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## Investigation of the Relationship Between Occupational Personality Types, 21st-Century Skills, and Teaching Motivation

**Sinan ÇELİKBİLEK<sup>1</sup>**

Muğla Sıtkı Koçman University

**Ebru ÇAKIR<sup>2</sup>**

Muğla Sıtkı Koçman University

### Abstract

The current study was conducted to investigate the relationship between occupational personality types, 21st-century skills, and teaching motivation. The study was conducted in the descriptive relational survey model, one of the quantitative research methods. The study group consisted of all the students attending the Physical Education Teaching Department at Faculty of Sports Sciences of Muğla Sıtkı Koçman University. A total of 148 (F=59, M=89) students were included in the study. The questionnaire method was employed to collect the data in the study. The questionnaire consists of four parts: a personal information form in the first part and three scales in the following three parts. In the second part, there is the “21<sup>st</sup> Century Skills Self-Efficacy Perception Scale” consisting of 42 items, in the third part, there is the “Occupational Personality Types Inventory” consisting of 30 items and in the fourth part, there is the “Teaching Motivation Scale” consisting of 12 items. The SPSS v22 program package was used in the analysis of the collected data. As a result of the study, a significant correlation was found between occupational personality types and 21st-century skills self-efficacy perceptions, between the six personality types of occupational personality and intrinsic and extrinsic motivation, and between 21st-century skills self-efficacy perceptions and intrinsic and extrinsic motivation. According to the results of regression analyses, occupational personality types had a significant effect on intrinsic and extrinsic motivation.

Keywords: Occupational personality types, 21<sup>st</sup> century skills, teaching motivation, physical education teaching

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<sup>1</sup> Muğla Sıtkı Koçman University Marmaris Vocational School, MUĞLA, ORCID ID: 0000-0002-5199-6333

**Correspondence:** sinancelikbilek@mu.edu.tr

<sup>2</sup> Muğla Sıtkı Koçman University Physical Education and Sports Teaching, MUĞLA  
ebrucakir48@outlook.com ORCID: 0000-0003-4943-956X

## Introduction

The concept of personality is frequently used in our daily lives (Güney, 2000). Personality development is expressed as a process that begins with the conception of a human being and continues until the end of life. The concept of “personality” which means the characteristic qualities or traits of an individual, originated from the practice of theatre actors wearing masks on stage (Morgan, 2011). Doğan (2013) defines personality as an element that differentiates a person from other people. Personality, like fingerprints, encompasses unique traits specific to an individual (Acar & Karavelioğlu, 2022). In other words, personality is the primary factor that shapes all emotions and behaviors of an individual (Bacanlı, İlhan, & Aslan, 2009; Burger, 2006).

One of the most frequently used personality definitions in the literature belongs to Feshbach. For Feshbach (YEAR), personality emerges as a result of being influenced by the environment in which a person lives. In other words, personality is formed through a combination of innate characteristics and the influences coming from the surrounding environment (Yücel & Taşçı, 2008: 687).

When the relevant literature is examined, it is seen that the definitions of the concept of personality are focused on 3 points (Tekçe, 2010).

1. Personality is composed of the entirety of social skills. All of the relationships a person develops with other people around him/her and the behaviors he/she exhibits constitute that person’s personality.
2. The impact a person has on others reflects that person’s personality.
3. All of the characteristics of a person, the relationships he/she establishes with his/her environment, and the behavioral tendencies that emerge as a result of interaction constitute personality.

The concept of profession has different definitions in many different sources. In the Dictionary of the Turkish History Board, the profession is defined as “A person’s work or field of thought which the person chooses and devotes himself/herself in order to earn his/her own living.” (TDK, 2022).

The field of work that a person chooses to survive and earn a living is defined as a profession (Özgüven, 1999). In this context, a profession is not only described as a means of financial gain but also as a path for self-actualization. People meet their self-actualization needs through professional activities as well as different activities. Profession is expressed as an element that has a wide impact and that directly affects a person’s life (Kaya, 1988).

Dr. John Holland is one of the prominent researchers in the field of profession and personality. Holland, who has conducted highly significant studies on career choice, states that “career choice is an expression of personality” and emphasizes the importance of harmony between individual and



occupation in career selection. According to Holland's personality theory, there is a relationship between the factors that shape personality and the environments in which professions are performed. In this context, a person's choice of profession is expressed as a reflection of that person's personality (Bulutlar & Kamaşak, 2010).

21st-century skills are a prominent issue bringing about significant changes in education around the world in the 21st century, which is called the information age. While some changes require the updating of education systems, some changes affect the qualifications that teachers who are an important element in education must have. In the 21st-century, a shift from a teaching-centric approach to a learning-centric approach is observed. In this process, teachers also need to improve themselves under the requirements of the age and keep up with innovations. In other words, teachers are expected to adopt a student-centered approach by innovations (Taşgın, 2015).

According to Orhan Göksün (2016), in the current era marked by developments and changes, there is a need to prioritize the education of individuals who can analyze and transform information, as well as solve existing problems for the benefit of society. All these competencies that individuals are required to have been referred to as 21st-century skills. Hotoman (2019) also emphasized the importance of having the skills of the century we live in to develop as a society and as an individual. He expressed the importance of educating creative people who can solve problems and have a critical mindset in order not to fall behind in the era.

Teachers are provided with the professional knowledge, skills, and attitudes during their undergraduate education and 21st-century skills are among the most important skills to be acquired during this period so that pre-service teachers can enter the profession with an awareness of these skills (Saçmalıoğlu, 2019). 21st-century skills, which are effective in many aspects of individuals' lives and career goals, can be acquired through education at all stages of education, and the acquisition of these skills is the responsibility of teachers. In this context, it is extremely important for teachers to have these skills and transfer them to learning processes (Anagün et al., 2016).

The concept of motivation, which is one of the most important issues in the business life of teachers or employees, is a concept that originated from the Latin word "movere", which means to move (Tınaz, 2013). There are different definitions of motivation in the literature (Ergun Özler, 2013; Seker, 2015).

According to Çüceloğlu (2019), motivation is expressed as a broad concept encompassing an individual's desires, wishes, needs, impulses, and other feelings. All living things in the world have needs that they need to meet to survive. However, people need to take action to meet these needs, and all activities carried out to take this action include the concept of motivation (Gümüş & Sezgin, 2012;

as cited in İşgörür, 2020). Motivation to teach refers to a process that determines what attracts people to teaching and how long they will stay in this profession (Han & Yin, 2016).

In line with this information, the purpose of this current study is to examine the effects of pre-service physical education teachers' occupational personality types and 21st-century skills on their teaching motivation. The research questions prepared within the scope of the purpose of the research are as follows.

1. Is there a significant relationship between professional personality types and 21st century competencies?
2. Is there a significant relationship between professional personality types and teaching motivation?
3. Is there a significant relationship between 21st century competencies and teaching motivation?
4. Is there a significant relationship between professional personality types and intrinsic motivation regression analysis?
5. Is there a significant relationship between professional personality types and extrinsic motivation regression analysis?
6. Is there a significant relationship between 21st Century competencies and intrinsic motivation regression analysis?
7. Is there a significant relationship between 21st Century competencies and extrinsic motivation regression analysis?

### **Research Method**

In this part, research method, population and sample, data collection tools and data analysis have been mentioned, respectively.

#### **Research Method**

The current study employed the relational survey model, one of the quantitative research methods. This model was preferred because it allows for the examination of the relationship between variables and their impact on each other (Kaya, Balay, & Göçen, 2012).

## **Population and Sample**

Since there was no problem in reaching the population of this study and the scope of the population was narrow, the complete census method was preferred instead of sampling (Ural & Kılıç, 2005). The sample of the study consisted of 148 (Female = 59, Male = 89) people.

## **Data Collection Tools**

In the study, the questionnaire method, one of the quantitative data collection techniques, was preferred to collect data. The questionnaire form consists of four parts: a personal information form and three scale forms. The personal information form consists of four questions to elicit information about the participants' gender, age, grade level, and satisfaction with the department. The second part of the questionnaire form is the "21st Century Skills Self-Efficacy Perception Scale" which consists of 42 items. In the third part, there is the "Occupational Personality Types Inventory" consists of 30 items, and in the fourth part, there is the "Teaching Motivation Scale" consisting of 12 items.

**21st Century Skills Self-Efficacy Perception Scale:** The "21st Century Skills Self-Efficacy Perception Scale" consisted of 42 items and 3 sub-dimensions were employed to determine the 21st-century skills of the pre-service physical education and sports teachers in the current study. The scale consists of three dimensions: learning and renewal skills, life and career skills, and information, media, and technology skills. The scale developed by Anagün et al. (2016) is a five-point Likert scale. The Cronbach reliability coefficient of the scale was found to be .89 in the scale development study.

**Occupational Personality Types Inventory:** In the study, the "Occupational Personality Types Inventory" developed by Atli and Keldal (2017) was used to determine the occupational personality types of the pre-service physical education and sports teachers. The inventory, which consists of 30 items and allows determining six personality types (Realistic, Entrepreneurial, Inquisitive, Social, Artistic, and Traditional), is in a nine-point Likert type scale. In the scale development study, the reliability coefficient of the Occupational Personality Types Inventory was found to be .72 for the realistic sub-dimension, .85 for the entrepreneurial sub-dimension, .81 for the inquisitive sub-dimension, .81 for the social sub-dimension, .77 for the artistic sub-dimension, and .78 for the traditional sub-dimension.

**Teaching Motivation Scale:** In the study, the "Teaching Motivation Scale" developed by Kauffman, Yılmaz-Soylu, and Duke (2011) was used to determine the teaching motivation of the pre-service physical education and sports teachers. The scale consists of 12 items. The scale measures participants' motivation in two sub-dimensions: intrinsic and extrinsic motivation. Higher scores taken from the scale indicate higher levels of teaching motivation. The reliability value was found to be .86 for the intrinsic motivation sub-dimension and .76 for the extrinsic motivation sub-dimension.

Cronbach's alpha values were calculated for the reliability of the scales used and are presented in Table 1. Reliability analysis was calculated by the researcher based on the answers of 148 participants.

Table 1. Reliability Analysis Findings for the Scales

Dimensions	Cronbach's Alpha Value	Number of Items
Learning and Renewal Skills	.921	16
Life and Career Skills	.884	18
Information, Media, and Technology Skills	.905	8
Realistic	.758	5
Entrepreneurial	.703	5
Inquisitive	.750	5
Social	.842	5
Artistic	.733	5
Traditional	.732	5
Intrinsic Motivation	.870	6
Extrinsic Motivation	.879	6
All the Scales		76

If the values obtained in the reliability analysis are between 0.60 and 0.80, we can evaluate the scale as "reliable" and if it is between 0.80 and 1.00, we can evaluate the scale as "highly reliable" (Gürbüz & Şahin, 2018). It seems that the reliability levels of the scales are suitable for research.

### Data Analysis

SPSS v22 package program was used in the analysis of the collected data. Reliability analysis was conducted to check the reliability of the measurement tools used in the study. Frequency and percentage analyses were used to analyze the data obtained from the personal information form. Pearson correlation was used to determine the relationship between the variables and regression analysis was used to determine the power of prediction.

Table 2. Findings from the Normality Analysis of the Scales

Dimensions	Skewness	Kurtosis
Learning and Renewal Skills	.291	-.372
Life and Career Skills	.746	.717
Information, Media, and Technology Skills	.561	-.624
Realistic	-.417	.158
Entrepreneurial	-.160	.432
Inquisitive	-.642	.372
Social	-.547	-.243
Artistic	-.607	-.397
Traditional	-.753	.258
Intrinsic Motivation	-1.040	.728
Extrinsic Motivation	-.695	.081

When Table 2 is examined, it is seen that the research data shows a normal distribution. Tabachnick and Fidell (2013) stated that the skewness and kurtosis values in the range of  $\pm 1.5$  mean that the required criterion for normality is met.

## Findings

In this part, includes the demographic findings of the research and findings regarding the hypotheses. Research findings are presented in tables and interpreted.

Table 1. Gender Distribution of the Participants

Variables	N	%
Female	59	39.9
Male	89	60.1
Total	148	100.0

When Table 3 is examined, it is seen that 39.9% of the participants are female and 60.1% are male.

Table 2. Age Distribution of the Participants

Variables	N	%
18-20 Years Old	81	54.7
21-24 Years Old	54	36.5
25-28 Years Old	13	8.8
Total	148	100.0

When Table 4 is examined, it is seen that 54.7% of the participants are in the age group of 18-20, 36.5% are in the age group of 21-24 and 8.8% are in the age group of 25-28.

Table 3. Grade Level Distribution of the Participants

Variables	N	%
1 <sup>st</sup> Grade	41	27.7
2 <sup>nd</sup> Grade	31	20.9
3 <sup>rd</sup> Grade	38	25.7
4 <sup>th</sup> Grade	38	25.7
Total	148	100.0

When Table 5 is examined, it is seen that 27.7% of the participants are 1st graders, 20.9% are 2nd graders, 25.7% are 3rd graders and 25.7% are 4th graders.

Table 4. Participants' Level of Satisfaction with the Department They Attend

Variables	N	%
Yes	125	84.5
No	23	15.5
Total	148	100.0

When the participants' level of satisfaction with the department they attend is examined, it is seen that 84.5% of the participants are satisfied while 15.5% are not satisfied. It can be said that the great majority of the participants are satisfied with the department they attend.

Table 5. Relationship between Occupational Personality Types and 21<sup>st</sup> Century Skills

	n: 148	Learning and Renewal Skills	Life and Career Skills	Information, Media and Technology Skills
Realistic	r	.071	.306**	.119
	p	.392	.000	.150
Entrepreneurial	r	.268**	.209*	-.083
	p	.001	.011	.313
Inquisitive	r	.302**	.155	.080
	p	.000	.059	.332
Social	r	.149	-.007	.005
	p	.070	.931	.949
Artistic	r	.157	.041	.013
	p	.057	.623	.877
Traditional	r	.025	.138	.064
	p	.766	.095	.442

\*\*p<0.01 \*p<0.05

According to the results of the correlation analysis, there is a positive and significant correlation ( $p<0.05$ ) between the realistic personality type and life and career skills ( $r: .306$ ), between the entrepreneurial personality type and learning and renewal skills ( $r: .268$ ) and life and career skills ( $r: .209$ ) and between the inquisitive personality type and learning and renewal skills ( $r: .302$ ). The existence of a positive correlation between the variables means that they increase or decrease together. There is no significant correlation between the social, artistic, and traditional personality types and any dimension of the 21st-century skills perception scale.

Table 6. Relationship between the Occupational Personality Types and Teaching Motivation

	n: 148	Intrinsic Motivation	Extrinsic Motivation
Realistic	r	.449**	.485**
	p	.000	.000
Entrepreneurial	r	.373**	.373**
	p	.000	.000
Inquisitive	r	.405**	.452**
	p	.000	.000
Social	r	.420**	.429**
	p	.000	.000
Artistic	r	.378**	.363**
	p	.000	.000
Traditional	r	.668**	.636**
	p	.000	.000

\*\* p<0.01

According to the results of the correlation analysis, there is a positive and significant correlation between all the six personality types and intrinsic and extrinsic motivation ( $p<0.05$ ). The personality type having the strongest correlation with the intrinsic motivation ( $r: .668$ ) and extrinsic motivation ( $r: .636$ ) sub-dimensions of teaching motivation was determined to be the traditional personality type. The existence of a positive correlation between the variables means that they increase or decrease together. It is seen that the correlations between the variables are in the range of 0.30-0.69 and at a medium level.

Table 7. Relationship between 21<sup>st</sup> Century Skills and Teaching Motivation

	n: 148	Intrinsic Motivation	Extrinsic Motivation
Learning and Renewal Skills	r	.115	.106
	p	.163	.200
Life and Career Skills	r	.182*	.190*
	p	.027	.021
Information, Media, and Technology Skills	r	-.252**	-.257**
	p	.002	.002

According to the results of the correlation analysis, there is a positive and significant correlation ( $p < 0.05$ ) between life and career skills and intrinsic motivation ( $r: .182$ ) and extrinsic motivation ( $r: .190$ ) and there is a negative and significant correlation ( $p < 0.05$ ) between knowledge, media and technology skills and intrinsic motivation ( $r: -.252$ ) and extrinsic motivation ( $r: -.257$ ). It is seen that the correlation between the variables is weak. While life and career skills and the sub-dimensions of teaching motivation increase or decrease together, information, media, and technology skills and the sub-dimensions of teaching motivation have a negative correlation, and as one increases, the other decreases.

Table 8. Regression Analysis on the Effect of Personality Types on Intrinsic Motivation

Variables	B	SH	$\beta$	t	P
Realistic	.013	.012	.085	1.116	.266
Entrepreneurial	.020	.014	.141	1.489	.139
Inquisitive	-.023	.017	-.152	-1.316	.190
Social	-.001	.014	-.006	-.051	.960
Artistic	-.012	.015	-.082	-.815	.416
Traditional	.114	.016	.710	6.967	.000
Constant	.435	.412	-	1.057	.293

$R^2 = .470$

Adjusted  $R^2 = .448$

F = 20.849

p = 0.000

*Dependent variable: Intrinsic Motivation*

When Table 10 is examined, it is seen that the simple regression analysis conducted to examine the effect of occupational personality types on intrinsic motivation is statistically significant ( $p < 0.05$ ). Occupational personality types positively affect intrinsic motivation and increase it at a moderate level. According to the analysis results, only the traditional personality type has a significant effect on intrinsic motivation. The adjusted  $R^2$  was found to be 0.448. According to this value, 45% of intrinsic motivation is explained by occupational personality types.

Table 9. Regression Analysis on the Effect of Personality Types on Extrinsic Motivation

Variables	B	SH	$\beta$	T	P
Realistic	.026	.013	.162	2.057	<b>.042</b>
Entrepreneurial	.010	.014	.071	.728	.468
Inquisitive	.006	.018	.037	.311	.756
Social	.002	.015	.015	.128	.898
Artistic	-.020	.016	-.131	-1.261	.210
Traditional	.091	.017	.558	5.311	<b>.000</b>

Constant	.170	.433	-	.394	.694
$R^2 = .435$					
Adjusted $R^2 = .411$					
F = 18.128					
p = 0.000					

Dependent variable: Extrinsic Motivation

When Table 11 is examined, it is seen that the simple regression analysis conducted to examine the effect of occupational personality types on extrinsic motivation is statistically significant ( $p < 0.05$ ). Occupational personality types affect extrinsic motivation at a medium level. According to the analysis results, realistic and traditional personality types have a significant effect on extrinsic motivation. The adjusted  $R^2$  value was found to be 0.411. According to this value, 41% of extrinsic motivation is explained by occupational personality types.

Table 10. Regression Analysis of the Effect of 21<sup>st</sup> Century Skills on Intrinsic Motivation

Variables	B	SH	$\beta$	T	p
Learning and Renewal Skills	.084	.203	.038	.411	.682
Life and Career Skills	.743	.255	.280	2.919	<b>.004</b>
Information, Media and Technology Skills	-.761	.176	-.355	-4.330	<b>.000</b>
Constant	3.996	1.022	-	3.910	.000
$R^2 = .145$					
Adjusted $R^2 = .127$					
F = 8.118					
p = 0.000					

Dependent variable: Intrinsic Motivation

When Table 12 is examined, it is seen that the simple regression analysis conducted to examine the effect of 21<sup>st</sup> century skills on intrinsic motivation is statistically significant ( $p < 0.05$ ). 21<sup>st</sup> century skills affect intrinsic motivation at a medium level. According to the analysis results, life and career skills and information, media and technology skills have a significant effect on intrinsic motivation. The adjusted  $R^2$  value was found to be 0.127, indicating that 13% of intrinsic motivation is explained by 21<sup>st</sup> century skills.

