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Trust between Education Stakeholders in Primary School

Research Article

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ABSTRACT

This study also aims to determine the views and expectations of primary school education stakeholders regarding the concept of trust. In line with this study, the phenomenology design was preferred among qualitative research methods. The study group consists of 26 administrators, 24 primary school teachers, 21 elementary school students, and 25 parents whose children are enrolled in elementary schools affiliated with the Kahramanmaraş Provincial Directorate of National Education, selected using simple random sampling during the fall semester of the 2024-2025 academic year. Semi-structured interview questions developed by the researchers were used in the data collection phase of the study. Content analysis was used to analyze the data obtained. The results of the study showed that the stakeholders participating in the study were aware of the educational stakeholders, that bilateral agreements between educational stakeholders should be between teachers and parents and teachers and students, that interaction between educational stakeholders was not sufficient according to teachers and administrators but was sufficient according to students and parents, Effective communication, sense of duty, love, respect, and justice are effective factors in establishing trust among stakeholders, while disrespect, irresponsibility, lack of communication, physical violence, and injustice are factors that cause distrust. Stakeholders expect cooperative behavior, healthy communication, tolerance, and respect from other stakeholders.

Keywords:
Education stakeholders, trust, primary school

Introduction

Human beings are social creatures and therefore constantly interact with the people around them. As individuals acquire certain skills, they begin to interact with the people around them. With interaction, the individual's environment expands. This expansion of the environment begins with the child's transition to the school environment. The people in the expanding environment do not have the same meaning for the individual. There are some people who connect the individual to life and help them develop. The fundamental

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reason for this connection is the mutual trust between individuals. The quality of education and the well-being of the educational environment improve with the trust between stakeholders in the school environment.

When viewed in different contexts, the definition of education takes on different meanings. Education is a process of deliberately changing what exists in accordance with an individual's own desires and experiences through discipline, social services, earnings, learning, and a combination of these (Ertürk, 2017).

According to the Turkish Language Association (TDK), the term stakeholder is defined as a shareholder. Education stakeholders are defined as individuals who are interested in the success of a program or institution, who contribute to this success, and who are affected by it. These stakeholders, who play a key role in the education system, include students, parents, teachers, and school administrators (Waters, 2011). When the literature is examined, it appears that problems arise from stakeholders or situations that affect stakeholders. One of these problems is seen to be insecurity in schools (Kara 2020).

According to the Turkish Language Association (TDK), trust is defined as "the feeling of believing and committing oneself without fear, hesitation, or doubt; security, confidence." There are debates among sociologists and economists who clarify the concept of trust, as well as theorists in the field of social psychology. While sociologists and economists defend the view that trust is a phenomenon reflected by individuals within or outside an organization, theorists in the field of social psychology defend the view that it arises as a result of interpersonal interaction (Worchel, 1979). This situation has given rise to various types of trust.

Conflicts in the definition of trust have also influenced the classification of types of trust. McAllister (1995) examined trust in two categories, emotional and cognitive, focusing on the direction, nature, and outcomes of the relationship (Erdem, 2003). Emotional security is defined as the state of internalizing the value and attention received from others and reflecting it back to them (McAllister, 1995). Cognitive trust is defined as the individual's ability to recognize the person in front of them. This type of trust can be established through honesty, responsibility, and accuracy (Costigan et al. 1998; Koçak, 2019).

Another classification of the concept of trust was made by Shapiro and colleagues (1992) into three categories: knowledge-based, account-based, and identity-based. Knowledge-based trust is a type of trust formed by referring to the existing knowledge base regarding individuals' knowledge of each other. Knowledge-based trust has three sub-dimensions (Shapiro et al., 1992). The first is the contribution of knowledge to trust. In other words, it increases the predictability of behaviors that will be exhibited based on the level of familiarity between individuals. The second is the reinforcement of trust. This refers to avoiding behaviors that could negatively impact trust and acting in a manner consistent with the other person's trust criteria. The third is continuous communication and interaction between individuals. This situation is beneficial in terms of confirming the strengthening of trust between individuals (Lewicki & Bunker, 1996; Değirmenci, 2009). Account-based trust is a type of trust that is based on reason and the benefits it provides in the formation of the concept of mutual trust in individuals (Köksal, 2012; Mcknight et al., 1998). In this type of trust, the formation of the concept of trust among individuals is based on the calculation of mutual gain or loss (Karakuş, 2019). Identification is the understanding of the emotional and mental state of the person opposite the individual and the development of similar emotions and thoughts (Yücel, 2006). The type of trust based on identification is based on mutual identification among individuals. The individual knows the other person very well in terms of emotions and thoughts and knows how they will behave. This type of trust can be considered an advanced form of the other two types of trust (Lewicki & Bunker, 1996).

