exchange has four dimensions: affect, loyalty, contribution, and professional respect (Liden and Maslyn, 1998). The affect dimension contains friendship and affection between the leader and the member (Wilhelm, Herd ve Steiner, 1993). The contribution dimension refers to the leader's support for its members outside of their job descriptions. The actions of the leader and the member to defend each other's behaviour are explained by the loyalty dimension. The professional respect dimension includes the prestige of each individual within and outside the organization (Liden & Maslyn, 1998).

Emotions are crucial in the leader-member exchange. Leaders make an endeavour to understand employees' feelings and thoughts and use empathy to build trusting relationships (Squires, 2010). Leaders or managers are more easily accepted and respected by them. It is obvious that the quality of interaction with the manager shapes perceived organizational justice, which has a serious impact on employees' attitudes and behaviors. Polat (2009) emphasizes that the main role in building a sense of justice in schools belongs to the school principal. Previous studies (Graen & Uhl-Bien, 1995; Gürboyoğlu, 2009; Tziner, Felea, & Vasiliu, 2015; Zeb, Abdullah, Othayman, &

Ali, 2019) show that the leader-member exchange and perceived organizational justice are positively associated. Wayne, Shore, Bommer, and Tetrick (2002), on the other hand, reveal in their studies that fair managers can create positive social interactions. It can be argued that the leader-member exchange and organizational justice variables have a two-way relationship.

Organizational Justice

Organizational justice is the reflection of perceived justice on the work environment, in other words, perceived justice regarding the work environment (Greenberg, 1990). It consists of three components: distributive justice, procedural justice, and interactional justice (Colquitt, 2001; Cropanzano, Prehar, & Chen, 2002; Greenberg, 1990). Distributive justice refers to the perceptions of employees about whether the resources or outcomes are fairly distributed according to their performance (Moorman, 1991). Procedural justice refers to the perceptions of employees about the correctness of procedures used by the organization while making a decision (Scandura, 1999). Interactional justice, on the other hand, is concerned with how the information is communicated to the subordinates by the managers and whether the subordinates treat managers and colleagues in a courteous manner with respect and dignity (Eren, 2015). Perceived justice of employees about the fairness of procedures in the organization is closely associated with the impression that their managers take care of them and respect their rights (Konovsky & Pugh, 1994). The fairness of the school principal in distributing rewards and punishments, applying rules to all members equally, being selfless when communicating and interacting with school members, and acting in accordance with the rules of courtesy enhances the sense of justice in the school (Polat, 2009). One of the main duties of leaders is to positively shape the approaches of human resources towards the leader and the organization (Dilek, 2005).

Research Objective

The focus of this study is to reveal the relationships between the organizational image, which is thought to strengthen perceived justice by contributing to meet the psychosocial needs of the employees, and the leader-member exchange and perceived organizational justice. The literature on management presents no detailed study on how the organizational image of schools affects the social interaction and perceived organizational justice between principals and teachers. Also, in this study, the role of leader-member exchange in explaining perceived organizational justice of organizational image has been revealed. It has been deemed important to overcome these deficiencies in the literature and to present a different perspective on the effect mechanisms of organizational image.

This study examines organizational image, the leader-member exchange, and organizational justice in tandem. In addition to expanding the theoretical knowledge on these variables, a model has been proposed for the relationship between these variables, with support from the relevant literature. The following hypotheses have been proposed and subjected to testing.

H1: Organizational image positively affects the leader-member exchange.

H2: The leader-member exchange positively affects perceived organizational justice.

H3: Perceived organizational image positively affects perceived organizational justice.

Method

Research Model

Teachers' views on research variables were collected through scales. In this study, the relationship between perceived organizational image, the leader-member exchange, and perceived organizational justice is revealed. Therefore, this study was designed in the relational survey model (Büyüköztürk et al., 2012) in which the relationship between variables and if any, its direction and degree, are determined.

Population and Sample

Teachers working in secondary schools in the province of Hatay constitute the population of this study. 43 secondary schools were selected by disproportionate cluster sampling, and scales were distributed to the teachers in these schools. It was seen that 213 of the returned forms were valid and thus, the valid forms were evaluated.