Table 11. Regression Analysis of the Effect of 21<sup>st</sup> Century Skills on Extrinsic Motivation

Variables	B	SH	$\beta$	T	p
Learning and Renewal Skills	.040	.206	.018	.195	.846
Life and Career Skills	.818	.258	.303	3.172	<b>.002</b>
Information, Media and Technology Skills	-.794	.178	-.364	-4.460	<b>.000</b>
Constant	3.820	1.035	-	3.691	.000
$R^2 = .153$					
Adjusted $R^2 = .136$					
F = 8.684					
p = 0.000					

Dependent variable: Extrinsic Motivation

When Table 13 is examined, it is seen that the simple regression analysis conducted to examine the effect of 21<sup>st</sup> century skills on extrinsic motivation is statistically significant ( $p < 0.05$ ). 21<sup>st</sup> century skills affect extrinsic motivation at a medium level. According to the analysis results, life and career skills and information, media and technology skills have a significant effect on extrinsic motivation.



The adjusted R2 value was found to be 0.136, indicating that 14% of extrinsic motivation is explained by 21st century skills.

### **Discussions**

This study was conducted to examine the effects of pre-service physical education teachers' occupational personality types and 21st-century skills on their teaching motivation.

As a result of the correlation analysis conducted to reveal the relationship between the research variables, a positive and significant correlation was found between the realistic personality type and life and career skills, between the entrepreneurial personality type and learning and renewal skills, and the life and career skills and between the inquisitive personality type and learning and renewal skills.

According to another result of the study, there is a positive and significant correlation between the six personality types and intrinsic and extrinsic motivation. Akkuş (2023) similarly found that there is a significant correlation between personality types and motivation of pre-service teachers. Gedik (2023) found a negative correlation between personality and employee motivation. According to the results of the correlation analysis, there is a positive and significant correlation between life and career skills and intrinsic motivation and extrinsic motivation, and a negative and significant correlation between information, media, and technology skills and intrinsic motivation and extrinsic motivation.

According to the results of the regression analyses performed to determine the effect of independent variables on the dependent variable, occupational personality types have a significant effect on intrinsic and extrinsic motivation. According to the results of the study, 45% of intrinsic motivation and 41% of extrinsic motivation are explained by occupational personality types. According to the results of the analysis conducted to examine the effect of 21st-century skills on teaching motivation, 13% of intrinsic motivation and 14% of extrinsic motivation are explained by 21st-century skills. These results show that 21st-century skills are a significant predictor of teaching motivation. Bulut (2022) similarly found that there is a weak but significant correlation between the levels of using 21st-century teaching skills and teaching motivation.

The sample of the current study consists of pre-service physical education and sports teachers attending a faculty of sports sciences. Future studies can be conducted in different departments that have received formation training in sports sciences. This can enable the valuation of variables across different departments. The study was conducted only in Muğla province due to various restrictions. Comparative analyses can be made by including university students from different provinces in future studies. In this study, the relationship between pre-service teachers' 21st-century skills, teaching motivation, and occupational personality types was examined. In future studies, investigations can be conducted using different personality type scales.

## **Policy Implications**

Restructuring the training programs in accordance with the professional personality types of physical education and sports science teachers can enable these teachers to work more effectively and motivated. With programs customized according to teachers' interests and abilities, more efficient educational processes can be created for both themselves and their students. Integrating 21st century skills into physical education and sport science curricula can help teachers develop skills such as critical thinking, problem solving, collaboration and digital literacy. Adoption of these skills by teachers enables students to gain these competencies. Additionally, developing special strategies for physical education and sports science teachers to increase teaching motivation can increase teachers' professional satisfaction and create a more effective teaching environment. In this context, Ekici, Abide, Canbolat and Öztürk (2017) emphasize that it is necessary to equip individuals with more diverse and advanced competencies. Just having a diploma is no longer considered sufficient; certain skills are also required. These skills, defined as "21st century skills", must first be internalized by teachers in order to be transferred to students. Because the transfer of skills to students will be given by teachers during the learning process (Yalçın, 2018; Erten, 2020; Uyar & Çiçek, 2021). Teachers' possession of these skills and their ability to transfer them to students is a critical factor for the success of the education system. In this context, the education of the future should be shaped in a way that enables students to acquire 21st century skills.

Teachers, one of the most effective elements of the education system, are expected to constantly improve themselves in terms of teaching skills and competencies, follow the developments in the world of education, be innovative and strive to use new teaching methods. Mustafa and Othman (2010) state that this situation depends on the motivation of teachers. Teachers must have high motivation to acquire and maintain these skills and competencies. Highly motivated teachers will be more effective in providing students with 21st century skills. Therefore, developing and implementing strategies that will increase teachers' motivation is critical for the success of the education system. Educational policies should be designed to support teachers' motivation and contribute to their professional development. In this context, teachers equipping themselves with innovative methods and applying these methods in their classes will both increase the success of students and improve the general quality of the education system.

The study may help physical education and sports science teachers understand how to communicate more effectively with students with different professional personality types and how to motivate them. This information allows teachers to adapt their teaching methods to individual student needs. Developing career guidance and career planning services enables teachers to have more information about career paths suitable for their personality types, which contributes positively to teachers' career development. Making education policies more inclusive and flexible by taking into

account the individual differences of physical education and sports science teachers can make teaching processes more effective and efficient. The shift to personalized learning models can also improve teacher and student performance in physical education and sports science. This study can help train more motivated and competent teachers by increasing the contributions of physical education and sports science teachers to educational policies. Shaping education policies in line with these findings can contribute to creating a more efficient, motivating and talent-oriented educational environment.

### **Author Contribution and Conflict of Interest Declaration Information**

All authors contributed equally to the article. There is no conflict of interest.

### **Ethics Information**

This study was found appropriate in terms of research ethics by the decision of Muğla Sıtkı Koçman University Medicine and Health Sciences Ethics Committee dated 05.04.2022 and numbered 43.

### **References**

- Acar, E. & Karavelioğlu, M. B. (2022). Beden eğitimi ve spor öğretmenlerinin kişilik özellikleri ve izlenim yönetimi arasındaki ilişkinin incelenmesi. *Gaziantep Üniversitesi Spor Bilimleri Dergisi*, 7(2), 108-127.
- Aksüt, R. (2023). *Yöneticilerin karanlık kişilik özellikleri ile çalışan motivasyonu arasındaki ilişkide psikolojik sağlamlığın düzenleyici rolü*. (Unpublished master's thesis). Fırat Üniversitesi Sosyal Bilimler Enstitüsü, Elazığ.
- Anagün, S., Atalay, N., Kılıç, Z. & Yaşar, S. (2016). Öğretmen adaylarına yönelik 21. Yüzyıl becerileri yeterlilik algıları ölçeğinin geliştirilmesi: Geçerlik ve güvenirlik çalışması. *PAU Eğitim Fakültesi Dergisi*, 40, 160-175.
- Atli, A., & Keldal, G. (2017). Mesleki Kişilik Tipleri Envanterinin Geliştirilmesi. *Eskişehir Osmangazi Üniversitesi Sosyal Bilimler Dergisi*, 18(1), 73-93. DOI: 10.17494/ogusbd.330743
- Bacanlı, H., İlhan, T. & Aslan, S. (2009). Beş Faktör Kuramına Dayalı Bir Kişilik Ölçeğinin Geliştirilmesi: Sıfatlara Dayalı Kişilik Testi (Sdkt). *Türk Eğitim Bilimleri Dergisi*, 7(2): 261-279.
- Bulut, D. (2022). *Sınıf öğretmenlerinin 21. yüzyıl becerileri ile öğretme motivasyonu düzeylerinin incelenmesi*. (Unpublished master's thesis). Ege Üniversitesi Eğitim Bilimleri Enstitüsü, İzmir.
- Bulutlar, F. & Kamaşak, R. (2010). Kişilik, Mesleki Tercih Ve Performans İlişkisi: Akademik Personel Üzerine Bir Araştırma. *Organizasyon ve Yönetim Bilimleri Dergisi*, 2(2): 119-126.
- Cüceloğlu, D. (2019). *İnsan ve Davranışı: Psikolojinin Temel Kavramları*. İstanbul: Remzi Kitabevi.

- Doğan, T. (2013). Beş Faktör Kişilik Özellikleri Ve Öznel İyi Oluş. *Doğuş Üniversitesi Dergisi*, 14(1), 56-64.
- Ekici, G., Abide, Ö. F., Canbolat, Y. & Öztürk, A. (2017). 21. Yüzyıl becerilerine ait veri kaynaklarının analizi. *Eğitim ve Öğretim Araştırmaları Dergisi*, 6(1), 124-134.
- Ekşi, D. (2019). *Okul öncesi öğretmenlerinin yöneticilerinde algıladıkları liderlik stilleri ile kendi motivasyon düzeyleri arasındaki ilişki*. (Unpublished master's thesis). Trakya Üniversitesi Sosyal Bilimler Enstitüsü, Edirne.
- Ergun Özler, N. D. (2013). *Güdüleme*. C. Koparal, & İ. Özalp (Ed.). Yönetim ve Organizasyon (s. 124-159). Eskişehir: T.C. Anadolu Üniversitesi Yayını.
- Erten, P. (2020). Öğretmen adaylarının 21. Yüzyıl becerileri yeterlilik algıları ve bu becerilerin kazandırılmasına yönelik görüşleri. *Millî Eğitim Dergisi*, 49(227), 33- 64.
- Güney, S. (2000). *Davranış Bilimleri*. Ankara: Nobel Yayınları.
- Han, J. & Yin, H. (2016). Teacher Motivation: Definition, Research Development and Implications For Teachers, *Cogent Education*, 3(1): 1-24.
- Hotoman, D. (2019). *Ekonomik Açıdan 21. Yüzyıl Becerileri*. AD Öğretim-Özçelik ve M. Nur-Tuğluk (Edt). Eğitimde ve Endüstride, 21, 291-315.
- Karasar, N. (2005). Bilimsel araştırma yöntemi. Ankara: Nobel Yayın Dağıtım.
- Kauffman, D. F., Yılmaz-Soylu, M. & Duke, B. (2011). Öğretme motivasyonu ölçeğinin geçerlik çalışması. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, 40, 279-290.
- Kaya, A., Balay, R., Göçen, A. (2012). Öğretmenlerin Alternatif Ölçme ve Değerlendirme Tekniklerine İlişkin Bilme, Uygulama ve Eğitim İhtiyacı Düzeyleri. *International Journal of Human Sciences [Online]*. (9)2: 1229-1259.
- Kaya, Z. (1988). *Lise Son Sınıf Öğrencilerinin Meslek Seçimindeki Sosyo-Ekonomik Faktörler*. İ. Ü Sosyal Bilimleri Fakültesi, İstanbul.
- Morgan, C. T. (2011). *Psikolojiye giriş* (S. Karakaş ve R. Eski, Çev. Ed). Konya: Eğitim Yayınevi.
- Mustafa, M., & Othman, N. (2010). The effect of work motivation on teacher's work performance in pekanbaru senior high schools, Riau Province, Indonesia. *SOSIOHUMANIKA*, 3(2), 259-272.
- Orhan Göksün, D. (2016). *Öğretmen Adaylarının 21. Yüzyıl Öğrenen Becerileri ve 21. Yüzyıl Öğreten Becerileri Arasındaki İlişki*. (Unpublished doctoral dissertaiton). Anadolu Üniversitesi, Eğitim Bilimleri Enstitüsü, Eskişehir.
- Özgüven, İ. (1999). *Çağdaş Eğitimde Psikolojik Danışma ve Rehberlik*. Ankara: PDREM Yayınları.

- Saçmalıoğlu, M. G. (2019). *Beden Eğitimi Öğretmen Adaylarının, Mesleki Öğrenme Topluluğu Aracılığıyla 21. Yüzyıl Becerilerini Ortaya Çıkarma Süreçlerinin Keşfedilmesi*. Ankara Üniversitesi Eğitim Bilimleri Enstitüsü, Ankara.
- Seker, S. E. (2015). *Motivasyon Teorisi (Motivation Theory)*. YBS Ansiklopedi, 2(1), s. 22-27.
- Tabachnick, B.G., & Fidell, L.S. (2013). *Tabachnick, Fidell Using Multivariate Statistics* (sixth ed.) Pearson, Boston.
- Taşgın, A. (2015). *Klinik uygulamaların öğretmen adaylarının öğrenme ve öğretme süreç becerilerine, öz yeterliliklerine ve mesleki tutumlarına etkisi*. (Unpublished doctoral dissertaiton). Atatürk Üniversitesi. Erzurum.
- Tekçe, E. A. (2010). *Yıldırma Olgusu Ve Yıldırma İle Kişilik Arasındaki İlişkinin İncelenmesi: Bir Bankacılık Sektörü Örneği* (Unpublished master's thesis). T.C. Erciyes Üniversitesi Sosyal Bilimler Enstitüsü, Kayseri.
- Tınaz, P. (2013). *Motivasyon. Çalışma Yaşamından Örnek Olaylar* (3. b., s. 3-17). içinde İstanbul: Beta Yayıncılık.
- Ural, A. & Kılıç, İ. (2005). *Bilimsel araştırma süreci ve SPSS ile veri analizi*, Ankara: Detay.
- Yalçın, S. (2018). 21. Yüzyıl becerileri ve bu becerilerin ölçülmesinde kullanılan araçlar ve yaklaşımlar. *Ankara Üniversitesi Eğitim Bilimleri Fakültesi Dergisi*, 51(1), 183- 201. doi:10.30964/auebfd.405860
- Yüce, G. (2023). *Öğretmen adaylarının sosyo-ekonomik durumlarının ve kişilik özelliklerinin motivasyonlarına etkisinin incelenmesi*. (Unpublished doctoral dissertaiton). Gazi Üniversitesi Eğitim Bilimleri Enstitüsü, Ankara.
- Yücel, C. & Taşçı, S. K. (2008). Öğretmenlerin Kişilik Özellikleri ve Örgütsel Vatandaşlık Davranışı, *Selçuk Üniversitesi Sosyal Bilimler Dergisi*, Sayı: 20, 685-706.

## Relationship between Democratic Attitudes and Attitudes Toward Implementing Cooperative Learning: A Cross-sectional Study of Pre-service Science Teachers

Özgecan KIRIK<sup>1</sup>

Çukurova University, Adana, Türkiye

### Abstract

Pedagogical methods shape students' grasp of democracy. Cooperative learning, by fostering democratic values in classrooms, empowers students for active civic participation. This approach is seen as ideal, suggesting pre-service teachers using it will hold positive democratic attitudes. This study seeks to determine how attitudes towards democracy and implementing cooperative learning differ among pre-service science teachers at various grade levels (n=207), and how these attitudes correlate with each other. Additionally, the study aims to investigate how the relationship between attitudes towards democracy and implementing cooperative learning changes across grade levels. A cross-sectional design was employed. Data was collected using the Collaborative Learning Scale to measure the attitudes towards implementing cooperative learning and Democratic Perceptions and Attitudes Scale to measure democratic attitudes. The findings revealed that pre-service teachers' year of training has no influence on their democratic attitudes and their attitudes towards implementing cooperative learning. However, participants consistently exhibited strong democratic attitudes and attitudes towards implementing cooperative learning, with a non-significant increase across grade levels. These findings suggest a widespread support for democratic principles in future classrooms and a belief in the value of cooperative learning as an instructional approach and their high expectations of success when using this method. Furthermore, there is a strong, positive correlation between democratic attitudes and attitudes towards implementing cooperative learning at all grade levels. This means that pre-service teachers who value democratic principles in the classroom are more likely to view cooperative learning strategies favorably. These findings highlight a strong link between pre-service science teachers' democratic values and their openness to using cooperative learning. The correlation coefficient increases with higher training years. As pre-service science teachers progress through their training program, the focus on democratic education practices might increase.

**Keywords:** Democratic attitudes, Cooperative learning, Pre-service science teachers

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<sup>1</sup>Assoc. Prof. Dr., Faculty of Education, Çukurova University, Adana, Türkiye, ORCID: 0000-0001-8262-5458

**Correspondence:** ozge.deniz@gmail.com

## **Introduction**

Many countries have made sacrifices to establish democratic societies. However, holding elections is not enough to ensure a sustainable democracy. Equipping future generations with the necessary skills and values is crucial for democracy to thrive. Schools should prioritize teaching rights, responsibilities, and essential values for citizenship in a democratic society. A democratic and inclusive classroom encourages student involvement in decision-making, fostering responsibility and a conducive learning environment (Knight, 2001; Roberts & Owens, 2012). Equipping students with essential skills for unbiased learning is crucial for promoting diversity and civic engagement.

Cooperative learning encourages active student participation through face-to-face collaboration, ensuring high levels of engagement. This approach promotes an egalitarian and compassionate democratic society by allowing students to contribute (Johnson & Johnson, 1994; Cuna, 1996). According to Johnson and Johnson (2016), pedagogical methods in schools significantly impact students' understanding of democracy, emphasizing the importance of embodying democratic principles in classroom and school environments. When teachers employ cooperative learning methods, they foster democracy classrooms, leading to the emergence of a democracy stance (Vinterek, 2010) within these educational environments (Ferguson-Patrick, 2014). These classrooms employ inclusive teaching methods like cooperative learning to promote participation and reduce exclusionary practices (Florian & BlackHawkins, 2011). These classrooms also foster improved student-teacher relationships through inclusive teaching methods, leading to better gender equality attitudes and more favorable perspectives on immigrants' and ethnic rights (Sampermans, 2019).

Based on the idea that cooperative learning creates democratic classrooms, it is expected that pre-service teachers who apply this method will have positive democratic attitudes. Therefore, a strong relationship may exist between pre-service teachers' democratic attitudes and their attitudes toward implementing cooperative learning. In this context, preservice science teachers' democratic attitudes can support cooperative learning by fostering an environment grounded in values such as participation, equality, and respect among students in the classroom. This study aims to uncover the relationship between pre-service science teachers' democratic attitudes and their attitudes toward implementing cooperative learning and how this connection varies across different grade levels.

### **Democratic Attitudes**

Democracy is the expression of the will of the people, involving active participation in governance and society. It is underpinned by values like honesty, human rights, equality, justice, security, and tolerance (Köse, 2009). Open-mindedness and effective communication are key traits for individuals in democratic societies (Genç & Kalafat, 2007). Attitude encompasses an individual's feelings and behaviors towards themselves or the events and situations around them (İnceoğlu, 2010). A democratic attitude entails embracing values such as equality, freedom, and justice within the legal

framework, signifying principles like respect for human rights, tolerance, equality, and benevolence integrated into one's lifestyle (Demirsöz, 2010). The development of this attitude commences in the family and is fostered in educational institutions through influences from parents, family members, school peers, and teachers (Köse, 2009).

Johnson and Johnson (2016) highlight the significance of a classroom and school climate that embodies democratic principles. A democratic classroom environment entails active student involvement, emphasizing its significance for future democratic societies (Ferguson-Patrick, 2022). Cunat (1996) defined democratic education as "the vital and dynamic process of a learning community that recognizes and validates the individuality and responsibility of each participant" (p. 130), aiming to develop skills essential for fostering a just society upholding human rights. By instilling these values in the classroom, it cultivates responsible citizens capable of contributing to an unbiased learning environment within a just democratic society. Thus, fulfilling the aims of democratic education should be considered central to the purpose of schooling; incorporating a "democratic way of life" into educational institutions is crucial (Apple & Beane, 2007).

Teachers' teaching methods, questioning practices, their interactions with students, and their attitudes of support or hindrance can have an impact on students' psychological well-being (Dilekmen, 1999). Duman (2010) suggests that the development of pre-service teachers' democratic attitudes correlates with a positive shift in their views on modern educational philosophies. These philosophies prioritize a more democratic, student-centered approach to education. Educators who embrace these principles can utilize various teaching strategies such as collaborative, project-based, problem-based, and inquiry-based approaches to promote active student participation (Şimşek et al., 2009). Creating interactive environments in the classroom is key for allowing students to realize their gains from learning in a more democratic setting. Teachers are encouraged to give students responsibility in the education process and foster an environment of respect and trust within the classroom (Dilekmen, 1999). However, to foster a democratic and inclusive educational environment that promotes student success, teachers should embody the principles of democracy as an integral part of their daily lives (Çankaya & Seçkin, 2004). Teaching strategies based on the constructivist approach emphasize active student participation and increased responsibility for learning. Pre-service teachers expected to use this approach should embody democratic values to effectively impart these values in the classroom while following the science education curriculum adopted in Turkey (Ministry of National Education [MoNE], 2018).