Education is one of the foremost elements in the development of individuals and society. Communication and interaction among education stakeholders, who are also members of society, are factors that influence this development. One of the concepts that emerges as a result of communication and interaction

among stakeholders is the concept of trust. The education provided with this interpersonal trust can affect the quality of education. Especially in elementary school, which is one of the first environments where children open up to the outside world and meet new people, trust can be more important for children of this age than other concepts. In this context, examining how stakeholders get to know each other at the elementary school level and the interactions that develop between them is thought to make important contributions to the field in terms of identifying the elements that reinforce trust or lead to distrust and revealing the mutual expectations of stakeholders.

The purpose of this study is to determine the views of elementary school education stakeholders regarding the concept of trust among themselves, the factors contributing to the formation of trust and distrust among stakeholders, and their expectations of each other. In line with this general purpose, answers were sought to the following sub-objectives:

Education stakeholders' perception of "education stakeholders."

Education stakeholders' thoughts on bilateral cooperation and objectives.

Education stakeholders' thoughts on the level of interaction between stakeholders.

Education stakeholders' thoughts on the other stakeholder they trust the most.

Education stakeholders' thoughts on the factors that create trust among stakeholders.

Education stakeholders' thoughts on the factors that cause distrust among stakeholders.

Education stakeholders' thoughts on their expectations from the other stakeholder in creating trust among stakeholders.

Methodology

Study Model

This study, which aims to reveal trust among education stakeholders in primary schools, uses the phenomenology pattern from qualitative research methods. Yıldırım and Şimşek (2013) define qualitative research as "a research process that uses data collection methods such as observation, interviews, and document analysis to reveal perceptions and events in a realistic and holistic manner in their natural environment." A phenomenological study is a research design that reveals phenomena we are aware of but do not have a detailed understanding of, with the help of individuals who have experience with them (Creswell, 2016; Patton, 2014). Yıldırım and Şimşek (2011) define phenomenology as "focusing on phenomena that we are aware of but do not have a deep and detailed understanding of."

Study Group

The study group for the research was selected using simple random sampling from primary schools affiliated with the Kahramanmaraş Provincial Directorate of National Education in the fall semester of the 2024-2025 academic year and consisted of 26 administrators, 24 primary school teachers, 21 elementary school students, and 25 parents whose children were enrolled in primary school. Simple random sampling is a type of sampling in which each participant has an equal chance of being selected, without the selection of other participants affecting their chances (Büyüköztürk et al., 2010; Karasar, 2009). The demographic characteristics of the participants in the study are presented in Table 1.

Table 1. Demographic characteristics of participants

participant	*Demographic Characteristics*		$\bar{f}$	%
Administrator	gender	Female	6	33
		Male	20	77
	Educational Degree	University	17	65
		Graduate school	9	35
	Professional Seniority	1-10 Years	12	46
		11-20 Years	7	27
		21-30 Years	4	15,5
		30+ Years	3	11,5
Teacher	gender	Female	16	66,5
		Male	8	33,5
	Educational Degree	University	19	79
		Graduate school	5	21
	Professional Seniority	1-10 Years	10	41,5
		11-20 Years	6	25
		21-30 Years	6	25
		30+ Years	2	8,5
Student	Gender	Female	12	57
		Male	9	43
	Class	1	5	24
		2	5	24
		3	6	28
		4	5	24
	Number of Siblings in Education	1	6	28,5
		2	7	33,5
		3	4	19
		4	3	14
		5+	1	5
Parent	Gender	Female	16	64
		Male	9	36
	Age	20-30	2	8
		31-40	17	68
		41-50	5	20
		51-60	1	4
		60+	0	0
	Educational Degree	Elementary School	0	0
		Middle School	2	8
		high school	5	20
		University	13	52
		Graduate school	5	20
	Number of Children in Education	1	6	24
		2	11	44
		3	5	20
		4	2	8
		5+	1	4