Data Collection Tools and Procedure

There are three different five-point Likert-type scales in the forms distributed to teachers: organizational image, the leader-member exchange, and organizational justice scales.

The "Organizational Image Scale" developed by Gioia and Thomas (1996) and adapted into Turkish by Şahin (2014) was used to measure perceived organizational image. The scale is one-dimensional and consists of nine items. The Cronbach's Alpha internal consistency coefficient of the scale was computed as .96.

The "Leader-Member Exchange Scale", which is used to measure the level of school principal-teacher interaction, was developed by Liden and Maslyn (1998) and adapted into Turkish by Öztürk (2015). It consists of four dimensions: affect, contribution, loyalty, and professional respect, and three items in all dimensions. The Cronbach's Alpha Reliability Coefficient was found to be .86 in the affect dimension, .86 in the contribution dimension, .92 in the loyalty dimension, .95 in the professional respect dimension, and .95 in the total scale.

To measure perceived organizational justice, the "Organizational Justice Scale" developed by Niehoff and Moorman (1993) and adapted into Turkish by Şahin (2014) was used. This scale contains three dimensions including distributive justice, procedural justice, and interactional justice and 20 items. In this scale, the distributive justice dimension was measured with five items, the procedural justice dimension with six items, and the interactional justice dimension with nine items. The Cronbach's Alpha internal consistency coefficient of the scale was .96 while it was .78 in the distributive justice dimension, .94 in the procedural justice dimension, and .95 in the interactional justice dimension.

Confirmatory factor analysis (CFA) was applied to the scales used in the study. Thus, the compatibility of the factor structures of the scales with the data of this study was obtained. In Table 1 below, fit values produced as a result of CFA for each scale are given.

<i>Scales</i>	χ^2	<i>sd</i>	χ^2/sd	<i>p</i>	<i>IFI</i>	<i>TLI</i>	<i>CFI</i>	<i>RMSEA</i>
Organizational Image	10.03	5	2.00	.00	.99	.98	.99	.06
Leader-Member Exchange	20.48	11	1.86	.03	.99	.98	.99	.06
Organizational Justice	120.97	62	1.95	.00	.97	.96	.97	.06

Table 1. The goodness of Fit Values for the Scales

Table 1 reveals that the ratio of χ^2/sd ranges between 1 and 2 for the leader-member exchange and organizational justice variables and thus indicates the goodness of fit. The relevant value is 2 for the organizational image variable and indicates an acceptable fit. The *RMSEA* values for the variables of the study are above 0.05 and thus indicate acceptable fit values (Meydan ve Şeşen, 2015). *IFI*, *CFI*, and *IFI* values are also above 0.95, indicating goodness of fit (Byrne, 2010; Kline, 2011).

Data Collection

Ethical approval was obtained for the study from the ethics committee. Before the data collection tools were applied, the teachers were informed. Volunteer participation was taken as a basis in the study.

Analyses

The extreme values of the data were cleared. Then, it was determined that the data showed normal distribution and there was no multicollinearity problem between variables (tolerance > .20, VIF < 10). Validity and reliability analyzes were implemented for each scale used for obtaining data in the study. After the scales were determined to be valid and reliable, the model to be tested was created. The sub-models of the study were tested by IBM AMOS. Indeed, Şimşek (2007: 19) emphasizes that the scales used in the measurement of the variables in the proposed model should be valid and reliable before conducting a path analysis to latent variables.

Findings

Descriptive statistics and correlations

Descriptive statistics and correlation values for the variables are presented in Table 2.

<i>Variables</i>	\bar{x}	<i>Ss.</i>	<i>Standard error</i>	<i>1</i>	<i>2</i>	<i>3</i>
1. Image	3.27	.88	.06	1		
2. LMX	3.53	.78	.05	.49**	1	
3. Justice	3.65	.87	.06	.50**	.75**	1

*p<.05, **p<.01

Table 2. Descriptive statistics and correlation values

Notes: Image: Organizational Image, LMX: The Leader-Member exchange, Justice: Organizational Justice

The mean scores in Table 2 reveal that perceived organizational image is moderate (3: Partially agree) while the leader-member exchange and perceived organizational justice are partially high (4: Agree). The correlation coefficients indicate a moderate-level, positive, and significant relationship between perceived organizational image and the leader-member exchange ($r = .49$, $p < .01$) and perceived organizational justice ($r = .50$, $p < .01$). The leader-member exchange and organizational justice variables are also positively and significantly related ($r = .75$, $p < .01$).