Studies in the literature show that the democratic attitudes of teachers or pre-service teachers are related to gender (Demir & Arslan, 2021; Genç & Kalafat, 2007), educational philosophical beliefs (Çelik et al., 2022; Kumral, 2014; Sönmez Ektem, 2019), self-efficacy beliefs (Çelik et al., 2022; Topkaya & Yavuz, 2011), critical thinking dispositions of students (Turabik & Gün, 2016), teaching level (Demir & Arslan, 2021), communication skills (Tas, 2018), emotional intelligence (Ozaslan et al.



2020), social justice beliefs (Kılıçoğlu & Şentürk, 2021) and locus of control (Kesici, 2008). On the other hand, considering the positive effects of contemporary teaching methods on democratic attitudes of students (Çinici & Demir, 2010; Erbil & Kocabaş, 2018; Erdogan, 2021), it is important to investigate the relationship between pre-service teachers' attitudes towards the implementation of these teaching methods and their democratic attitudes.

### **The Relationship between Cooperative Learning and Democracy**

The relationship between democracy and cooperative learning can be understood within the framework of social interdependence theory, which outlines positive (cooperative), negative (competitive), and no interdependence. When goals are positively interdependent, collaboration thrives as individuals support one another. Conversely, negative interdependence breeds competition, where people hinder each other's progress. In the absence of interdependence, interaction itself might be lacking. When two people interact, cooperation may arise under specific circumstances outlined by social interdependence theory. These include positive interdependence, individual responsibility, supportive interaction, interpersonal skills, and group evaluation (Johnson & Johnson, 2009). *Positive interdependence* involves group members sharing a common fate through interrelated outcomes, which is fundamental in cooperative learning and important for individuals in a democratic society. Members of this society are united in their pursuit of common goals, including support for the constitution, knowledge of societal issues, and maintenance of democratic government. Emphasizing these shared objectives highlights the idea of a collective destiny with mutual benefits or consequences (Johnson & Johnson, 2016).

Another key element of cooperative learning is *individual accountability*, empowering each member as an independent and capable individual by completing tasks, mastering material, and assisting other group members. In a democratic society, individuals are required to embrace personal responsibility in fulfilling the duties of citizenship by engaging in the democratic process, upholding laws, defending the nation, participating in communities, and recognizing elected government (Johnson & Johnson, 2016).

The third fundamental element is *face-to-face promotive interaction*. Students can succeed by assisting, supporting, and encouraging each other's learning efforts (Johnson & Johnson, 2009). In democracies, citizens support and aid each other in fulfilling their responsibilities and achieving local and national goals. Supporting the success of all citizens' efforts involves the assumption that all citizens are of equal value regardless of gender, ethnicity or religion and should be treated equally under the law (Johnson & Johnson, 2016).

The fourth critical element involves the *appropriate use of social skills* such as conflict management, leadership, communication, trust building and decision making (Johnson & Johnson, 2009). In a democratic society, individuals are expected to use and master social skills. These skills

encompass leading at both local and national levels, fostering and upholding trust among all citizens, communicating effectively, making high-quality decisions, and resolving conflicts in constructive ways.

The fifth key element involves *group processing*, which pertains to examining the processes that members use to maximize their own and others' learning in order to identify ways for improvement. In democracies, engaging citizens in reflective discussions about the effectiveness and enhancement of the democratic process is essential. This encompasses creating fairer campaigns and elections, improving the effectiveness of elected representatives at local and national levels, as well as strengthening safeguards for citizens (Johnson & Johnson, 2016).

Citizenship in a democracy is largely rooted in a belief in the core values of democracy. According to Johnson and Johnson (2000), democratic values are more effectively instilled through cooperative, rather than competitive or individualistic, situations. Kirschenbaum (1994) further emphasizes that cooperative learning can significantly shape students' value development. Values such as self-respect, mutual respect, equality and fraternity inherent in cooperation also uphold democracy (Johnson & Johnson, 2000). In summary, cooperative learning groups can be considered as a microcosm of democracy, where citizens collaborate to make decisions about their own affairs. Likewise, in cooperative learning groups, students work together towards common goals and bear responsibility by participating in the collaborative process and fulfilling their roles. In both settings, all members are seen as equals. Moreover, in cooperative learning groups and democracies, members possess both the right and the duty to share their thoughts and opinions. Typically, decisions are made based on majority rule following a thorough evaluation of all perspectives. Individuals are expected to contribute to the group's goals by using their social skills appropriately cooperative learning groups necessitate that learners harmonize their personal needs with those of their peers and the overall group, cultivating a sense of community and moral connection among members striving for collective learning objectives (Johnson & Johnson, 2016).

Empirical studies have also shown the significant impact of cooperative learning in creating democratic classrooms. For instance, Ferguson-Patrick (2012) analyzed the case study of a teacher named Jill, who developed an inclusive democratic classroom through CL. The results showed that her democracy stance was reinforced and she fostered a classroom culture that was respectful, tolerant and inclusive. Similarly, Erbil and Kocabaş (2018) found that applying the cooperative learning method had a positive impact on the students' attitudes toward democracy in an elementary 3rd-grade life studies course. In another study by Ferguson-Patrick (2022), teachers reported that cooperative learning helped create a democratic classroom environment and promoted inclusivity and democratic values in education. Additionally, Malazonia et al. (2023) discovered that collaborative teaching enhanced acceptance of different groups and cultures among secondary students while promoting respect for diverse views. Likewise, other studies have also demonstrated that cooperative learning enhances

democratic attitudes in social studies, chemistry and biology courses (Çinici & Demir, 2010; Şahin & Uslu, 2017; Vacheishvili, 2015).

The teacher's role in cooperative learning is crucial for its success as they are responsible for structuring the essential elements linked to democracy. To bring democracy to life in the classroom, teachers should impart knowledge and exhibit a democratic stance. Stance is defined as "a way of looking at the world" (Vinterek, 2010, p. 368). A democratic stance involves a mindset that aligns with democratic attitudes and values, relevant to teachers who are committed to human rights, social justice and intercultural skills (Ferguson-Patrick, 2022). On the contrary, research indicates that cooperative learning is not as commonly implemented by teachers as expected (Abramczyk & Jurkowski, 2020; Sadıkoğlu et al., 2022; Tamimy et al., 2023). Similarly, studies show that pre-service teachers do not value cooperative learning as much as other pedagogies and have moderate self-efficacy in using this method (Ruys et al., 2010; Weinberger & Shonfeld, 2020). However, the beliefs and attitudes of teachers and pre-service teachers towards the method are linked to their inclination to use it (Abrami et al., 2004; Huang, 2016). Therefore, this study aims to contribute to identifying the variables that account for the tendency of pre-service science teachers to utilize cooperative learning in their future classrooms by uncovering the relationship between their attitudes towards democracy and implementing cooperative learning. Moreover, it seeks to understand how this relationship evolves throughout their undergraduate education. In line with these objectives, the research questions guiding the study are as follows:

1. How do pre-service science teachers' attitudes towards democracy vary by grade level?
2. How do pre-service science teachers' attitudes towards implementing cooperative learning vary by grade level?
3. What is the relationship between pre-service science teachers' attitudes towards democracy and their attitudes towards implementing cooperative learning?
4. How does the relationship between pre-service science teachers' attitudes towards democracy and their attitudes towards implementing cooperative learning vary by grade level?

### **Method**

This study utilized a cross-sectional design, a type of survey methodology. In cross-sectional survey research, it is aimed to determine the current situation at one time (Büyüköztürk et al., 2018). In this study, pre-service science teachers' attitudes towards democracy and implementing cooperative learning are examined according to different grade levels. The data for this study were gathered during the spring semester of the 2023-2024 academic year.

## **Participants**

Two hundred and seven pre-service science teachers (age 18-25 years) at an urban university in southern Turkey were selected for the study using convenience sampling. Volunteers from the existing group participated and completed an informed consent form. Among the pre-service teachers, 72.9% were female (n=151) and 27.1% were male (n=56). Additionally, 26.6% of the participants were in the first grade (n=55), 22.2% in the second grade (n=46), 26.1% in the third grade (n=54), and 25.1% in the fourth grade (n=52). All the students reported using cooperative learning in their pedagogy courses and science-based courses including laboratory classes.

## **Instruments**

The data was gathered using the Collaborative Learning Scale and Democratic Perceptions and Attitudes Scale, which were administered through Google Forms. Prior to completing the scales, students provided information about their gender, grade level and whether they had used cooperative learning in their undergraduate courses.

### ***Cooperative Learning Scale***

The Cooperative Learning Scale, originally named the Cooperative Learning Implementation Questionnaire (CLIQ), was developed by Abrami et al. (2004) to examine teachers' expectations and beliefs about implementing cooperative learning. The CLIQ comprised 48 items grouped under expectancy, value and cost categories. The expectancy items explored how teachers perceive the connection between their use of strategy and anticipated results, including aspects such as internal attributions (self-confidence, ability) and external attributions (student traits, classroom atmosphere, support from colleagues). Value items assessed how much teachers viewed the cooperative learning and its outcomes as valuable, including benefits for both the teacher (alignment with teaching beliefs, professional growth) and the students (improved academic performance, better attitudes, enhanced social skills). The cost items consider the perceived psychological and physical challenges required for implementation, which may act as deterrents to adopting the innovation, including factors like classroom setup time, exertion, and the need for specialized materials. The Cronbach Alpha was 0.74 for the value category, 0.86 for the expectancy category, and 0.87 for the cost category. It was adapted into Turkish by Kadan (2022) as the Cooperative Learning Scale for pre-service teachers by removing 11 items. Respondents evaluate the items on a 5-point Likert scale ranging from "1. strongly disagree" to "5. strongly agree," with options for "2. disagree," "3. undecided," and "4. agree" in between. The higher the score on the scale, the more positive students' views are toward implementing cooperative learning. Kadan reported a Cronbach Alpha reliability coefficient of 0.80 for the 37-item Cooperative Learning Scale. In this study, the reliability coefficients for the value, expectancy, and cost categories were found to be 0.84, 0.75, and 0.74 respectively. The overall scale demonstrated high internal consistency with a coefficient of 0.89.

### ***Democratic Perceptions and Attitudes Scale***

The study utilized the "Democratic Perception and Attitude Scale," a 36-item scale developed by Tutkun and Genç (2013), to evaluate the levels of democratic attitudes among pre-service teachers. The scale consists of three subscales aiming to determine the "personal", "educational" and "professional" readiness of pre-service teachers regarding their perceptions and attitudes towards democracy. The personal readiness dimension includes 11 items related to being self-critical, cooperative, open-minded, tolerant and sensitive, believing in equality and justice, respecting individual rights, adaptability, progress and developing problem-solving techniques. The educational readiness dimension involving 11 items encompasses engaging in research, analysis and synthesis as well as working effectively with individuals of diverse ideologies, religions, nationalities, gender and races while also focusing on respecting others and self-expression in an educational setting. The professional readiness dimension consists of 14 items measuring skills in democratic teaching, including collaborating with colleagues; demonstrating fairness and openness towards students; respecting students' rights; questioning teaching skills; employing various techniques, methods, and activities in teaching; fostering a positive classroom environment; efficiently managing the classroom; and providing feedback to students. All three sections of the scale utilized a 5-point Likert-type scale for responses, ranging from strongly disagree to strongly agree. The maximum possible score on the Democratic Perception and Attitude Scale is 180.

Exploratory factor analysis was performed on each of the three subscales to determine construct validity, while Cronbach's Alpha coefficient was employed to evaluate internal consistency. The analysis revealed that the subscales consisted of valid items with sub-factors. The Cronbach's Alpha values for personal, educational, and professional readiness subscales were 0.725, 0.811, and 0.897 respectively; indicating good internal consistency. The overall scale demonstrated high internal consistency with a coefficient of 0.93. Moreover, in this study sample, the Cronbach's Alpha value was found to be 0.96, indicating excellent reliability.

### **Data Analysis**

The data was analyzed using IBM SPSS Statistics 25 software with a significance level set at 0.05. Parametric tests were applied to analyze the data, which was confirmed to be normally distributed. Preservice science teachers' democratic attitudes and their attitudes towards implementing cooperative learning were compared across different grade levels using a one-way analysis of variance (ANOVA). The relationship between democratic attitudes and attitudes towards implementing cooperative learning was explored using Pearson product-moment correlation coefficient. Initial analyses were conducted to confirm adherence to the assumptions of normality, linearity, and homoscedasticity. To explore variations in this relationship based on grade level, separate correlation coefficients were computed for each grade level and compared.

## Results

One-way ANOVA results indicate that there was no significant difference in pre-service science teachers' democratic attitudes based on grade level for the first research question [ $F(3,203)=0.927$ ,  $p>0.05$ ]. The results of the ANOVA for the Democratic Perception and Attitude Scale scores are shown in Table 1.

**Table 1.** ANOVA results for the Democratic Perception and Attitude Scale scores

Source	Sum of Squares	df	Mean square	F	p
Between groups	759.979	3	252.326	0.927	0.429
Within groups	55245.00	203	272.143		
Total	56001.98	206			

Table 2 presents the descriptive statistics of the democratic attitudes across grade levels. Although there is an increase in mean scores from the first to the second year, as shown in Table 2, this increase is not statistically significant.

**Table 2.** Descriptive statistics of the democratic attitudes across grade levels

Grade level	N	Mean	SD
1	55	156.54	15.82
2	46	160.67	14.22
3	54	161.11	16.91
4	52	157.96	18.49

ANOVA for the Cooperative Learning Scale data showed no significant difference in preservice science teachers' attitudes towards implementing cooperative learning across different grade levels for the second research question [ $F(3,203)=2.355$ ,  $p>0.05$ ]. ANOVA results are given in Table 3.

**Table 3.** ANOVA results for the Cooperative Learning Scale scores

Source	Sum of Squares	df	Mean square	F	p
Between groups	1623.377	3	541.126	2.355	0.073
Within groups	46654.36	203	229.824		
Total	48277.74	206			

Table 4 presents the descriptive statistics of the attitudes towards implementing cooperative learning across grade levels. Although there is an increase in mean scores from the first to the second year, as shown in Table 3, this increase is not statistically significant.

**Table 4.** Descriptive statistics of the attitudes towards implementing cooperative learning across grade levels

Grade level	N	Mean	SD
1	55	132.72	15.82
2	46	139.76	14.22
3	54	137.44	16.91
4	52	139.25	18.49

The Pearson correlation test results indicated a strong, positive relationship between the two variables, with a correlation coefficient of  $r=0.565$ ,  $n=207$ ,  $p<0.01$ , showing that higher levels of democratic attitudes were associated with greater inclination towards implementing cooperative learning. Cohen (1988) proposed that Pearson  $r$  values of 0.10, 0.30, and 0.50 signify small, medium, and large effect sizes, respectively. The correlation coefficients were found to be also significant when calculated separately for each grade level. Pearson correlation test results for grade levels are shown in Table 5. Based on the results in Table 5, there is a strong correlation between the variables at each grade level, and the correlation coefficient tends to increase as the grade level increases.

**Table 5.** Results of Pearson correlation tests indicating the relationship between democratic attitudes and attitudes towards implementing cooperative learning for grade levels

Grade level	N	r	Sig. (2-tailed)
1	55	0.500	0.000
2	46	0.553	0.000
3	54	0.590	0.000
4	52	0.612	0.000

Significance level=0.01 (two-tailed)

### Discussion, Conclusion and Recommendations

This study investigated the pre-service science teachers' democratic attitudes and their attitudes towards implementing cooperative learning based on grade level, and explored how the relationship between these two attitudes varied across different grade levels. The first research question addressed

the effect of grade level on democratic attitudes. The study revealed that the democratic attitudes of pre-service science teachers did not significantly differ according to the grade level. This suggests that university life and pre-service teacher education may not have a significant effect on the development of democratic attitudes. The lack of significant differences in democratic attitudes across different grade levels might also indicate that the foundational values associated with democratic education—such as respect for diversity, openness to different perspectives, and emphasis on participatory learning—are introduced early and consistently throughout the teacher training program. Studies in the literature also suggest that democratic attitudes do not vary based on the grade level of pre-service teachers (Genç & Kalafat, 2007; Gozler, 2021; Onuray Egilmez, 2018). On the other hand, democratic attitudes seemed to increase slightly as students progressed towards the upper grades. A more extensive investigation could validate or refute the subtle increase in democratic attitudes. Furthermore, the democratic attitudes of the participants at all grade levels were quite high, as evidenced by the fact that the maximum score on the Democratic Perception and Attitude Scale is 180. First grade students already exhibited strong democratic attitudes, and this trend continued with a non-significant increase as grade levels progressed. High democratic attitudes across the board suggest that pre-service teachers were generally supportive of implementing democratic principles in their future classrooms. This could include fostering environments where students feel valued and heard, promoting equal participation, and encouraging critical thinking. Pre-service teachers appear to be well-prepared and likely to foster democratic values in their classrooms, which is crucial for developing students' critical thinking, respect for diverse viewpoints, and collaborative skills. Further research could explore what specific experiences or curriculum components most effectively contribute to the development of democratic attitudes. Understanding these can help in enhancing teacher training programs. Moreover, investigating how these democratic attitudes translate into actual classroom behaviors and student outcomes can provide insights into the effectiveness of pre-service training in democratic education.

The second research question concerns how the attitudes of pre-service teachers towards implementing cooperative learning vary across grade levels. The findings revealed that pre-service teachers' year of training has no influence on their attitudes, supporting the finding of Ruys et al. (2010). It could be contended that teacher training should focus more on the professional growth of pre-service teachers in relation to cooperative learning. On the other hand, although the difference between grade levels is not significant, there seems to be an increasing positive attitude towards implementing cooperative learning as grade level rises. While the trend is interesting, the lack of statistical significance suggests a need for further investigation with a larger sample size. Moreover, it is suggested to explore the reasons why attitudes might become more positive with higher grade levels. Perhaps their experiences in science education program emphasized its benefits for older students. All participants stated that they used cooperative learning in their science and pedagogy courses. The involvement in cooperative learning instruction and participation might have a positive impact on their attitudes of



cooperative learning. Indeed, research shows that using cooperative learning in pre-service teachers' undergraduate courses develops their positive attitudes about using cooperative learning (Saborit et al., 2016; Ruys et al., 2010; Veenman et al., 2002). It is also noteworthy that their attitudinal scores were high. The pre-service teachers' positive attitudes towards implementing cooperative learning demonstrate their belief in its value as an instructional approach, and their high expectations of success when using this method (Abrami et al., 2004; Veenman et al., 2002). Abrami et al. (2004) discovered that the expectancy of success seemed to be the most important factor in distinguishing between teachers who use cooperative learning and those who do not. They propose that to effectively promote the adoption of educational innovations, professional developers need to focus on boosting teachers' expectations of success. The high expectancy of success on the part of the pre-service teachers may be an indication that they are likely to use the method in their future classes. These high scores might also highlight the effectiveness of current teacher training curriculums in promoting cooperative learning as a valuable teaching strategy. It suggests that training programs are successfully instilling an understanding and appreciation of these methods among future teachers.

While the study shows a trend, further research could explore what specific factors contribute to the increase in positive attitudes as pre-service teachers advance in their training. Is it linked to more hands-on teaching experience, better understanding of pedagogical theories, or perhaps mentorship and feedback mechanisms within the training programs? Further studies could also examine how these positive attitudes towards cooperative learning translate into actual classroom practices and how effectively these practices impact student learning outcomes.

The third and fourth research questions address the relationship between pre-service science teachers' attitudes towards democracy and their attitudes towards implementing cooperative learning. According to the results, there is a strong, positive correlation between democratic attitudes and attitudes towards implementing cooperative learning at all grade levels. This means that pre-service teachers who value democratic principles in the classroom are more likely to view cooperative learning strategies favorably. These findings highlight a strong link between pre-service science teachers' democratic values and their openness to using cooperative learning. This suggests that fostering democratic values in teacher training programs could lead to increased implementation of cooperative learning strategies that promote student collaboration and participation in science classrooms. The significant correlation existing at each training year suggests this connection holds true regardless of the year in the pre-service program. However, the finding that the correlation coefficient increases with higher training years is particularly interesting. As pre-service science teachers progress through their training program, the focus on democratic education practices might increase. This could lead them to see a stronger connection between democratic values and the benefits of cooperative learning for fostering student participation and collaboration. Throughout the training program, pre-service teachers likely gain more experience and knowledge of various teaching strategies. With a stronger understanding of how to

implement cooperative learning effectively, teachers who value democratic principles might see it as a more viable option for promoting those values in their classrooms. Science teaching methods courses introduce pre-service teachers to teaching methods and practical experiences aligned with the constructivist approach. Designing learning environments based on the constructivist approach requires the creation of democratic classrooms (Bay et al., 2010; Oğuz, 2011). As senior pre-service science teachers take more instruction methods courses, they are likely to become better acquainted with and adopt the constructivist approach. It has been suggested that pre-service teachers who embrace the constructivist approach as a teaching-learning strategy also have stronger democratic values (Oğuz, 2011). This claim supports the result that pre-service teachers who had a more favorable attitude towards implementing cooperative learning which is based on constructivist approach had stronger democratic attitudes.

The findings also align with previous research suggesting that cooperative learning fosters democratic classrooms (Ferguson-Patrick, 2014, 2022) and cultivates democratic attitudes in students (Erbil & Kocabaş, 2018; Malazonia et al., 2023; Mitakidou & Tamoutseli, 2011; Şahin & Uslu, 2017; Vacheishvili, 2015). Pre-service who value democratic principles might see cooperative learning as a way to create a more participatory classroom environment where students have opportunities to share ideas, work together, and reach decisions collaboratively, reflecting democratic ideals. They might view cooperative learning as a valuable method for cultivating essential democratic competencies in students, including communication, collaboration, and respect for diverse perspectives. Thus, pre-service teacher programs that emphasize both democratic values and cooperative learning strategies could be beneficial in preparing future science educators. Future research could investigate the specific reasons why pre-service teachers with democratic values are drawn to cooperative learning and examine whether pre-service teachers who implement cooperative learning actually foster democratic attitudes in their students.

### **Limitations**

It is important to acknowledge some limitations of this study. First, The Cooperative Learning Scale does not provide a definition of the cooperative learning. This could have resulted in variations in how students interpreted cooperative learning, potentially affecting the accuracy of the measurements. Furthermore, the current study relies solely on self-reported data, precluding the collection of observational data on pre-service teacher practices. This approach necessitates acknowledging the inherent limitations associated with self-reported measures in educational research (Borg, 2006). These limitations include potential biases such as social desirability, where the pre-service teachers may report their practices in a way that is perceived favorably. Additionally, self-reported measures are often researcher-defined, potentially neglecting the full spectrum of pre-service teachers' beliefs and experiences. Furthermore, such data cannot definitively capture actual classroom practices. To

strengthen the validity of future research exploring the relationship between reported beliefs and observed practices, the incorporation of observational methods and qualitative data collection is highly recommended. Moreover, the sample size of the study limits its generalizability. The specific group of pre-service teachers studied might not be representative of all pre-service science teachers. Factors like location, specific program characteristics, or chance selection could influence the results.

### **Policy Implications**

The study provides valuable insights into education policies, particularly in the realms of democratic education and cooperative learning. The strong and consistent democratic attitudes among pre-service science teachers suggest a solid foundation for democratic principles in future classrooms. Education policies can leverage this finding by reinforcing democratic education at all training levels. This could involve incorporating democratic principles more explicitly into teacher training curricula to ensure all pre-service teachers understand and value these concepts. Additionally, offering workshops and seminars focused on democratic education to both pre-service and in-service teachers can help maintain and deepen their commitment to these values.

Given the positive attitudes towards implementing cooperative learning, policies could focus on promoting and supporting this instructional approach. This could include providing schools with the necessary resources, such as materials and training, to implement cooperative learning effectively. Ensuring that teacher training programs include comprehensive modules on cooperative learning strategies, emphasizing their benefits and practical applications, is also essential.

The strong correlation between democratic attitudes and cooperative learning indicates that teachers who value democracy are likely to favor cooperative learning. This suggests a synergistic approach where promoting one can reinforce the other. Policy implications could include designing teacher education programs that integrate democratic principles and cooperative learning strategies, highlighting their interconnectedness. Encouraging schools to cultivate a culture that values both democracy and collaboration can create an environment where cooperative learning can thrive.

The study found that while attitudes remained strong, the correlation between democratic attitudes and cooperative learning increased with higher training years. This implies a potential increase in the understanding and application of these principles as teachers progress through their training. Policy recommendations might include introducing democratic and cooperative learning concepts early in teacher training programs to establish a strong foundation from the beginning. Providing continuous support and advanced training in these areas as pre-service teachers advance in their programs can reinforce and expand their skills and attitudes.

The non-significant increase in attitudes across grade levels suggests a stable but potentially under-optimized training program. Policymakers could conduct regular assessments of teacher training

programs to identify areas for improvement in promoting democratic education and cooperative learning. Implementing feedback mechanisms where pre-service teachers can share their experiences and suggestions for enhancing training programs can also be beneficial.

Overall, the study's findings underscore the importance of integrating democratic values and cooperative learning into teacher training programs. Education policies should aim to reinforce these principles through curriculum development, resource allocation, and continuous support. By doing so, future teachers will be well-equipped to foster democratic, collaborative, and inclusive classrooms.

### **Conflict of Interest**

Author declares no conflicts of interest.

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There is no funding for this study.

### **Ethical Statement**

The study received ethical approval by the Scientific Research and Publication Ethics Committee in the Social and Human Sciences of the author's university on February 02, 2024, with decision number 15. At the beginning of the study, all participants were informed about the process and provided informed consent.

### **Credit Author Statement**

The author assumes sole responsibility for the conception and design of the study, the analysis and interpretation of the literature, and the preparation of the manuscript.

## **References**

- Abramczyk, A., & Jurkowski, S. (2020). Cooperative learning as an evidence-based teaching strategy: what teachers know, believe, and how they use it. *Journal of Education for Teaching*, 46(3), 296–308. <https://doi.org/10.1080/02607476.2020.1733402>
- Abrami, P. C., Poulsen, C., & Chambers, B. (2004). Teacher motivation to implement an educational innovation: Factors differentiating users and non-users of cooperative learning. *Educational Psychology*, 24(2), 201-216. <https://doi.org/10.1080/0144341032000160146>
- Apple, M., & Beane, J. (2007). *Democratic schools: Lessons for a powerful education*. Heinemann.
- Bay, E., Gündođdu, K., & Kaya, H. I. (2010). The perceptions of prospective teachers on the democratic aspects of the constructivist learning environment. *Electronic Journal of Research in Educational Psychology*, 8(2), 617-642.
- Borg, S. (2006). *Teacher cognition and language education: Research and practice*. Continuum.

- Büyüköztürk, Ş., Kılıç Çakmak E., Akgün, Ö. E., Karadeniz, Ş., & Demirel, F. (2018). *Bilimsel araştırma yöntemleri* (25. Baskı). Pegem A Yayıncılık.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Routledge.
- Cunat, M. (1996). "Vision, vitality and values: Advocating the democratic classroom. In L. E. Beyer (Ed.), *Creating democratic classrooms: The struggle to integrate theory and practice* (pp. 127–149). Teachers College Press.
- Çankaya, D., & Seçkin, O. (2004, May 20-21). *Demokratik değerlerin benimsenmesi açısından öğretmen ve öğretmen adaylarının görüş ve tutumları*. Uluslararası Demokrasi Eğitimi Sempozyumu, Çanakkale, Türkiye.
- Çelik, R., Koca, F., & Dadandi, İ. (2022). The role of self-efficacy and educational beliefs in democratic values: the case of Turkish pre-service teachers. *Athens Journal of Education*, 9(4), 559-574. <https://doi.org/10.30958/aje.9-4-2>
- Çinici, A., & Demir, Y. (2010). İşbirlikli Tahmin-Gözlem-Açıklama (TGA) aktivitelerinin 9. sınıf öğrencilerinin demokratik tutumları üzerine etkisi. *Bayburt Üniversitesi Eğitim Fakültesi Dergisi*, 5(1), 13–23.
- Demir, T., & Arslan, A. (2021). Öğretmenlerin yansıtıcı düşünme eğilimleri, demokratik davranışları ve 21. yüzyıl öğrenen becerilerinin CHAID analizi yöntemi ile incelenmesi. *Karaelmas Eğitim Bilimleri Dergisi*, 9(1), 184-203.
- Demirsöz, E. S. (2010). *Yaratıcı dramının öğretmen adaylarının demokratik tutumlar, bilişüstü farkındalıkları ve duygusal zekâ yeterliliklerine etkisi* [Yayımlanmamış doktora tezi]. Dokuz Eylül Üniversitesi.
- Dilekmen, M. (1999). *Grupla psikolojik danışmanın öğretmen adaylarının demokratik tutum ve empatik beceri düzeylerine etkisi*. [Yayımlanmamış doktora tezi]. Atatürk Üniversitesi.
- Duman, B. (2010). Correlation between the graduate-students' perception of educational philosophies and their democratic attitudes. *Procedia Social and Behavioral Sciences*, 2, 5830–5834.
- Erbil, D. G., & Kocabaş, A. (2018). Cooperative learning as a democratic learning method. *Journal of Research in Childhood Education*, 32(1), 81–93. <https://doi.org/10.1080/02568543.2017.1385548>

- Erdogan, E. (2021). The impact of digital storytelling on the academic achievement and democratic attitude of primary school students. *Educational Policy Analysis and Strategic Research*, 16(1), 427-448. <https://doi.org/10.29329/epasr.2020.334.22>
- Ferguson-Patrick, K. (2012, December 2-6). *Developing an inclusive democratic classroom "in action" through cooperative learning* [Conference presentation]. Australian Association for Research in Education (NJ1), Joint Australian Association for Research in Education and Asia-Pacific Educational Research Association Conference (AARE-APERA 2012) World Education Research Association (WERA) Focal Meeting, Sydney, New South Wales, Australia.
- Ferguson-Patrick, K. (2014). *Establishing a democracy classroom: Cooperative learning and good teaching*. [Unpublished doctoral dissertation]. University of Newcastle.
- Ferguson-Patrick, K. (2022). Developing a democratic classroom and a democracy stance: Cooperative learning case studies from England and Sweden. *Education 3-13*, 50(3), 389-403. <https://doi.org/10.1080/03004279.2020.1853195>
- Florian, L., & K. Black-Hawkins. (2011). Exploring inclusive pedagogy. *British Educational Research Journal*, 37(5), 813-828. <https://doi.org/10.1080/01411926.2010.501096>
- Genç, S.Z. & Kalafat, T. (2007). Öğretmen adaylarının demokratik tutumları ile problem çözme becerilerinin çeşitli değişkenler açısından incelenmesi. *Pamukkale Üniversitesi Eğitim Fakültesi Dergisi*, 22(2), 10-22.
- Genç, S.Z. & Kalafat, T. (2008). Öğretmen adaylarının demokratik tutumları ile empatik becerilerinin değerlendirilmesi üzerine bir araştırma. *Sosyal Bilimler Dergisi*, 19, 211-222.
- Gozler, A. (2021). Determination of democracy awareness levels of teacher candidates, *International Online Journal of Educational Sciences*, 13(2), 592-603. <https://doi.org/10.15345/iojes.2021.02.018>
- Huang, Y.-H. (2016). Exploring teachers' motivation for implementing cooperative learning using Expectancy-Value Theory. *International Journal for Cross-Disciplinary Subjects in Education*, 7(3), 2852-2856. <https://doi.org/10.20533/ijcdse.2042.6364.2016.0388>
- İnceoğlu, M. (2010). *Tutum, algı, iletişim* (5. baskı). Beykent Üniversitesi Yayınevi
- Johnson, D. W., & Johnson, R. (1994). *Learning together and alone: Cooperative, competitive and individualistic learning*. Allyn & Bacon.

- Johnson, D. W., & Johnson, R. (2000). Cooperative learning, values, and culturally plural classrooms. In M. Leicester, C. Modgill, & S. Modgill (Eds.), *Values, the classroom, and cultural diversity* (pp. 15–28). Cassell PLC
- Johnson, D. W., & Johnson, R. T. (2009). An educational psychology success story: social interdependence theory and cooperative learning. *Educational Researcher*, 38(5), 365–379. <https://doi.org/10.3102/0013189X09339057>
- Johnson, D. W., & Johnson, R. (2016). Cooperative learning and teaching citizenship in democracies. *International Journal of Educational Research*, 76, 162–177. <https://doi.org/10.1016/j.ijer.2015.11.009>
- Jöreskog, K. G., & Sörbom, D. (2001). *LISREL 8.51*. Scientific Software.
- Kadan, Ö.F. (2022). Pre-service Turkish language teachers' opinions on cooperative learning. *Route Educational & Social Science Journal*, 70, 141-150. <http://dx.doi.org/10.17121/ressjournal.3108>
- Kesici, Ş. (2008). Democratic teacher beliefs according to the teacher's gender and locus of control. *Journal of Instructional Psychology*, 35(1).
- Kılıçoğlu, G., & Şentürk, I. (2021). Investigating relationship between democratic attitudes and social justice beliefs of pre-service teachers. *Educational Policy Analysis and Strategic Research*, 16(3), 245-271. <https://doi.org/10.29329/epasr.2021.373.13>
- Kirschenbaum, H. (1994). *One-hundred ways to enhance values and morality in schools and youth settings*. Allyn & Bacon.
- Knight, T. (2001). Longitudinal development of educational theory: Democracy and the classroom. *Journal of Education Policy*, 16(3), 249–263. <https://doi.org/10.1080/02680930110041384>
- Köse, E., (2009). Okul öncesi öğretmenlerinin demokrasi anlayışlarının değerlendirilmesi (Erzurum ili örneği). *Kastamonu Eğitim Dergisi*, 17(3), 871–880.
- Kumral, O. (2014). Predicting democratic attitudes and educational philosophies of student teachers. *International Journal of Social Science & Education*, 4(2), 359-368.
- Küçükahmet, L. (1989). *Demokrasi eğitiminde boyutlar ve sorunları demokrasi için eğitim*. TED Yayınları.

- Malazonia, D., Lobzhanidze, S., Maglakelidze, S., Chiabrishvili, N., Giunashvili, Z., & Natsvlshvili, N. (2023). The role of collaborative learning in the education for democratic citizenship (case of Georgia). *Cogent Education*, 10(1). <https://doi.org/10.1080/2331186X.2023.2167299>
- Ministry of National Education (MoNE) (2018). *Science curriculum* (Primary and middle school grades 3, 4, 5, 6, 7, and 8). Ankara.
- Mitakidou, S., & Tamoutseli, K. (2011). Engaging learners in cooperative learning through environmental and cross-cultural activities. *Journal of Teacher Education for Sustainability*, 13(1), 5–18. <https://doi.org/10.2478/v10099-011-0001-5>
- Oğuz, A. (2011). Öğretmen adaylarının demokratik değerleri ile öğretme ve öğrenme anlayışları. *Değerler Eğitimi Dergisi*, 9(22), 139-160.
- Onuray Egilmez, H., Egilmez, Ö., & Engür, D. (2018). Democratic perception and attitudes of pre-service music teachers in Turkey. *International Journal of Evaluation and Research in Education*, 7(2), 100-108. <https://doi.org/10.11591/ijere.v7.i2.13141>
- Ozaslan, H., Kumcağız, H., & Baba Ozturk, M. (2020). The relationship between emotional intelligence and democratic perceptions and attitudes of teacher candidates. *Inonu University Journal of the Faculty of Education*, 21(2), 636-654. <https://doi.org/10.17679/inuefd.590592>
- Pallant, J. (2007). *SPSS survival manual: A step by step guide to data analysis using SPSS for Windows*. Open University Press
- Roberts, K. & Owens, S. (2012). *Innovative education: A review of the literature*. Government of South Australia.
- Ruys, I., Van Keer, H. & Aelterman, A. (2010). Collaborative learning in pre-service teacher education: An exploratory study on related conceptions, self-efficacy and implementation. *Educational Studies*, 36(5), 537-553. <https://doi.org/10.1080/03055691003729021>
- Saborit, J. A. P., Fernández-Río, J., Cecchini Estrada, J. A., Méndez-Giménez, A., & Alonso, D. M. (2016). Teachers' attitude and perception towards cooperative learning implementation: Influence of continuing training. *Teaching and Teacher Education*, 59, 438–445. <https://doi.org/10.1016/j.tate.2016.07.020>
- Sadıkoglu, M., Demirel, T., & Hastürk, G. (2022). Fen bilimleri öğretmenlerinin işbirlikli öğrenme yönteminin uygulanabilirliği hakkındaki görüşleri. *International Journal of Active Learning (IJAL)*, 7(1), 1–22.



- Sampermans, D. (2019). *The democratic school climate: Active citizenship at school*. [Unpublished doctoral dissertation]. Katholieke Universiteit Leuven.
- Sönmez Ektem, İ. (2019). Öğretmen adaylarının eğitim felsefesi inançları ve demokratik tutumları arasındaki ilişki. *Kastamonu Eğitim Dergisi*, 27(6), 2391-2402. <https://doi.org/10.24106/kefdergi.3142>
- Şahin, H., & Uslu, Ö. (2017). 5. sınıf sosyal bilgiler dersinde işbirlikli öğrenmenin öğrencilerin başarıları ve demokratik tutumlarına etkisi [Effects of cooperative learning on students' achievements and democratic attitudes in the 5th grade social studies course]. *Mehmet Akif Ersoy Üniversitesi Eğitim Fakültesi Dergisi*, 1(41), 184. <https://doi.org/10.21764/efd.74935>
- Şimşek, U. Doymuş, K. ve Karaçöp, A. (2009). Yükseköğretimde eğitim gören öğrencilerin demokratik tutumlarına jigsaw ve birlikte öğrenme tekniklerinin etkisi. *Atatürk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 13(1), 167–176.
- Tamimy, M., Rashidi, N., & Koh, J. H. L. (2023). The use of cooperative learning in English as foreign language classes: The prevalence, fidelity, and challenges. *Teaching and Teacher Education*, 121(January). <https://doi.org/10.1016/j.tate.2022.103915>
- Tas, A. M. (2018). Examination of the relationship between the democratic attitude of prospective teachers and their communication skills. *Universal Journal of Educational Research*, 6(5), 1060-1068. <https://doi.org/10.13189/ujer.2018.060527>
- Topkaya, E. Z., & Yavuz, A. (2011). Democratic values and teacher self-efficacy perceptions: A case of pre-service English language teachers in Turkey. *Australian Journal of Teacher Education (Online)*, 36(8), 31-48.
- Turabik, T., & Gün, F. (2016). The relationship between teachers' democratic classroom management attitudes and students' critical thinking dispositions. *Journal of Education and Training Studies*, 4(12), 45-57. <https://doi.org/10.11114/jets.v4i12.1901>
- Vacheishvili, N. (2015). Cooperative learning as a democratic awareness method in value education. *Education Policy, Management and Quality*, 7(2), 71–82. <https://doi.org/10.48127/spvk-epmq/15.7.71>
- Veenman, S., van Benthum, N., Bootsma, D., van Dieren, J., & van der Kemp, N. (2002). Cooperative learning and teacher education. *Teaching and Teacher Education*, 18(1), 87–103. [https://doi.org/10.1016/S0742-051X\(01\)00052-X](https://doi.org/10.1016/S0742-051X(01)00052-X)

Vinterek, M. (2010). How to live democracy in the classroom? *Education Inquiry* 1(4), 367–380.  
<https://doi.org/10.3402/edui.v1i4.21951>

Weinberger, Y. & Shonfeld, M. (2020). Students' willingness to practice collaborative learning.  
*Teaching Education*, 31(2), 127-143. <https://doi.org/10.1080/10476210.2018.1508280>

## The Effectiveness of Family-Centered Teaching in Developing Self-Care Skills for Children with Autism Spectrum Disorder<sup>1</sup>

**Esra ERBAŞ<sup>2</sup>**

Anadolu University

**Atilla CAVKAYTAR<sup>3</sup>**

Maltepe University

### Abstract

Teaching of self-care skills with the participation of families at home, which is the natural environment of the child, contributes to effective and permanent results. Even though it is preferred that the family take an active part in teaching, most parents who plan to work with their children have difficulties in how they teach. The previous studies demonstrate that when adequate support is provided to parents, they can teach their children the skills they need. This study aimed to investigate the effectiveness of a family education program developed for teaching self-care skills to individuals with autism spectrum disorder. A mother and her child with autism spectrum disorder participated in the study. The study was designed with multiple probe with probe conditions across behaviors/skills which is one of the single subject research designs. The finding demonstrates that the mother was able to teach self-care skills (hand washing, toileting, and dressing) by using the least to most prompting teaching method and following the procedure properly during the teaching period. Additionally, the mother expressed her satisfaction with the teaching sessions. The results concluded that she realized the effect and importance of the systematic and planned teaching.