Measurement model

The measurement model for the relationship between latent variables in this study is presented in Figure 1.

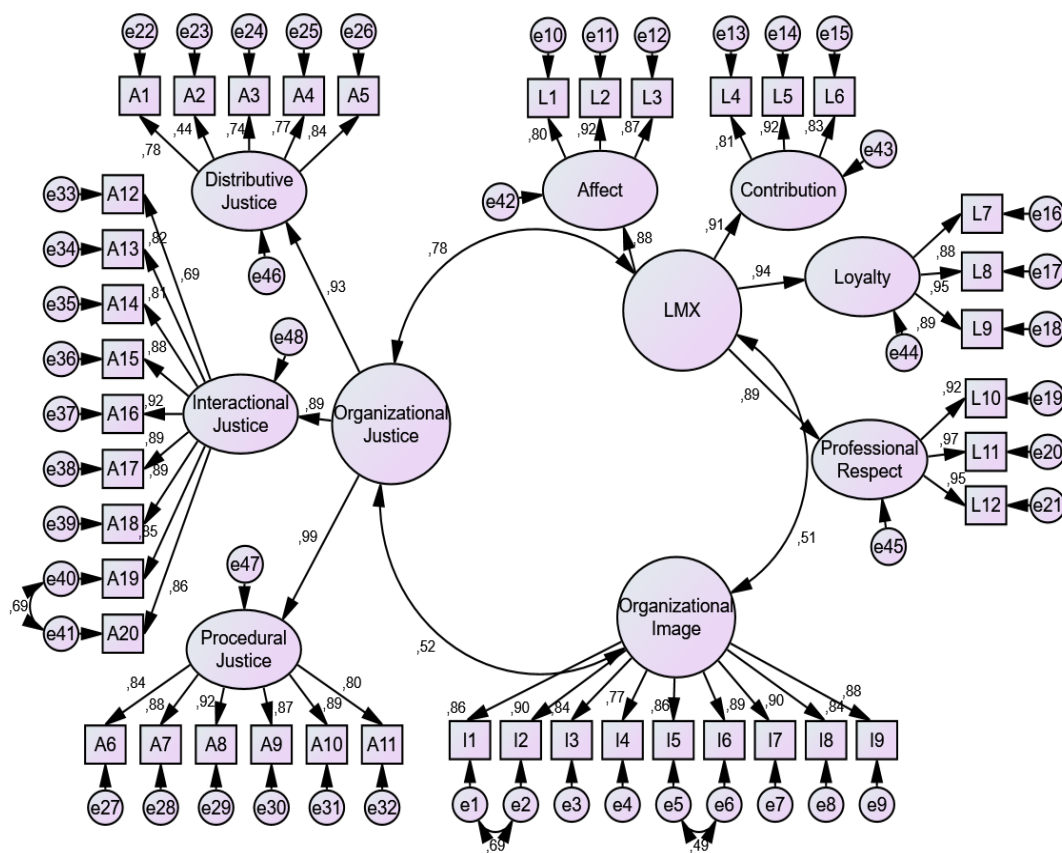


Figure1. Measurement Model

The measurement model in Figure 1 reveals that error covariance was added between items I1 and I2, A19 and A20, and I5 and I6, and the errors of these items were associated with each other. The measurement model reveals that the scales used in the measurement of research variables have an acceptable level of fit with the data ($\chi^2 = 1570.04$, $sd = 766$, $\chi^2 / sd = 2.05$, $p = .00$, $IFI = .92$, $TLI = .91$, $CFI = .92$, $RMSEA = .07$). The fit values reveal that the χ^2/df ratio is greater than 2 and the RMSEA value is greater than .05. IFI, TLI, and CFI values are above .90. Therefore, these fit values are at an acceptable level.