**Keywords:** autism spectrum disorder, self-care skills, family education, least-to-most prompting, family-centered teaching.

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<sup>2</sup> PhD. Student, Department of Special Education, Anadolu University, Türkiye, ORCID ID: 0000-0002-6565-0819

**Correspondence:** esraerbass1090@gmail.com

<sup>3</sup> Professor, Department of Special Education, Maltepe University, Türkiye, ORCID ID: 0000-0001-8067-1602, Email: atilla.cavkaytar@gmail.com

## Introduction

Autism spectrum disorder (ASD) is a neurological disorder accompanied limited interests and repetitive behaviors and negatively affects the communication and social interaction of the individual (American Psychiatric Association [APA], Diagnostic and Statistical Manual of Mental Disorders-5 [DSM-V], 2013). The main purpose in the education of individuals with ASD is to enable them to lead their life independently or with minimal support and to increase their adaptation to social life. For this purpose, it is essential to support the development of individuals with ASD by using strategies and techniques in their intervention programs that aim to meet their needs in areas where they have deficiencies (Ardic & Cavkaytar., 2014). As in every individual, the first step of independence is taken by meeting the most basic needs necessary for daily life by the individuals themselves. Acquiring the skills that are essential for daily life not only provides a successful and quality life for individuals but also creates a positive effect on the life of those around these individuals (Cannella-Malone et al., 2006; Keen et al., 2010; Minjarez et al., 2013).

Many of these skills, which have an impact on the quality of daily life (eg., feeding, using the toilet, bathing, and dressing), usually develop spontaneously by observing and modeling adults' behavior using cognitive skills (Spriggs et al., 2017). Individuals with ASD may have difficulties in learning and generalizing skills that include the needs of daily life, as in most academic and social skills. The findings of the studies show that individuals with ASD have difficulties in performing self-care skills (Eaves & Ho, 2008; Flynn & Healy, 2012; LaVesser & Berg, 2011) and that the limitations in the development of these skills make it difficult to participate in a social and working life (Farley et al., 2009; Kellems et al., 2018). Therefore, it is necessary to start the education of individuals with ASD as early as possible and support their individual needs with the most appropriate educational opportunities.

Research on ASD condenses family education as beneficial for children with ASD to gain independent living skills (Black et al., 2018). Effective and permanent results can be achieved for these children when parents can provide systematic instruction to their children and apply it properly (Cruz-Torres et al., 2020; Kellems et al., 2018; Vismara et al., 2009). This not only contributes positively to the development of the children, but also increases the participation of family members in daily activities and reduces stress (Keen et al., 2010; Minjarez et al., 2013). However, most parents who plan to work with their children have difficulties knowing how to teach (McConachie & Diggle, 2007). To gain more effective results, families should have knowledge of planned, systematic, and scientifically based interventions to use in the education of children with ASD (Cruz-Torres et al., 2020; Kellems et al., 2018). The findings of the studies demonstrate that when adequate support is provided to parents, they can teach their children the skills they need. Although skills differ, there are many studies showing family members can become active members of the education when effective support is provided (Elisa et al., 2019; Hancock et al., 2002; Kaiser et al., 2000; Najdowski et al., 2010; Stiebel, 1999).

Parents' involvement in the process of gaining self-care skills for their children is preferable. Because, teaching these skills with the participation of families at home, which is the natural environment of the child, is more appropriate (Bettison, 1982). However, the needs of families of children with ASD show that families require assistance in taking an active part in their children's education (Dunst & Espe-Sherwindt, 2016). The differentiation of the needs and learning methods of individuals with special needs necessitates disseminating family education programs by conducting studies that include different examples in family education. The realization of family-centered teaching practices based on needs of families constitutes an important reason for this study. Accordingly, this research stemmed from a mother's need to teach her child self-care skills and examined whether the mother was able to teach her child and the effects of her teaching on the child.

Based on this need, the aim of the study was to determine the effect of the teaching practices carried out by a mother who participated in the family education program adapted from Cavkaytar (1999). The family education program includes teaching self-care skills by using the least to most prompting procedure. Accordingly, answers to the following questions were sought in this study:

1. Is the program effective on the mother's level of knowledge about skill teaching?
2. Is the teaching provided by the mother to her child with ASD effective in learning the determined self-care skills?
3. What are the views of the mother about the family education program and the implementation process?

## **Method**

### **Participants**

The child who was an 11-year-old boy with ASD and his 41-year-old mother participated in the study. Some criteria were taken into consideration in determining the participants. The criteria for the determination of the parent: (a) Having a child with ASD, (b) Having a need to improve in self-care skills of the child, (c) Being literate enough to understand the family education program, (d) Being willing to participate in the family education program, (e) Signing the prepared consent form. The criteria for the determination of the child: (a) Not being able to fulfill at least six self-care skills, (b) Not having a physical disability that would prevent the learning of skills, (c) Having a receptive language at a level to understand and fulfill the instructions.

In line with these criteria the Snowball Technique was used to determine the child and the mother who participated in the Teaching of Self-Care Skills Family Education Program (SCS-FEP). Adhering to the snowball technique, the study was announced to the parents through the special education teachers and Guidance and Research Center. Parents were also asked to convey the study to

other parents. As a result of the announcements, interviews were held with parents who volunteered to participate in the study. A mother and her child with ASD who fully met the participant criteria was selected and the mother was very willing to participate in the program. The content of the program was explained to the mother, and she was asked to read and sign the participant consent form. The characteristics of the mother and her child are given below.

Mother was 41 years old and had a high school degree. After working for many years, she ended her work life due to the care and education of her son. She had been attending a sewing course supported by Public Education Center within her child's school. Therefore, she was at school full-time during school hours. The mother had not participated in any family education program before.

The child was a 11-year-old boy diagnosed with ASD. He was continuing to the 5th grade in a special education practice school affiliated with the Ministry of National Education. He has good receptive language skills but uses alternative communication in expressive language. He had the ability to imitate and can follow instructions. He enjoys participating in simple game activities (e.g., throwing/shooting the ball) with his peers and can interact in the game environment. A large part of self-care and daily living skills needed to be developed.

### **Settings and Materials**

The family education sessions in the Family Education Program were held in three different environments, depending on the mother's preference and availability: at home, at school, and at the sewing course room. For the family training sessions, a "Self-Care Skills Teaching Hand Manual (SCS-THM)" was developed. SCS-THM (30-page) It was adapted from the program developed by Cavkaytar (1999). Additionally, the tools and equipment such as plates, forks, spoons, food, clothes were used for studying daily living skills with the mother in family training sessions.

After completing the family training sessions with the mother, the skill teaching done by the mother was carried out in the family's home environment. During the teaching sessions, the bathroom of the house was used for hand washing and toileting skills. The bathroom, which was an average size of 10 m<sup>2</sup>, contained a toilet, sink, shower cabin, washer, bathroom rug and other materials required for teaching (hand towel, soap, toilet paper, etc.). Dressing skill teaching was held in the child's own room which contains a bed, closet, toys, and a medium-sized carpet. Elastic waist and wide cut sweatpants were preferred in teaching the skill of wearing pants.

### **Ethical Procedures**

The research was carried out with the date of March 3, 2019, and the number of 21572 Anadolu University University Ethics Committee Approval. Ethical principles, such as volunteering and

confidentiality, were adopted for the participants. These ethical principles were included in the consent form and shared with the mother.

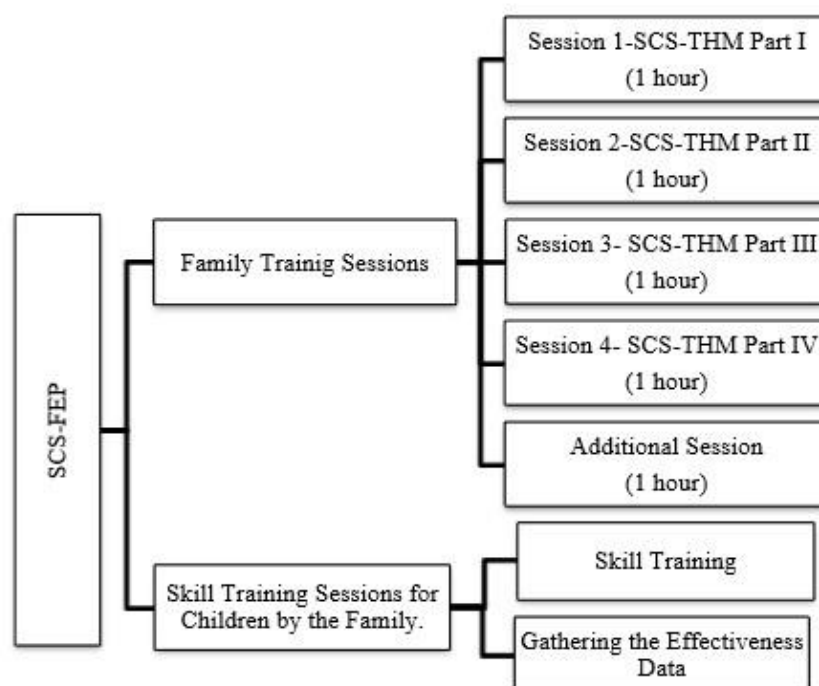
### **Research Design**

The study was designed with a multiple probe with probe conditions across behaviors/skills, which is one of the single case research methods. Three dependent variables (three behaviors/skills) are determined according to multiple probe with probe conditions across behaviors/skills model. In this model the baseline data of all three skills are taken simultaneously and when stable data was obtained in the first skill, the first skill teaching was carried out. When the achievement criterion of the skill was reached during the teaching, all skills were measured. After the stable baseline data for the second skill were provided, the teaching of the second skill was implemented. This process was repeated in the same way until the third skill teaching was completed (Horner & Baer, 1978; Ledford, 2018). To visualize the data and monitor the process more easily, the obtained data was illustrated in graphics.

The independent variable of the study was the instruction of the mother which was the Self-Care Skills Teaching Family Education Program developed for this study. The dependent variable was the ability of the child with ASD to fulfill the target self-care skills taught to him by his mother within the program.

### ***Teaching of Self-Care Skills Family Education Program (SCS-FEP)***

SCS-FEP is a program designed to provide parents with the knowledge and skills they need to teach self-care skills to their children with ASD and to support the parents' teaching competencies. SCS-FEP is a home-centered family education program based on the approach that considers parents as teachers. SCS-FEP consists of two phases: (1) family training sessions, (2) skill training sessions for children held by the family. Figure 1 illustrates the stages of the program in a general framework.



**Figure 1.** *Phases of SCS-FEP*

As illustrated in Figure 1, family training meetings of the program lasted for a total of five hours in five sessions. For each meeting session, the parts of the SCS-THM were presented. Figure 2 shows brief information about the content of the SCS-THM.

<p><b>Part I</b> Pre-knowledge/Fundamental Information</p>	<ul style="list-style-type: none"> <li>•Independent living skills, self-care skills and the importance of these skills</li> </ul>
<p><b>Part II</b> Preparations Before Skills Training</p>	<ul style="list-style-type: none"> <li>•Determining the self-care skills needed by the individual to be taught, deciding the teaching order of the skills, determining the reinforcers, using the data recording forms and planning the teaching activities</li> </ul>
<p><b>Part III</b> Skills Teaching</p>	<ul style="list-style-type: none"> <li>•Teaching times, final preparations before teaching, teaching activities, and methods and techniques to be used (attract attention, giving instructions and prompting, prompting hierarchy, requesting a response, approving, reinforcing)</li> </ul>
<p><b>Part IV</b> Reviwing the parent training sessions and ve skill teaching</p>	<ul style="list-style-type: none"> <li>•Practicing the instruction about the steps to be followed during the teaching and how to fill out the data recording form and pilot skill teaching form</li> </ul>

**Figure 2.** *The Content of SCS-THM*



As illustrated in Figure 2, SCS-THM consists of four parts: pre-knowledge/fundamental information covering independent living and self-care skills, preliminary preparations before skill teaching, skill teaching, reviewing the program and implementing the sample skill teaching. The SCS-THM also includes charts, lists and data recording forms to be used before and during the skill teaching by the parents.

### ***Evaluation of the Program***

To determine the success of the family education program on the level of knowledge acquisition related to the teaching of the self-care skills and to evaluate the teaching competency of the parents, the Family Education Program Evaluation Form (FEP-EF) and Skills Teaching Data Record Form (ST-DRF) were prepared. The forms contain the aims of the program. FEP-EF, which sets the baseline of the SCS-THM, aims to evaluate the participant parent's knowledge level of teaching. The FEP-EF consists of four main sections and a total of 31 items. Three experts in the field of special education evaluated the content of the program, FEP-EF, and ST-DRF. Necessary editing was made based on the corrections and changes requested by the experts.

The ST-DRF was developed to assess the ability of the parents participating in the family training sessions to practice skill-teaching. The ST-DRF form includes task analysis of the skills and columns that require marking checkboxes in accordance with the prompting hierarchy. This form was prepared to be used in the pilot skill teaching phase and was used for evaluation purposes in the post-test phase. The skills of eating and wearing a jacket were selected for the pilot study. In the pilot teaching phase in which the parent and the expert (the researcher) played a mutual role, the parent's ability to complete the application steps in the ST-DRF was recorded in the FEP-EF.

To analyze the data related to the success of SCS-FEP, a plus (+) is given for each correct mark for each line in the 31-question assessment tool that was applied as pre-test and post-test. The Total number of correct answers/Total number of questions X 100 formula was used for the calculation. The difference between the percentile results of the pre-test and post-test results was visualized with a column chart after analysis.

For the experimental control, some precautions were taken to prevent and/or minimize risk factors that could affect the internal validity of the study. Since possible changes in the dependent variable was expected because of the independent variable, family members and teachers were informed about not doing any teaching activities so the skills (dependent variables) would not be affected by another factor other than the teaching provided by the mother within the program. When the child needed toileting, hand washing and dressing during school hours, the mother and the teacher accompanied the child and gave the necessary support without giving directions that would disturb the data of the study.

For the external validity of the current study, the participants, the settings, and the tools/materials used were clearly defined. The mother's teaching sessions were video-recorded, and the first researcher periodically visited the home where the teaching was carried out by the mother.

### **Data Collection Instruments and Gathering Data**

Data collection consists of two main stages. The first stage aimed to evaluate the success of the family education offered to the mother. In the second stage the data was gathered to evaluate the effectiveness of teaching self-care skills that was carried out by the mother. In addition, implementation fidelity, inter-observer agreement (IOA), and social validity data were collected during the implementation phase.

#### ***Effectiveness of the Program (SCS-FEP)***

In the study, the data collection was based on the multiple probe with probe conditions across behaviors/skills. So, to determine how the child currently performed and what level the child would acquire the target skills, a baseline phase, intervention phase and probe phase data were collected. To record how the child responded to the steps in the task analysis of the target skills, the Intervention Sessions Data Record Form (IS-DRF) and the Probe Sessions Data Record Form (PS-DRF) were used. The IS-DRF, which was prepared to keep a data record of the skills taught by the mother, consists of columns showing task analysis steps of the skills and sessions. Similarly, the PS-DRF was created by the researchers to record the baseline and attendance data during the implementation process. A separate form was prepared for each skill and the responses of the child to the steps were marked on the form and a data record was kept. The response interval for each step was set at five seconds and the single opportunity method was used. Correct responses given in the five-second interval after the instruction were marked as "+". Incorrect responses or unresponsive steps were marked as "-".

#### ***Implementation Fidelity***

To evaluate implementation fidelity, a Implementation Fidelity Form (IFF) was used. Thirty percent of the teaching and probe sessions of three skills were determined randomly from the recorded videos. In the video recordings, the behaviors that the mother fulfilled/not fulfilled in accordance with the planned procedure were recorded in the form as "+/-".

The video recordings of the sessions were taken randomly (30%) and watched by a different observer, recorded as "+/-" on the form, and then compared with the records kept by the researcher to determine whether the steps in the task analysis of the skills were performed or not. IOA data were collected by an observer (different researcher) only for handwashing and wearing pants. However, for the toilet skill, it was not collected. The Teaching Sessions Data Collection Form (TS-DR) was used to collect IOA data for the instructional sessions. Thirty percent of the instructional sessions for handwashing and wearing pants were randomly selected by the observer and compared with the data processed by the researcher.

### ***Social Validity***

To determine the views and experiences of the participant mother about the program and the process, some questions were posed. For that, The Social Validity Questionnaire consisting of 12 open-ended questions was employed. In the face-to-face interview with the mother, questions were asked, and the mother's answers were recorded using the voice recording feature of a mobile device. Then, the audio recording was transcribed into a Word document. After receiving the approval from the professionals for the document, the mother's answers were written in the Social Validity Questionnaire.

### **Procedure**

Family education sessions were held twice a week for two and a half weeks for a total of five sessions. Each session lasted approximately one hour. Each session was planned, and a reminder was made by calling the mother before the meeting. The sessions were held at the mother's home or the school of the child depending on the mother's preference and availability.

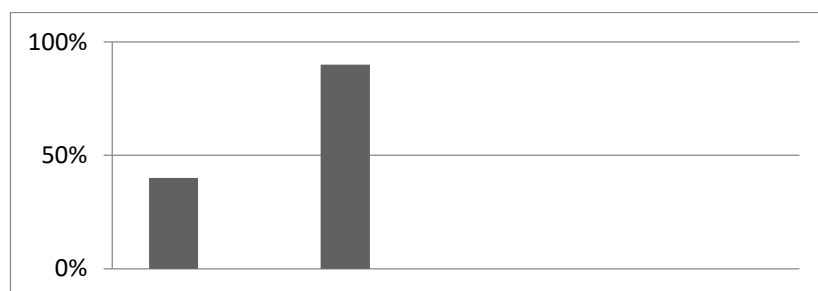
In the first session a pre-test was applied using the Family Education Program Evaluation Form. Afterward, detailed information about the purpose and the flow of the program was provided to the mother. The session was ended by giving explanations about independent living skills, self-care skills, and the importance of these skills.

In the second session the second part of the Handbook (Preparations for Skills Teaching), focused on determining the self-care skills that the child needed, deciding on the teaching order of the skills, determining the effective reinforcers, usage of data recording forms and the planning of the skill teaching. Copies of the forms included in the annexes were given to the mother and she was told how to fill in the forms. To make clear explanations, the first researcher used the examples from the Handbook. In the planning part it teaches how to use the data record forms with included examples.

In the third session the skill teaching session, final preparations before teaching, teaching methods and techniques to be used, were handled under the topic of the skill teaching, which is the 3rd part of the Handbook. The mother was informed on issues that are needed during the teaching sessions such as how to attract the attention of the child and provide instructions and prompts, using the prompting hierarchy, approving, reinforcing, and activating.

In the fourth session of the program How to Conduct Teaching Sessions was discussed under Title Four of the Handbook. The steps that the mother should follow during the teaching and how to mark the data record forms were reviewed and revised. A sample session of teaching was done with the mother. In sample teaching the researcher and the mother practiced teaching various skills using role-playing. During the role-playing, feedback was given to the mother and the deficiencies were corrected. At the last stage of this session, a post-test was administered using the Family Education Program Evaluation Form. Successful completion of this session is a prerequisite for the mother to start teaching skills to her child. A success of at least 70% was required from the mother. The pre-test score of the

mother was 12 (38.70%) of the 31 questions. A total of 28 (90.32%) correct answers were obtained in the post-test. Figure 3 illustrates the percentages of correct responses given by the mother.



**Figure 3.** Pre-test and post-test results of the mother

In the fifth session the list of skills and reinforcers that the mother was asked to complete in the previous sessions was checked. Using this list, the skills to be taught and the reinforcers to be used during the teaching sessions were determined with agreement from the mother. Considering the needs of the child, three different skills were determined: (1) Handwashing, (2) Toileting independently, (3) Wearing sweatpants. In addition, the mother was asked to complete the task analysis of the determined skills, and the researcher intervened when necessary. After that, the steps of each skill depending on the task analysis was entered on the Teaching Process Data Record Form and given to the mother to use in teaching. After this stage, the experimental process of the skill teachings to the child was started by the mother.

All sessions for skill teaching were held at home and video recordings were taken with the mother's personal cell phone. For the teaching of the determined skills, the *least to most prompting procedure* was employed by the mother. According to this method, the mother presented her child with prompts according to the prompt hierarchy in cases where she could not get an answer within the five-second response interval or received an incorrect answer to a step.

In all three skills the mother generally used the reinforcers of "playing ball, going out and eating", which her child likes the most and did not get bored. The mother also included social reinforcements (saying well done, hugging, kissing, etc.) in each session. In addition, the mother reminded her child before the teaching with sentences such as "We came from the outside, you need to wash your hands", "We are going to eat, you need to wash your hands", "Put on your sweatpants, let's play soccer." By conducting the teaching in this way, she made the connection between necessity and the child's understanding of the time and necessity of performing the skill.

After the family training sessions ended, to determine the child's performance in three skills, the mother was asked to gather baseline data for each skill under the supervision of the first researcher. When there was consistency in the data for each skill at three consecutive times, the baseline sessions were terminated and the teaching of the first skill was started. The mother recorded the teaching and

probe sessions daily and shared them with the researcher via a mobile application. After the acquisition of all three skills, the probe session data were obtained until at least three sets of stable data were obtained for all skills. In the probe sessions in cases where the child responded incorrectly or did not respond in the response interval, that step was recorded as wrong (-). The researcher accompanied the mother as an observer in obtaining the baseline and probe sessions data for all skills.

When the achievement (80% and above) in the first skill (handwashing) was obtained three consecutive times, the first researcher visited the home. Probe sessions were held by the mother for all skills and when three stable data were obtained, the teaching of the first skill was terminated and the second skill teaching session was started. The same procedure in the first skill was repeated exactly in the second skill (toileting independently) and the third skill (wearing sweatpants). When the success was met in the third skill, the experiment was terminated.

### **Data Analysis**

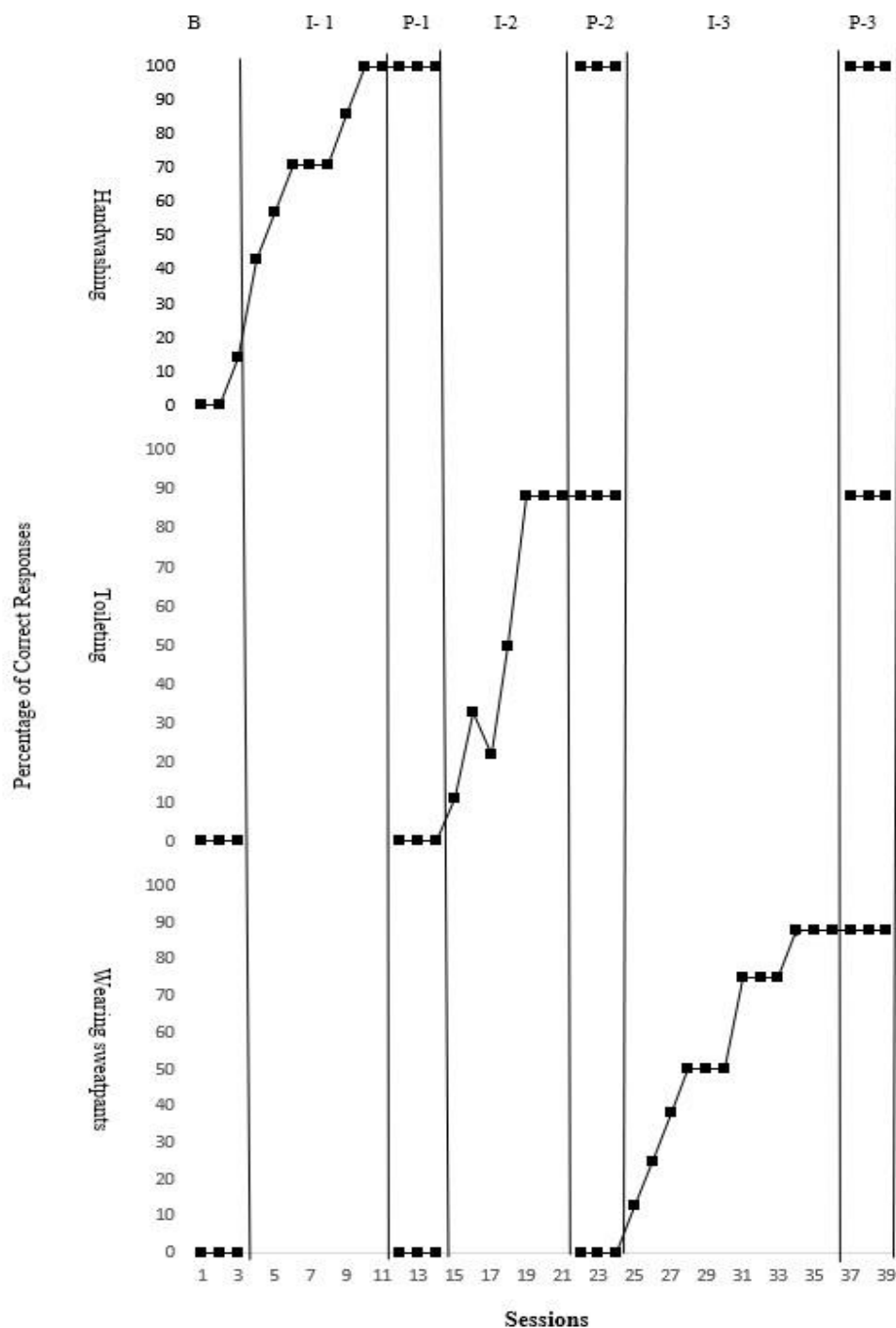
In the experimental data analysis, the number of correct responses was divided by the total number of steps, and the percentage of correct responded steps was calculated for the baseline, teaching, and probe sessions. The steps for which the prompts were provided were considered incorrect, and only the steps with the correct response were included in the calculation. Then, the percentage values were plotted on the graph. To evaluate the implementation fidelity, the formula “observed implementer behavior/planned implementer behavior X 100” was used. In the inter-observer agreement data, the formula “agreement / (agreement + disagreement) X 100” was used. For the social validity report the audio recordings of the semi-structured interview with the mother was transcribed into a MS Word document. Data were taken from this document and analyzed. To determine the accuracy of the transcription, the document was shared with a professional in the special education department. The professional confirmed the accuracy of the transcribed records. Then, the data was processed into the Social Validity Data Form.

## **Findings**

### **Intervention**

In figure 4 the graph indicates the findings regarding the teaching of the mother regarding the self-care skills and the level of the child's realization of these skills in the baseline, intervention (teaching), and probe sessions. According to the graph the baseline level of the child on handwashing skill was 5% on average. After the teaching sessions, this level increased to 86% by the seventh session and 100% by the eighth and ninth sessions. In the probe phase the child independently demonstrated a handwashing skill of 100% in three consecutive sessions. For the second skill (using the toilet), the baseline level was 0%. In the probe sessions held after the teaching of the first skill, the child demonstrated an average level of 3.7% for this skill. As seen in the graph, a level of 88% was obtained

by the 7th session. The baseline level to wear sweatpants was 0%. After the 13th session, stable data at a level of 88% was obtained.



**Figure 4.** The Child’s Correct Response Percentages of Skill Levels at Baseline and Intervention

\*B: Baseline, I: Intervention, P: Probes

The data indicates that there is a significant difference between the baseline and teaching phases for all three skills. This reveals that the independent variable has an effect on the dependent variable.

Therefore, it is possible to conclude that the teaching carried out by the mother who completed the SCC-FEP was effective for the skill acquisition of her child with ASD.

### **Fidelity Data Findings**

The implementation fidelity findings indicating the extent to which the mother implemented the teaching and probe sessions as planned. Implementation fidelity level for the baseline and probe sessions of the hand washing, toileting, and wearing sweatpants skills were 100%. Implementation fidelity for the teaching sessions of handwashing was 89.7%, toileting 88%, and wearing sweatpants was 93.8%. Additionally, the data analysis for the inter-observer agreement for baseline and probes indicates 100% accuracy for handwashing and wearing pants skills.

### **Social Validity Findings**

The mother expressed her satisfaction with the teaching sessions that she carried out with her child and enjoyed participating in the program. She stated the following about the contribution of the program to her own development. "I was teaching something before, but this time I learned to teach like a real teacher. I learned to be more patient. Thanks to the program, I learned how to teach appropriately. I also thank you. Glad I joined."

The mother answered the question "Was teaching with the least to most prompts' procedure helpful for your child in learning self-care skills?" "As I said before, this method did not work for him. No, the model now works for him." The mother stated that the child's acquisition of the self-care skills within the program contributed a lot to her daily life. "I no longer have to interfere in the toilet and hand washing. Especially in terms of school, these made me very comfortable."

She expressed how the independence gained by his child in these skills had an impact on their lives. Another question was asked. "With the knowledge and skills, you learned from this program, do you plan to teach different skills to your child in the future?" "Of course, I will teach. For example, from now on I will teach him to put on his shoes by himself," she said. She stated that there was nothing she didn't like about the program. She only had some problems with the school during the study, so sometimes she was stressed. Although the mother was stressed and had anxiety about non-program factors that she sometimes mentioned in the studies, this did not affect the study overall. The reason why she stayed with the program and the teaching with determination through stressful times during the program was "I don't have the personality to give up. This is important both for him to be able to do something on his own and for the burden of caring for him be lifted off me."

Social reliability findings of the study shows that the family education program can provide the knowledge and ability for the mother to teach the determined self-care skills to her child like a teacher. It has been revealed that the skills acquired by the child contribute positively to their lives both in the

home and in the school. Additionally, the results confirm that she realized the affect and importance of the systematic and planned teaching.

### **Conclusion, Discussion, and Suggestions**

The aim of this study was to determine the effectiveness of a family education program developed for teaching self-care skills to individuals with ASD. Therefore, a mother and a child with ASD participated in the study. The findings of the study indicated that the mother's teaching to her child with ASD within the program gained the targeted self-care skills. As a result of the Family Education Program, the mother was able to teach by using the least to most prompting procedure and was able to record the data reliably during her teaching.

The findings of the current study are consistent with the findings of other studies that consider parents as teachers in teaching self-care skills (e.g., Cavkaytar, 1999, 2007; Ozcan & Cavkaytar, 2009; Sonmez & Aykut, 2011; Sonmez & Varol, 2008). In the study carried out by Cavkaytar (1999), the parents participating in the program improved the self-care and domestic skills of their children with intellectual disabilities. The aim of the current study was to disseminate Cavkaytar's study by conducting his program with individuals with different types of disability into different regions. It was seen that the SCS-FEP developed on the teaching of self-care skills is effective in developing self-care skills in a child with ASD. Similarly, in a study conducted by Ozcan and Cavkaytar (2009), a family training program for teaching toileting skills was developed and the effectiveness of the program was investigated. The findings of the study show that providing systematic trainings to the families improves the teaching competencies of the families. In the study, the families could learn how to teach toileting skills to their children with special needs and implement effectively what they learn within the program.

The examination of the studies shows that family training programs provide positive outcomes for the individuals with special needs and parents. The studies that consider family members as educators in teaching the new skills to individuals with special needs prove that if planned and systematic instructions are provided for parents and other family members, they can implement what they learn and teach their children appropriately (e.g., Batu, 2008; Bearss et al., 2015; Cankaya & Kuzu, 2018; Cavkaytar, 1999; Doan & Toussaint, 2016; Kurtoglu & Cavkaytar, 2022; Nefdt et al., 2010; Schertz & Odom, 2007; Tekin-Iftar, 2008; Ulugol & Cavkaytar, 2020). Although most of these studies focus on different teaching methods, different disability types and skill areas, it is seen that family centered teaching practices realize the knowledge and skill competencies of family members for teaching and are effective in teaching the targeted skills. Similarly, in this current study, the mother's program-based test result rates increased from 38.70% to 90.32%. She was able to teach the determined skills appropriately to her child and the child developed the skills.

Social validity findings show that the mother was satisfied with the program. She noticed the mistakes that she knew to be true while teaching her child before, and that it became important to be



systematic and planned when teaching her children. In studies dealing with the factors that make it difficult for individuals with ASD to participate in social life and work, limitations in self-care skills are seen as a barrier and prevents participation (Farley et al., 2009; Kellems et al., 2018). As in the current study, families see self-care skills as a factor that facilitates daily living and social life.

It was observed that the mother, who was the participant of the study, was hopeless from time to time in the family training sessions and during the teaching sessions to her child. The mother expressed her opinion that the methods to be used while planning the study would not work. The fact that the mother did not receive a systematic and planned education before can be explained as one of the reasons for this. In addition, the fact that his knowledge and skills were not sufficient in teaching his child caused him to think negatively at the beginning. But after the program, the mother's success in teaching changed her thoughts positively. This situation once again revealed the importance of providing more education opportunities to families. Especially families with limited access to services have more difficulties in this regard (Mello, 2016). Therefore, family education provides an opportunity to meet these needs.

The study has some limitations. This study was limited to a mother and a child with ASD and three self-care skills. This limits the generalizability for the study. However, the detailed description of the study in terms of participants, environment, equipment, and procedure allows it to be repeated by different researchers with different participant groups.

Regrettably, after the study was completed, monitoring data based on the data recording form could not be obtained because the family moved to a different home environment outside the city and the mother did not volunteer to provide formal information. In the phone conversations with the mother, it was learned that the child continued the skills. He performs these skills in a different home environment which is an important indicator in terms of generalization between environments. In addition, inter-observer data were not gathered for toileting skill because it involves privacy, and the mother did not want the video to be shared with anyone else. The first researcher watched the videos of toilet skill on the mother's phone for implementation fidelity data.

The teaching of self-care skills is best implemented in the home, which is the natural environment of the individuals. Family members play a critical role in learning these skills. However, some families who want to teach their children have difficulties in some cases regarding what, how and which methods and techniques they will use. Family education programs like these provide useful opportunities. Organizing a systematic and structured family training program focusing on the teaching of self-care skills based on the needs of different types of disabilities and evaluating their effectiveness is key to the success of these types of programs.

Additionally, conducting dissemination activities about the family education programs can make significant contributions to the community. The availability of resources provides important

support to family members and educators, and institutions that cooperate with families. In this respect, bringing together existing family education programs in handbooks and improving their accessibility through online modules and/or mobile applications can be beneficial in terms of supporting families in need of information and guiding teachers.

Lastly, the mother stated that she spends more time on the education of her children compared to her husband. These statements of the mother are similar to the findings of the other studies (Carpenter & Towers, 2008; Johnson & Simpson, 2013; Smith et al., 2010). According to research, mothers have a great responsibility in the care of their children with special needs. However, fathers do not provide enough support to the mother. This may be explained by the role of fathers to provide for the house or mothers' traditional role of being primary caregiver. The support of each family member is important for the development of individuals with special needs. All parents' involvement provides mutual support to each other and is considered natural support for individuals with special needs. Therefore, more efforts should be made to involve fathers and other family members. However, primarily it should be aimed to change the attitudes of fathers to become more involved in their children's education.

#### **Statement of Responsibility**

The authors contributed equally to the related research. Therefore, each author is equally responsible.

#### **Ethical Procedures Statement**

The research was carried out with the date of March 3, 2019, and the number of 21572 Anadolu University University Ethics Committee Approval.

#### **Conflicts of Interest**

The authors declare that they have no conflict of interest.

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#### **References**

- American Psychiatric Association (2013). *Diagnostic and statistical manual of mental disorders (5th ed.)*. American Psychiatric Publishing.
- Ardic, A., & Cavkaytar, A. (2014). Effectiveness of the modified intensive toilet training method on teaching toilet skills to children with autism. *Education and Training in Autism and Developmental Disabilities, 49*(2), 263–276. <http://www.jstor.org/stable/23880609>
- Batu, S. (2008). Caregiver-delivered home-based instruction using simultaneous prompting for teaching home skills to individuals with developmental disabilities. *Education and Training in Developmental Disabilities, 43*(4), 541–555.