Structural Model

In line with the tested hypotheses, one-way paths were drawn between variables, and a structural model was presented. As a result of the path analysis, it was seen that there were no statistically insignificant path coefficients. Figure 2 presents the structural model that produces the best fit values.

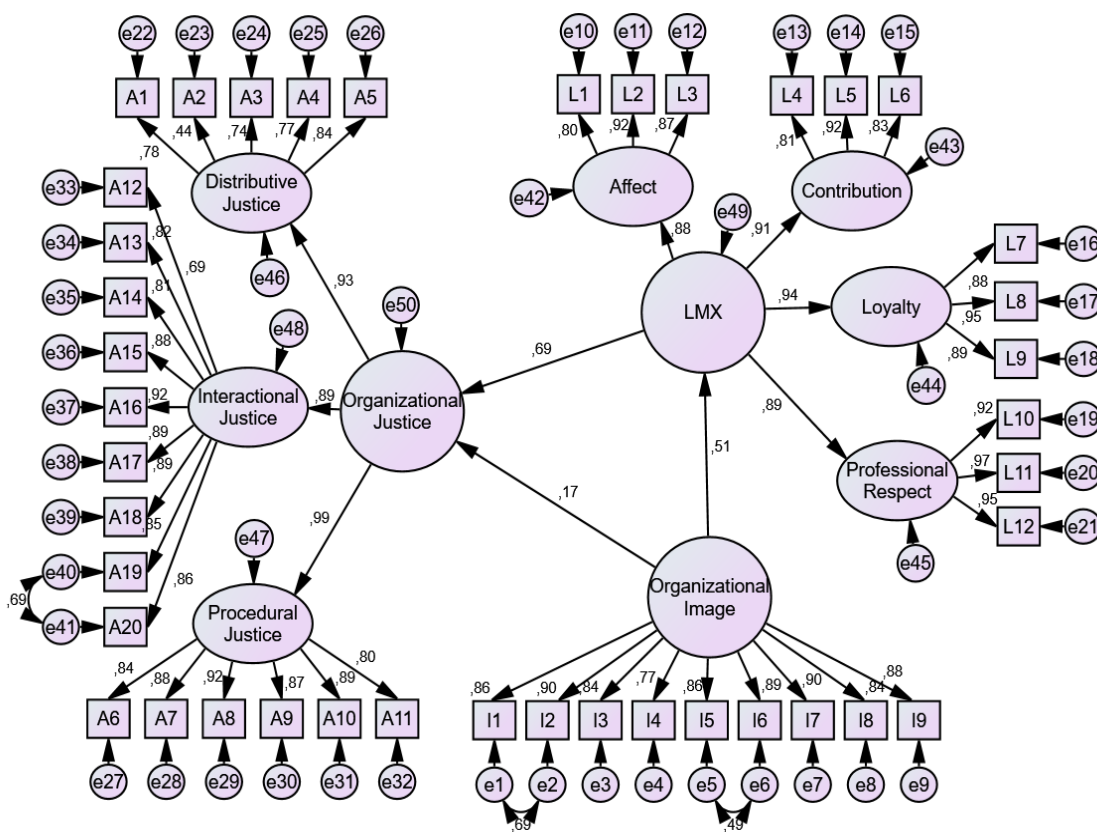


Figure 2. Structural Model

The structural equation model in Figure 2 reveals that perceived organizational image positive affects teachers' leader-member exchange levels ($\beta = .51$, $p < .01$) and perceived organizational justice ($\beta = .17$, $p < .01$). 1 unit of perceived organizational image contributes an increase of .51 units to the leader-member exchange and an increase of .17 units to perceived organizational justice. The leader-member exchange positively affects perceived organizational justice ($\beta = .69$, $p < .01$). Also, perceived organizational image has a positive effect on perceived organizational justice with the partial mediating effect of the leader-member exchange ($\beta = .35$, $p < .01$). 1 unit of perceived organizational image increase indirectly provides an increase of .35 units for perceived organizational justice.

Discussion

Teachers' practices and behaviors are affected if they believe their schools are positively viewed by outsiders. Hatch and Majken (1997) argue that organizational image, which is the reflection of organizational identity, is shaped by culture. In previous studies (Öztürk, 2015; Yener Aydın, 2017), it was found that organizational culture is positively associated with the leader-member exchange. This implies that perceived image shaped by culture is positively related to the school principal-teacher interaction. The images of schools increase the quality of the interaction between the school principal and the teacher. Perry and Mankin (2007) emphasize that organizational image varies depending on how managers approach employees. Organizational image and the behaviors of the leader towards the employees are associated with one another. The positive perceptions about the character, actions, symbols, and signs of the organization over time create organizational image. This positive perceived organizational image is appreciated by teachers. Therefore, it is clear that such consequences strengthen the interaction between teachers and their school principals.

The high level of leader-member exchange increases the responsibilities and contributions of the employees within the organization. It is also known that high-quality exchange creates mutual trust, support, and loyalty between the managers and subordinates (Asgart, Silong, Ahmad, & Abu Sama, 2008). The leader's support contributes to building trust in organizations. One of the outcomes of trust is organizational justice (Polat, 2007). In other words, perceived organizational justice of individuals with high levels of trust is enhanced (Polat, 2009). Also İşcan ve Sayın (2010) have found that organizational justice is affined to trust. Therefore, the quality interaction between the school principal and the teacher activates psychological states such as trust and commitment. Teachers with such feelings perceive that their school principals behave fairly. This study reveals that the interaction between school principal and teacher also increases teachers' perceived justice. Previous studies (Graen & Uhl-Bien, 1995; Gürboyoğlu, 2009; Tziner et al., 2015; Zeb et al., 2019) support that the leader-member exchange increases perceived organizational justice. In leader-member exchange theory, the quality of the employees is important for the leader to group his/her employees as an in-group or out-group (Northouse, 2013). Therefore, this theory emphasizes that the leader approaches his/her subordinates fairly. Employees perceive that their leaders treat them fairly and their perceived justice regarding the functioning and practices in their organizations is strengthened.

Ertürk (2018) reveals that organizational identity and organizational justice variables are moderately and positively related. It is known that organizational image is related to how the organization reflects its own organizational identity to the masses (Birkigt et al., 1995). In this context, it should be noted that perceived organizational justice, which has a significant relationship with organizational identity, may also be related to organizational image. It was also found that organizational image increases perceived organizational justice both directly and indirectly through leader-member exchange. To maintain the positive image perception of the school, the principal should show more sensitivity while approaching school members. In this context, Saygın (2016) emphasized that it is important for the school principal to make their subordinates feel better about their own situation. If school principals behave sensitively and delicately in their actions and procedures, this is likely to strengthen their interaction with teachers and thus, teachers are likely to believe that they are treated fairly (Demir, 2021). For, in such an environment, teachers believe that their school principals are able to make the most appropriate decisions about the institution and the members of the school.

Conclusion

In line with these findings above, it is suggested that:

- It is important for the school principal to successfully reflect the strengths of the school to the external environment in terms of creating a positive organizational image.
- The attitudes and behaviors of school principals and teachers who perceive a positive external image are also positively affected.
- School principals and teachers pay attention to cooperation and solidarity in their interactions with each other. Perceived sincerity and goodwill perception are mutually reinforced.
- This study is important original research in educational organizations because of its contributions to the field as it sheds light on the relationship between organizational image and organizational justice, presents the relationships between research variables in a holistic approach, and creates a wider framework for the explanation of concepts.

This study has some limitations. First of all, it is necessary to reveal the relationship between perceived organizational image and organizational justice in different studies. Based on

the findings of this study, one may notice that organizational image affects perceived organizational justice more indirectly. Therefore, it is clear that a mediating variable plays a role between organizational image and organizational justice variables. For example, a key variable such as organizational trust can be added as mediating variable. Another limitation of this study is that it was designed only in a quantitative method. A natural consequence of this situation is that it is not possible to examine the relationship between variables in depth. Yet another limitation is that previous studies showed that there is a two-way effect between leader-member exchange and organizational justice. Scholars can focus on determining which of these two variables has more power over the other. The reasons for this can be examined in the designed research.

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