- Bearss, K., Johnson, C., Smith, T., Lecavalier, L., Swiezy, N., Aman, M., McAdam, B.D., Butter, E., Stillitano, C., Minshawi, N., Sukhodolsky, G. D., Mruzek, W., Turner, K., Neal, T., Hallett, V., Mulick, A. J., Green, B., Handen, B., Deng, Y., ... & Scahill, L. (2015). Effect of parent training vs parent education on behavioral problems in children with autism spectrum disorder: A randomized clinical trial. *JAMA*, *313*(15), 1524-1533. <https://doi.org/10.1001/jama.2015.3150>
- Bettison, S. (1982). *A comparison of toilet training strategies for the retarded* (Unpublished doctoral dissertation). University of Adelaide
- Cankaya, S., & Kuzu, A. (2018). Effectiveness of mobile skill teaching software for parents of individuals with intellectual disabilities. *International Education Studies*, *11*(3), 1-11. <https://doi.org/10.5539/ies.v11n3p1>
- Cannella-Malone, H., Sigafos, J., O'Reilly, M., de la Cruz, B., Edrisinha, C., & Lancioni, G. E. (2006). Comparing video prompting to video modeling for teaching daily living skills to six adults with developmental disabilities. *Education and Training in Developmental Disabilities*, *41*(4), 344–356.
- Carpenter, B., & Towers, C. (2008). Recognizing fathers: The needs of fathers of children with disabilities. *Support for Learning*, *23*(3), 118–125. <https://doi.org/10.1111/j.1467-9604.2008.00382.x>
- Cavkaytar, A. (1999). *The effectiveness of a parent training program for teaching self-care and domestic skills to mentally handicapped children* (Doctoral dissertation). Eskisehir Anadolu University.
- Cavkaytar, A., & Pollard, E. (2009). Effectiveness of parent and therapist collaboration program (PTCP) for teaching self-care and domestic skills to individuals with autism. *Education and Training in Developmental Disabilities*, *44*(3), 381–395. <http://www.jstor.org/stable/24233482>
- Cruz-Torres, E., Duffy, M. L., Brady, M. P., Bennett, K. D., & Goldstein, P. (2020). Promoting daily living skills for adolescents with autism spectrum disorder via parent delivery of video prompting. *Journal of Autism and Developmental Disorders*, *50*(1), 212-223. <https://doi.org/10.1007/s10803-019-04215-6>
- Doan, D., & Toussaint, K. A. (2016). A parent-oriented approach to rapid toilet training. *International Electronic Journal of Elementary Education*, *9*(2), 473-486.
- Dunst, J., & Espe-Sherwindt, L. (2016) Parent mediated intervention in early childhood. In B. Reichow, B. A. Boyd, E. E. Barton & S. L. Odom (Ed.), *Handbook of Early Childhood Special Education* (pp.37-56). Springer International.
- Eaves, L. C., & Ho, H. H. (2008). Young adult outcome of autism spectrum disorders. *Journal of Autism and Developmental Disorders*, *38*(4), 739-747. <https://doi.org/10.1007/s10803-007-0441-x>

- Farley M. A., McMahon W. M., Fombonne E. W., Jenson W. R., & Coon H. (2009). Twenty-year outcome for individuals with autism and average or near average cognitive abilities. *Autism Research* 2(2), 109–118. <https://doi.org/10.1002/aur.69>
- Flynn, L., & Healy, O. (2012). A review of treatments for deficits in social skills and self-help skills in autism spectrum disorder. *Research in Autism Spectrum Disorders*, 6(1), 431–441. <https://doi.org/10.1016/j.rasd.2011.06.016>
- Hancock, T. B., Kaiser, A. P., & Delaney, E. M. (2002). Teaching parents of preschoolers at high risk: Strategies to support language and positive behavior. *Topics in Early Childhood Special Education*, 22(4), 191–212.
- Horner, R. D., & Baer, D. M. (1978). Multiple-probe technique: A variation of the multiple baseline. *Journal of applied behavior analysis*, 11(1), 189-196.
- Jenkins, S., Stephens, B., & Sternberg, L. (1980). The use of parents as parent trainers of handicapped children. *Education and Training of the Mentally Retarded*, 15(4), 256–263.
- Johnson, N. L., & Simpson, P. M. (2013). Lack of father involvement in research on children with autism spectrum disorder: Maternal parenting stress and family functioning. *Issues in Mental Health Nursing*, 34(4), 220-228. <https://doi.org/10.3109/01612840.2012.745177>
- Keen, D., Couzens, D., Muspratt, S., & Rodger, S. (2010). The effects of a parent-focused intervention for children with a recent diagnosis of autism spectrum disorder on parenting stress and competence. *Research in Autism Spectrum Disorders*, 4(2), 229–241. <https://doi.org/10.1016/j.rasd.2009.09.009>
- Kellems, R. O., Rickard, T. H., Okray, D. A., Sauer-Sagiv, L., & Washburn, B. (2018). iPad® video prompting to teach young adults with disabilities independent living skills: A maintenance study. *Career Development and Transition for Exceptional Individuals*, 41(3), 175-184. <https://doi.org/10.1177/2165143417719078>
- Koegel, R. L., Bimbela, A., & Schreibman, L. (1996). Collateral effects of parent training on family interactions. *Journal of Autism and Developmental Disorders*, 26(3), 347–359.
- Koegel, R. L., Symon, J. B., & Kern Koegel, L. (2002). Parent education for families of children with autism living in geographically distant areas. *Journal of Positive Behavior Interventions*, 4(2), 88-103.
- Kurtoğlu, S., & Cavkaytar, A. (2022). Zihin yetersizliği olan bireylere kişisel bakım becerilerinin öğretiminde bir aile eğitimi programının etkililiği. *Ankara Üniversitesi Eğitim Bilimleri Fakültesi Özel Eğitim Dergisi*, 23(1), 53-83. <https://doi.org/10.21565/ozelegitimdergisi.756223>
- LaVesser, P., & Berg, C. (2011). Participation patterns in preschool children with an autism spectrum disorder. *OTJR: Occupation, Participation and Health*, 31(1), 33-39. <https://doi.org/10.3928/15394492-20100823-01>

- Ledford, J. R. (2018). No randomization? No problem: Experimental control and random assignment in single case research. *American Journal of Evaluation*, 39(1), 71–90. <https://doi.org/10.1177/1098214017723110>
- Marchant, M., & Young, K. R. (2001). The effects of a parent coach on parents' acquisition and implementation of parenting skills. *Education and Treatment of Children*, 24(3), 351–373.
- McConachie, H., & Diggle, T. (2007). Parent implemented early intervention for young children with autism spectrum disorder: A systematic review. *Journal of Evaluation in Clinical Practice*, 13(1), 120-129. <https://doi.org/10.1111/j.1365-2753.2006.00674.x>
- Mello, M. P., Goldman, S. E., Urbano, R. C., & Hodapp, R. M. (2016). Services for children with autism spectrum disorder: Comparing rural and non-rural communities. *Education and Training in Autism and Developmental Disabilities*, 51(4) 355-365.
- Miller, U. C., & Test, D. W. (1989). A comparison of constant time delay and most to least prompting in teaching laundry skills to students with moderate retardation. *Education and Training in Mental Retardation*, 24(4), 347-354.
- Minjarez, M. B., Mercier, E. M., Williams, S. E., & Hardan, A. Y. (2013). Impact of pivotal response training group therapy on stress and empowerment in parents of children with autism. *Journal of Positive Behavior Interventions*, 15(2), 71–78. <https://doi.org/10.1177/1098300712449055>
- Nefdt, N., Koegel, R., Singer, G., & Gerber, M. (2010). The use of a self-directed learning program to provide introductory training in pivotal response treatment to parents of children with autism. *Journal of Positive Behavior Interventions*, 12(1), 23-32. <https://doi.org/10.1177/1098300709334796>
- Ozcan, N., & Cavkaytar, A. (2009). Parents as teachers: Teaching parents how to teach toilet skills to their children with autism and mental retardation. *Education and Training in Developmental Disabilities*, 44(2), 237-243.
- Schertz, H. H., & Odom, S. L. (2007). Promoting joint attention in toddlers with autism: A parent-mediated developmental model. *Journal of autism and developmental disorders*, 37(8), 1562-1575. <https://doi.org/10.1007/s10803-006-0290-z>
- Smith, L. E., Hong, J., Seltzer, M. M., Greenberg, J. S., Almeida, D. M., & Bishop, S. L. (2010). Daily experiences among mothers of adolescents and adults with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 40(2), 167-178. <https://doi.org/10.1007/s10803-009-0844-y>
- Sonmez, N., & Aykut, C. (2011). Using mother delivered simultaneous prompting for teaching independent toileting skills to a child with developmental disability. *Journal of Human Sciences*, 8(2), 1151-1171.

- Sonmez, N., & Varol, N. (2008). The effects of the home-based education program in acquiring and maintaining toilet training for mentally retarded children. *Journal of Educational Sciences and Practice*, 7(14), 139–155.
- Spriggs A.D., Ayres K.M., Trump C., & Taylor C. (2017). Building programs focused on daily living and adult independence. In H. M. Chiang (Ed.), *Curricula for teaching students with autism spectrum disorder*. (pp.195-224). Springer.
- Symon, J. B. (2005). Expanding interventions for children with autism: Parents as trainers. *Journal of Positive Behavior Interventions*, 7(3), 159-173.  
<https://doi.org/10.1177/10983007050070030501>
- Tekin-Iftar, E. (2008). Parent delivered community-based instruction with simultaneous prompting for teaching community skills to children with developmental disabilities. *Education and Training in Developmental Disabilities*, 43(2), 249-265.
- Turnbull, A., Blue-Banning, M., Turbiville, V., & Park, J. (1999). From parent education to partnership education: A call for a transformed focus. *Topics in Early Childhood Special Education*, 19(3), 164–172. <https://doi.org/10.1177/027112149901900308>
- Ulugol, F., & Cavkaytar, A. (2020). The effectiveness of parent training program in teaching domestic skills to individuals with intellectual disability. *Anadolu Journal of Educational Sciences International*, 10(2), 930-957. <https://doi.org/10.18039/ajesi.760299>
- Vismara, L. A., Colombi, C., & Rogers, S. J. (2009). Can one hour per week of therapy lead to lasting changes in young children with autism? *Autism*, 13(1), 93–115. <https://doi.org/10.1177/1362361307098516>

## Students' Views on the Use of Cryptology Methods Education Contexts<sup>1</sup>

Sercan ÖZER<sup>2</sup>

Çanakkale Onsekiz Mart University

Levent ÇETİNKAYA<sup>3</sup>

Çanakkale Onsekiz Mart University

### Abstract

This study aimed to gather middle school students' opinions on the utilization of cryptologic methods in education. Using a case study approach, data were collected through a semi-structured interview form developed with expert input. The focus was on the effects of integrating cryptologic methods within the Information Technologies and Software course. The study involved approximately 105 middle school students. Data analysis revealed that students generally viewed cryptologic methods positively, highlighting benefits such as enhanced long-term and rapid learning, improved problem-solving skills, and increased interest and motivation through diverse teaching techniques. However, some students reported difficulties in learning cryptologic methods and a lack of interest. The findings suggest that engaging, sustainable, and rapid learning captures students' attention and enhances their focus. Integrating cryptologic methods into the curriculum holds significant potential for developing 21st-century skills, including critical thinking, research, and problem-solving abilities, enabling students to connect clues and formulate solutions. The further integration of cryptologic methods promises to foster enjoyable and enduring cognitive gains in students' learning activities.

**Keywords:** Cryptology, Information Technologies, 21st century skills, Digital Game-Based Learning,

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<sup>2</sup> Expert, Çanakkale Onsekiz Mart University, School of Graduate Studies, Computer and Instructional Technologies Education, Çanakkale, Turkey, ORCID: 0000-0002-3201-8905

**Correspondence:** sercanozer85@gmail.com

<sup>3</sup> Assoc. Prof. Dr., Çanakkale Onsekiz Mart University, Faculty of Education, Computer and Instructional Technologies Education, Çanakkale, Turkey, ORCID: 0000-0002-0167-4846, Email: lctetinkaya@comu.edu.tr

## Introduction

The increasing ease provided by digital technologies in people's lives (Giacomo et al., 2017) has paved the way for the reassessment and development of previously used but gradually overlooked methods and technologies. This process has encouraged the emergence of new applications based on old knowledge and technologies. In light of these technological advancements, the science of cryptology, which dates back to ancient times and is based on the foundations of mathematics, has regained importance (Arora et al., 2015; Massey, 1988). Cryptology has established a foundation for meeting societies' needs to protect information and decrypt texts for desired purposes (Çeşmeci, 2009). The evolution of cryptology has been shaped particularly by the need for private communication in diplomatic and military fields (Buluş, 2006), gradually contributing to the resolution of such needs for societies and individuals.

After understanding the historical and theoretical background of cryptology, it is essential to focus on its applications in education and the benefits it offers to students. There are numerous advantages to using cryptology methods in educational settings (Rocca, 2005). Especially in today's rapidly advancing digital transformation, skills related to securely storing, using, and transmitting information can be enhanced through cryptology-based education. These trainings help students develop 21st-century skills such as problem-solving, computational thinking, and critical thinking (Patterson, 2020). Integrating cryptology into mathematics and information technology courses makes the content more effective, allowing students to gain deeper knowledge in these areas (Simms & Chi, 2011). Although the use of traditional cryptology methods has decreased today, these methods have been found to play a significant role in developing students' 21st-century skills (RathiDevi et al., 2017). Cryptology education generally prepares students to adapt to the new digital world (Sakalli et al., 2004). Moreover, it has the potential to equip students with the skills to use and protect personal data, learn secure data transmission in online environments, and effectively utilize digital technologies (Arınmış-Uzun, 2021).

The rise of digital technologies in education not only increases the need for security and data protection but also transforms learning methods. In this context, digital games serving educational purposes have become an innovative tool that enriches students' learning experiences. Research has shown that such games increase students' motivation by capturing their interest (Lin et al., 2010). Additionally, gaming experiences support students in achieving various learning objectives, thus ensuring more active participation and in-depth knowledge acquisition (Minović et al., 2015). Digital games have the potential to significantly contribute to the development of students' creativity, critical thinking, problem-solving, and collaboration skills. These skills are crucial not only in the educational process but also in professional life (Yang & Chang, 2013). Game-based education offers students greater independence, allowing them to set their own learning pace and take more responsibility in the process. This encourages students to play a more active role and makes the learning experience



enjoyable (Prensky, 2001). Furthermore, digital games, by presenting tasks at varying levels of difficulty, have the potential to boost students' confidence and enthusiasm for learning (Oti, 2012; Sadera et al., 2014).

The integration of cryptology methods from ancient applications with contemporary technologies creates an innovative and transformative approach in education (Adamovic et al., 2018). Within this framework, the integration of cryptology methods from past to present with modern technology has the potential to offer students engaging and enjoyable learning environments (Bergner et al., 2012). Especially the combination of cryptology methods with the fast-paced and engaging features of digital games can enhance students' problem-solving abilities. This multifaceted approach holds significant potential for effectively imparting both problem-solving and information processing skills to students (Percival et al., 2022). This strategy not only provides students with an interesting and enjoyable learning experience but also allows them to deeply understand cryptology methods in a historical context and how these methods addressed past problems (Rubin, 1997). Furthermore, students can apply cryptology methods to their real lives, gaining important skills such as analytical thinking, logical reasoning, and data analysis. In this regard, it is crucial to evaluate the potential contributions of integrating the science of cryptology and digital games into educational environments. This study aims to deeply examine students' perspectives on the integration of cryptology methods into digital game-based learning environments and their use in education and teaching.

## **Method**

### **Research Design**

This research utilized qualitative research methods, an approach that aims to collect descriptive data in natural settings and focuses on the perspectives of research subjects, employing an inductive methodology (Bogdan & Biklen, 2006). A case study method was adopted in the research, aiming to examine existing application examples through the question of 'how' (Yıldırım & Şimşek, 2008). This approach allowed the research to be conducted in a detailed and focused manner. Additionally, expert opinions were consulted during data collection and evaluation processes to enhance the methodological reliability and validity of the research.

### **Participants**

The study included a total of 105 sixth-grade students, selected through random sampling and based on voluntary participation. Necessary permissions were obtained from both students and their parents, with detailed information provided to parents through consent forms. This careful process ensured the study's compliance with ethical standards and the protection of participants' rights, significantly contributing to the reliability and validity of the research.

## Implementation Phase

### *Development of the Digital Game-Based Cryptology Application*

The research model synthesizes the ADDIE model with the experiential game model. In planning the five stages of the game model, the Analysis, Design, and Development stages were developed according to the ADDIE model. The choice of the ADDIE model was influenced by its practicality and purposefulness compared to other instructional design models in the literature (Arkün et al., 2009). The Implementation and Evaluation stages were based on the experiential game model, which is grounded in "Experiential Learning Theory." This model progresses from concrete to abstract experiences, expecting students to derive conclusions from concrete experiences such as data collection and observation and to use these conclusions purposefully (Kiili, 2005).

The necessary scenarios, graphics, and content for the game were developed with the support of experts. The game includes problems related to classical encryption methods, each containing the keys required to solve them. The designed game consists of eight rooms, each containing one encryption problem that needs to be solved. Students are expected to find clues hidden in each room and solve the encryption to earn the eight keys. Some rooms require students to encrypt texts, while others require them to decrypt encrypted texts. Figure 1 provides visuals of the general overview of the game.

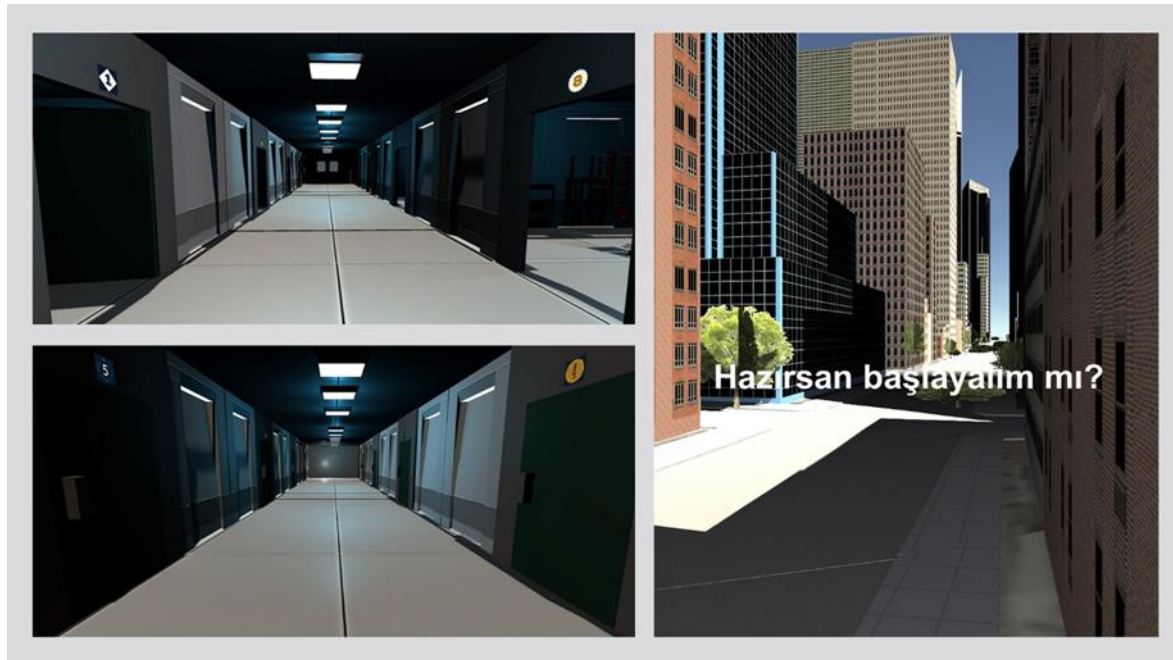


Figure 1. General Overview of the Digital Game-Based Cryptology Application

### ***Experience Phase of the Digital Game-Based Cryptology Application by Students***

Before the data collection process began, necessary permissions were obtained from the Ethics Committee of the Graduate School of Educational Sciences at ÇOMÜ to ensure the research adhered to ethical norms and standards. The schools where the research would be conducted were identified. Prior to data collection, students were taught outcomes involving cryptology methods as part of the sixth-grade Information Technology and Software course curriculum. Classical encryption methods were utilized in teaching these outcomes. Activities were conducted based on the Caesar encryption method to create and decrypt ciphers. Following this, students began playing the digital game-based cryptology game. The game consists of eight rooms, each containing problems related to eight different encryption methods, each requiring specific keys. Students were expected to find and solve the ciphers composed of eight separate keys. These methods include Caesar, Vigenere, Scytale, Pigpen, Rail Fence Cipher, and Algebraic encryption methods, as well as Semaphore and Morse alphabets. These encryption methods and special alphabets used in communication form the basis of the problems in the game rooms. Students were expected to find clues hidden in each room and solve problems prepared with different encryption methods provided in each clue. Some rooms required students to encrypt texts, while others required them to decrypt encrypted texts. All these activities were completed within a two-week period. After completing the process, an open-ended questionnaire was administered to the students for data collection.

#### **Data Collection**

Following the experience with the digital game-based cryptology application, students' opinions were collected using a comprehensive open-ended questionnaire. This questionnaire was designed to cover a broad perspective on various game experiences, preferences, and satisfaction levels. The valuable data collected from a total of 105 students were gathered over a period of 2 weeks. During this period, efforts were made to include students with different demographic characteristics, ensuring participation from various classes, age groups, and genders. This method was adopted to increase the general validity and diversity of the data obtained. The collected data are securely stored in a digital environment by the researcher, using a secure storage system. These security measures were implemented to ensure the privacy and anonymity of the students. The information obtained was used solely for analysis purposes.

#### **Data Analysis**

Following the application of the open-ended questionnaire, which constitutes the qualitative aspect of the study, the written data collected from the experimental group students were analyzed using categorical analysis and frequency analysis techniques, which are types of content analysis. The categorical analysis process involved the following stages: (1) coding the data, (2) creating categories, (3) organizing categories, and (4) identifying and interpreting the findings (Corbin & Strauss, 2007).

Frequency analysis was used to quantitatively determine the occurrence frequency of the data, thereby identifying the intensity and importance of a specific item (Ryan & Bernard, 2000). This process quantified the qualitative data, increasing the reliability of the data, reducing bias, and enabling comparison among the data (Yıldırım & Şimşek, 2008). Moreover, this approach allowed for a deeper understanding and the acquisition of a broad perspective on the research findings.

## Findings and Discussion

### *Findings and Comments on the Digital Game-Based Cryptology Application*

Students were asked about the topics they learned and the aspects they found interesting regarding the digital game-based cryptology application. The data collected through the open-ended form were analyzed using categorical analysis and frequency analysis techniques. The analysis results revealed that all students provided positive feedback. The categories determined based on the students' responses and the frequency and percentage values related to these categories are shown in Table 1.

Table 1. Students' Opinions on the Topics Learned and Interesting Aspects of the Digital Game-Based Cryptology Application

Positive	f	%
Learning with enjoyment	52	49,52
Contribution to mathematics learning	47	44,76
Awareness of information security	14	13,33
Intelligence development	9	8,57
Logical thinking	3	2,86

All students participating in the study expressed positive opinions. Some of the students' views on the topics learned and interesting aspects of the digital game-based cryptology application are as follows. S18 stated, "Learning cryptology through games is really fun," while S21 mentioned, "Cryptology in digital games is not only for fun but also useful in daily life. Thanks to my knowledge of encryption, I can keep my online accounts more secure." S38 added, "Cryptology in games makes learning enjoyable." These views suggest that the digital game-based cryptology application contributes to learning with enjoyment. Additionally, S55 noted, "Thanks to cryptology games, some topics in math class have become more memorable and clear," S73 commented, "I think solving ciphers in the game improves my math skills," and S82 mentioned, "I learned math-related topics better." These statements indicate that the digital game-based cryptology application contributes to mathematics learning. On the other hand, S57's comment, "Dealing with cryptology in games made me think about real-world security measures," and S101's view, "Cryptology games increased the importance of securing information," suggest that the digital game-based cryptology application raises awareness about information security.

S33 stated, "Solving ciphers in the games helps me develop my intelligence," and S45 mentioned, "... these games make me love math and logic even more." These views indicate that the digital game-based cryptology

***Students' Difficulties and Solutions While Learning Cryptology Methods***

Students were asked about the difficulties they experienced while learning cryptology methods and their views on solutions to these difficulties. The data collected through the open-ended questionnaire were analyzed, and the categories determined based on the students' responses, along with their frequency and percentage values, are shown in Table 2.

Table 2. Students' Views on Difficulties and Solutions While Learning Cryptology Methods

Difficulties	f	%
Mathematical terms and calculations	63	60,00
Step-by-step processing	39	37,14
Inappropriateness to level	13	12,38
<b>Solutions</b>		
Peer learning	46	43,80
Taking notes and reinforcement	43	40,95
Breaking down the topic	21	20,00

In the study conducted to deeply examine students' views on the integration of cryptology methods into a digital game-based learning environment, students were asked about the difficulties they experienced while learning cryptology methods and their views on solutions to these difficulties. S5 stated, "I felt like I wasn't very good at math. It was especially hard to understand complex encryption algorithms," S63 mentioned, "Dealing with numbers was challenging for me, especially large ones," and S47 added, "Cryptology was a topic that combined history and math, which sometimes confused me." These views suggest that the mathematical terms and calculations within cryptology methods caused difficulties for the students. Additionally, S39 stated, "The challenging part was following the steps for decryption in order. Sometimes the steps got mixed up," and S18 mentioned, "Understanding the path followed by cryptology methods to reach the goal was difficult for me," indicating that the algorithms created while developing cryptology methods were challenging for students to grasp. Furthermore, S101's comment, "Cryptology sometimes included things I didn't understand, and it was hard for me to grasp," and S92's view, "I struggled to understand some cryptology terms because they weren't suitable for my level," suggest that there might be issues with students' comprehension of cryptology applications.

Regarding the solutions proposed by students to overcome these difficulties, S67 stated, "Discussing and learning the topics with my group members helped me better understand cryptology methods," and S44 mentioned, "I asked our teacher to explain with simple examples, and working with my friends helped me understand the topics better." These statements indicate that peer learning and consulting their teachers were effective solutions for the difficulties they faced. Additionally, S88's comment, "I overcame this topic by taking notes and solving example questions," highlights that taking notes and reinforcement were helpful solutions, while S41's view, "I overcame the difficulty by breaking the topics down into small parts and proceeding step-by-step," indicates that tackling complex topics piece by piece helped to overcome the challenges.

***Impact of Knowledge Learned in the Digital Game-Based Cryptology Application on Daily Life***

Students were asked about their views on the impact of the knowledge learned in the digital game-based cryptology application on their daily lives. The responses collected through the open-ended questionnaire are presented in Table 3.

Table 3. Students' Views on the Impact of Knowledge Learned in the Digital Game-Based Cryptology Application on Daily Life

Positive	f	%
Ability to create secure passwords	67	63,80
Protecting personal data	44	41,90
Developing logic to solve problems	13	12,38
<hr/>		
Negative		
Methods being outdated	5	4,76

The majority of students expressed positive opinions. Some of the students' views on the impact of the knowledge learned in the digital game-based cryptology application on their daily lives are as follows. S22 stated, "By informing my family about creating passwords, we made our social media account passwords stronger," and S75 mentioned, "I use the cryptology knowledge I learned from the games to strengthen the passwords for my internet accounts." These views suggest that students have become aware of the importance of security in their online interactions with their families and can create strong passwords using cryptology methods. Additionally, S43 stated, "...I use the encryption methods I learned from the games in my diaries and personal files," and S13 mentioned, "...I use them in my 'secret notebook' to store my class notes." These statements indicate that students use cryptology methods to protect their personal data. S21 mentioned, "...I solve the ciphers in puzzle books using the encryption logic I learned from the games," suggesting that cryptology methods have contributed to their ability to solve problems they encounter.

Regarding the negative views, S86 stated, "I think the passwords created with old cryptology methods wouldn't be strong," which suggests that the impact of the encryption methods used in the digital game-based cryptology application on daily life might be limited.

***Student Views on Experiences with Digital Game-Based Cryptology Applications***

Students were asked about their views on the impact of the knowledge learned in the digital game-based cryptology application on their daily lives. The analysis of the data collected through the open-ended questionnaire is presented in Table 4.

Table 4. Students' Views on Experiences with Digital Game-Based Cryptology Applications

	f	%
Easy learning	39	37,14
Enhancing success	28	26,67
Speeding up reading, comprehension, and understanding	25	23,81
Learning new encryption methods	22	20,95
Developing skills	20	19,05
Assisting learning	19	18,10
Enhancing intelligence	16	15,24
Fun learning	7	6,67
Acting faster and more efficiently	6	5,71
Learning without realizing	4	3,81
Permanent learning	2	1,90

All students expressed positive views in response to this open-ended question. Some of the students' views on their experiences with digital game-based cryptology applications are as follows. S84 stated, "I think it helped me learn more easily," S29 mentioned, "It had a positive effect, I can solve ciphers better now," S3 commented, "It was very useful. It made it more permanent in my mind," and S62 said, "It's very fun, so it sticks in my mind more. I'm having fun but also learning without realizing it. It would be great if we could always learn this way." These views suggest that digital game-based cryptology applications enhance easy learning, fun learning, and retention.

Additionally, S97 stated, "I think games have a significant effect on lessons," S14 mentioned, "When I first took the exam, I had questions like 'what is this?' but the games we played were effective. I scored higher on my second exam," and S36 commented, "The activities were good, it was a game that would develop our skills." These views indicate that digital game-based cryptology applications increase academic success and develop skills.

Furthermore, S17 mentioned, "I think it added more knowledge and taught new things," S94 said, "It taught me new information. It was both fun and it developed our intelligence," S60 commented, "It was good, it taught us by making us solve ciphers, and the last game was more enjoyable," S26 mentioned, "It sped up and facilitated my reading, comprehension, and understanding," and S37 said, "I think it was very good. I learned a lot of encryption methods thanks to the games." These views suggest that digital game-based cryptology applications teach new encryption methods, develop intelligence, and speed up reading and understanding. Based on the students' feedback, it can be concluded that digital game-based cryptology applications have a predominantly positive impact on students.

### **Discussion, Conclusion and Recommendations**

The aim of this study with middle school students is to examine the impact of integrating cryptology methods into a digital game-based learning environment on education and teaching from the perspective of student opinions. Data collected from questions asked under four different headings were analyzed, and it was found that students generally have a positive outlook on cryptology methods and that they gained various benefits from the digital game-based cryptology application developed with these methods.

Students' positive views on cryptology methods in education generally focused on the concrete applications of cryptology. In this study, when looking at students' opinions on the topics learned and interesting aspects of the digital game-based cryptology application, factors such as contributing to mathematics learning, learning with enjoyment, and raising awareness of information security came to the forefront. Griffiths' (2020) study shows that postgraduate students see cryptology not only as important but also as an exciting field, emphasizing the need for a strong mathematical foundation to be effective in this area. In this context, students' positive outlook on cryptology motivates them in the learning process. Both studies highlight the importance and necessity of mathematics education in cryptology, as expressed by the students. Additionally, the findings indicate that cryptology education creates an enjoyable learning experience and increases motivation.

Regarding the impact of the knowledge learned in the digital game-based cryptology application on daily life, students emphasized factors such as creating secure passwords, protecting personal data, and developing critical thinking to solve problems. It was found that students applied the knowledge they gained from cryptology methods to their daily lives. Sakalli's (2004) research highlights the potential of cryptology to enhance mathematics education, suggesting that students can achieve more interest and success in this area when it is associated with mathematics. This study reveals that using abstract mathematical concepts in cryptology in daily life can make students' learning experiences more concrete and impactful. When looking at these two studies, it can be said that cryptology methods can contribute to solving problems encountered in daily life when applied in different fields.



Spaht et al. (2002) emphasized the practical applications of cryptology, indicating that cryptology can play an important role in increasing students' interest in mathematics. Zapechnikov et al. (2015) examined the use of distance education technologies in teaching cryptology, showing that students are open to innovative approaches in this field. Distance education can provide students with learning opportunities in cryptology regardless of distances, allowing them to develop their knowledge and skills in this area. Students' positive views on cryptology suggest that they see cryptology not only as an academic subject but also as an applicable and exciting field in daily life. This can enable cryptology to be used more effectively and attractively in education.

When examining the literature on the use of cryptology in educational environments, it is revealed that students have positive views on the use of cryptology in these environments. Although cryptology has been a continuously evolving field from past to present, it can be said that it has not been adequately addressed in education. Educational studies on cryptology generally show positive results. Therefore, there is a need to include more cryptology education in current curricula. Teaching cryptology to students can develop many skills. This study concluded that adding new tools to the curriculum to enhance students' education with cryptology was positively received by students. Specifically, digital game-based cryptology applications were found to resonate more with students' interests and attitudes and contributed more effectively to skill acquisition. Thus, incorporating more innovative approaches and applications in cryptology into educational systems can allow students to develop these important skills more effectively.

### **Policy Implications**

The findings from the study highlight several key areas where educational policies can be informed and enhanced by integrating cryptology methods and digital game-based learning environments. Below are the policy implications derived from the study:

#### 1. Incorporation of Cryptology in Curricula:

- **Mathematics and Information Technology Integration:** Given the positive impact of cryptology on students' understanding and interest in mathematics, educational policies should encourage the incorporation of cryptology topics into mathematics and IT curricula. This can foster a deeper understanding of mathematical concepts and enhance students' problem-solving skills.
- **Development of New Learning Modules:** Policies should support the development of new, engaging learning modules that integrate cryptology methods. These modules can be designed to align with existing educational standards while introducing innovative content that appeals to students' interests.

#### 2. Promotion of Digital Game-Based Learning:

- **Support for Educational Game Development:** Policies should incentivize the development and use of educational digital games that incorporate cryptology. Funding and resources can be allocated to educational technology developers to create high-quality, engaging games that can be used in classrooms.

- **Teacher Training and Resources:** Teachers should be provided with the necessary training and resources to effectively integrate digital game-based learning into their teaching practices. This includes professional development programs focused on the use of educational games and cryptology methods in the classroom.

### 3. Enhancement of Digital Literacy and Security Awareness:

- **Digital Security Curriculum:** Incorporating cryptology into education not only enhances mathematical and logical skills but also raises awareness about information security. Policies should mandate the inclusion of digital security and cryptology in the curriculum to equip students with the knowledge to protect personal data and understand secure data transmission.

- **Critical Thinking and Problem-Solving Skills:** Policies should emphasize the development of critical thinking and problem-solving skills through cryptology education. This can be achieved by integrating activities that require logical reasoning and analytical thinking, preparing students for the challenges of the digital age.

### 4. Encouragement of Innovative Educational Practices:

- **Support for Experiential Learning Models:** The positive feedback from students on the use of cryptology in digital game-based learning suggests that experiential learning models are highly effective. Policies should support the adoption of such models, encouraging hands-on, interactive learning experiences that make education more engaging and effective.

- **Research and Evaluation:** Continuous research and evaluation should be supported to assess the effectiveness of cryptology and digital game-based learning in education. Policies should promote ongoing studies to refine these methods and ensure they meet educational objectives.

### 5. Equity and Accessibility:

- **Ensuring Access for All Students:** Policies must ensure that all students, regardless of their socio-economic background, have access to the technologies and resources needed for digital game-based cryptology education. This includes providing devices, internet access, and software necessary for participation in such innovative learning environments.

- **Inclusive Curriculum Design:** The curriculum should be designed to be inclusive, addressing the diverse needs of students and ensuring that cryptology and digital game-based learning methods are accessible and beneficial to all learners.

By implementing these policy recommendations, educational systems can effectively integrate cryptology methods and digital game-based learning into their curricula, thereby enhancing students' learning experiences and preparing them for the demands of the digital world.

### **Conflict of Interest**

The authors declare no conflict of interest.

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No funding was received for conducting this study.

### **Ethical Statement**

This study was approved by the Ethics Commission of Çanakkale Onsekiz Mart University (approval number: 2023-YÖNP-0180) in 2023. All procedures were carried out in accordance with the relevant guidelines and regulations. Informed consent was obtained from all study participants.

### **Credit Author Statement**

All authors contributed equally to the conceptualization, methodology, data collection, analysis, and writing of this manuscript.

## **References**

- Adamovic, S. Z., Šarac, M., Stamenkovic, U., & Radovanovic, D. (2018). The importance of the using software tools for learning modern cryptography. *International Journal of Engineering Education*, 34, 256-262.
- Arınmış Uzun, S. (2021). Türkiye'de kişisel verilerin korunması ve vatandaş algısının ölçülmesi. *Bilişim Teknolojileri Dergisi*, 14(3), 207-221. <https://doi.org/10.17671/gazibtd.735471>.
- Arkün, S., Baş, T., Avcı, Ü., Çevik, V., & Gürcan, T. (2009). ADDIE tasarım modeline göre web tabanlı bir öğrenme ortamı geliştirilmesi. *Eğitimin Değişen Yüzü: Yeni Paradigmalar Kongresi bildirileri*, 1-7.
- Arora, M., Engles, D. & Sharma, S. (2015). Mds algorithm for encryption. *Journal of Computer Science*, 3(11), 479-483. <https://doi.org/10.3844/jcssp.2015.479.483>
- Bergner, N., Holz, J. & Schroeder, U. (2012). "Cryptography for middle school students in an extracurricular learning place". *Proceedings of the 4th International Conference on Computer Supported Education (CSEDU-2012)*, 265-270.
- Bogdan, R. C., & Biklen, S. K. (2006). *Qualitative Research for Education to Theory and Methods (5th ed.)*. Boston: Allyn & Bacon.

- Buluş, H. N. (2006). *Temel Şifreleme Algoritmaları ve Kripto analizlerinin İncelenmesi*. Yüksek Lisans Tezi, Trakya Üniversitesi Fen Bilimleri Enstitüsü, Edirne.
- Corbin, J. M., & Strauss, A. C. (2007). *Basics of qualitative research: Techniques and procedures for developing grounded theory*. Thousand Oaks, CA: Sage Pub.
- Çeşmeci, M. Ü. (2009). Kriptoloji tarihi. *UEKAE Dergisi*, 1.
- Giacomo, D. D., Ranieri, J. & Lacasa, P. (2017). Digital learning as enhanced learning processing? Cognitive evidence for new insight of smart learning. *Front Psychology*, (8). <https://doi.org/10.3389/fpsyg.2017.01329>
- Griffiths, B.J. (2020). Cryptography in undergraduate education: perceptions of postgraduate students. *Cryptologia*, 45, 553- 562.
- Kiili, K. (2005). Digital game-based learning: Towards an experiential gaming model. *The Internet and Higher Education*, 8(1), 13-24, <https://doi.org/10.1016/j.iheduc.2004.12.001>.
- Lin, K., Wu, T., & Wang, T. (2010). Using competitive digital game-based learning to improve learning motivation.
- Massey, J. L. (1988). An introduction to contemporary cryptology. *Proceedings of the IEEE*, 76(5), 533-549. <https://doi.org/10.1109/5.4440>
- Minović, M., Milovanović, M., Šošević, U., & González, M. A. C. (2015). Visualisation of student learning model in serious games, *Computers in Human Behavior*, 47, 98-107. <https://doi.org/10.1016/j.chb.2014.09.005>.
- Oti, A. (2012) Learning with digital games: a practical guide to engaging students in higher education. *Learning, Media and Technology*, 37(3), 328-330. <https://doi.org/10.1080/17439884.2012.680066>
- Patterson, B.A. (2020). Analyzing student understanding of cryptography using the SOLO taxonomy. *Cryptologia*, 45, 439- 449.
- Percival, N., Rayavaram, P., Narain, S., & Lee, C.S. (2022). CryptoScratch: Developing and evaluating a block-based programming tool for teaching K-12 cryptography education using Scratch. *2022 IEEE Global Engineering Education Conference (EDUCON)*, 1004-1013.
- Prensky, M. (2001). *Digital Natives, Digital Immigrants*. on The Horizon, 9.
- RathiDevi, M.S., YaminiPriya, R., & Sudha, S.V. (2017). Trends of cryptography stepping from ancient to modern. *2017 International Conference on Innovations in Green Energy and Healthcare Technologies (IGEHT)*, 1-9.
- Rocca, C. F. (2005). Cryptology in General Education. *Cryptologia*, 29, 337-342.

- Rubin, A.D. (1997). An Experience Teaching a Graduate Course in Cryptography. *Cryptologia*, 21, 97-109.
- Ryan, G., & Bernard, H. R. (2000). *Data management and analysis methods*. In N. Denzin & Y. Lincoln (Eds.), *Handbook of qualitative research* (pp. 769–802). Thousand Oaks, CA: Sage.
- Sadera W. Li Q., Song L. & Liu L. (2014). Digital game-based learning. *Computers in the Schools*, 31(1), 37–41. <https://doi.org/10.1080/07380569.2014.879801>
- Sakalli, M., Bulus, E., & Buyuksaracoglu, F. (2004). Cryptography education for students. *Information Technology Based Proceedings of the Fifth International Conference on Higher Education and Training, (ITHET 2004)*, 621-626.
- Simms, X., & Chi, H. (2011). Enhancing cryptography education via visualization tools. *ACM-SE '11*.
- Spaht, C. G., Link, W. C., & Martin, R. (2022). *Using Cryptology to Stimulate the Student's Interest in Mathematics Through Applications of Functions and Their Inverses*. Paper presented at 2002 GSW, unknown. <https://doi.org/10.18260/1-2-620-38765>
- Yang, Y.C., & Chang, C. (2013). Empowering students through digital game authorship: Enhancing concentration, critical thinking, and academic achievement. *Computer & Education*, 68, 334-344.
- Yıldırım, A., & Şimşek, H. (2008). *Sosyal Bilimlerde Nitel Araştırma Yöntemleri* (6.Baskı). Ankara: Seçkin Yayıncılık.
- Zapechnikov, S., Miloslavskaya, N., Budzko, V. (2015). On Experience of Using Distance Learning Technologies for Teaching Cryptology. In: Bishop, M., Miloslavskaya, N., Theocharidou, M. (eds) *Information Security Education Across the Curriculum. WISE 2015. IFIP Advances in Information and Communication Technology*, 453. [https://doi.org/10.1007/978-3-319-18500-2\\_10](https://doi.org/10.1007/978-3-319-18500-2_10)