Data Collection Tool and Analysis of Data

In this study, a form developed by the researcher titled "Thoughts on Trust Among Education Stakeholders in Primary Schools" was used as a data collection tool. During the preparation of the form, the researcher conducted a literature review with the help of printed sources, teachers in the field, and researchers who had conducted studies on this topic. This process, also known as "theory triangulation," involves conducting literature reviews through various methods to bring forth diverse and differing perspectives (Başkale, 2016). Following the literature review, the researcher created a pool of 17 questions. The question pool was then presented to experts for their opinions. The questions reviewed by the expert were reduced to 9 questions after content and scope adjustments. The question pool was submitted to expert opinion in order to increase the validity and reliability of the data collection tool, prevent misinterpretation and inadequacy in the literature review, and prevent the formation of closed themes (Creswell, 2017). The 9-question form was piloted with four education stakeholders outside the working group. The responses from the stakeholders were resubmitted to the expert opinion, and guidelines were added at the end of the questions to encourage open-ended responses such as "explain" and "why." Questions with common answers were combined to create a 7-question interview form. The remaining seven questions were piloted again with four different education stakeholders outside of the participants and working group from the first pilot application. The data obtained was analyzed by different researchers, and the analysis results were presented to the participants to obtain their opinion on whether their answers were included in these analyses. After obtaining participant confirmation, the final version of the semi-structured interview form titled "Thoughts on Trust Among Educational Stakeholders in Primary Schools" was finalized.

The interview form consists of two parts: one section containing the demographic characteristics of the participants and another section aimed at determining the thoughts of education stakeholders regarding trust. The data obtained in the study were analyzed using content analysis. Codes were determined using content analysis, relationships between codes were identified, categories were formed, and themes were created by combining categories. According to Silverman (2008), content analysis is a simple method of analysis that involves labeling specific words or groups of words.

Findings

This part of the study, which aims to determine the views and expectations of primary school education stakeholders regarding the concept of trust, presents the responses of the stakeholders who participated in the study to semi-structured interview questions in the form of codes, categories, and theme tables, and includes direct quotations from the stakeholders.

Findings Related to the First Sub-Problem

The first sub-problem of the study was "Who and what comes to mind when you hear the term 'education stakeholders'?" Based on the data obtained, coding was performed and the frequency values of the codes are presented in Table 2.

Table 2. Education Stakeholders' Perception Of "Education Stakeholders"

Scale	*Stakeholder*	*Category*	*Code*	*f*
Multidimensional Stakeholder Perception Shaping Education	School Administration	İnternal School Stakeholders	Teacher	24
			Student	19
			School Administration	13
		Family and Community-Based Stakeholders	Parent	24
			Civil Society Institutions	6
			Unions	1

	Official Corporate Stakeholders	Provincial And District Education Directorates	6
		Government Agencies	5
		Administrative And Municipal Units	1
	Academic Stakeholders	Universities	2
Teacher	İnternal School Stakeholders	Teacher	22
		Student	17
		School Administration	16
	Family And Close Circle Stakeholders	Parent	24
		Social Media	3
	Official Corporate Stakeholders	Provincial And District Education Directorates	5
		Civil Society Institutions	3
		Government Agencies	2
	Academic Stakeholders	Scientists	4
Student	İnternal School Stakeholders	Teacher	20
		School Administration	12
		Classmates	7
		Guidance Counselor	5
	Family And Close Circle Stakeholders	Parent	10
		Sibling	6
		Private Tutor	4
Parent	İnternal School Stakeholders	Teacher	23
		Student	16
		School Administration	14
		School Staff	5
	Family And Community-Based Stakeholders	Parent	19
		Social Media	2
	Official And Academic Stakeholders	Provincial And District Education Directorates	6
		Scientists	5

According to the opinions of primary school administrators, Table 2 was examined and the codes obtained were categorized into four categories: “İnternal School Stakeholders” “Family and Community-Based Stakeholders” “official Corporate Stakeholders” and “Academic Stakeholders” These categories are grouped under the theme of “Multidimensional Stakeholder Perception Shaping Education.” Within the School-Based Stakeholders category under the theme of Multidimensional Stakeholder Perceptions Shaping Education, “Teachers” received the most opinions, while “School Administration” received the fewest opinions. Within the Family and Community-Based Stakeholders category, ‘Parents’ received the most opinions, while “Unions” received the fewest opinions. Within the Official Institutional Stakeholders category, “Provincial and District MEB” received the most opinions, while “Property and Administrative Units”

received the fewest opinions. Within the Academic Stakeholders category, there was only one opinion, namely "Universities."

When the opinions of elementary school administrators in the İnternal School Stakeholders category were examined, it was found that elementary school administrators viewed teachers (n=25), students (n=19), and school administrators (n=13) as educational stakeholders. Based on the responses provided, the opinions of some elementary school administrators are as follows:

S.A5: "Our teachers…"

S.A12: "Teachers, students, and school administrators…"

When examining the opinions of primary school administrators in the Family and Community-Based Stakeholders category, it was noted that primary school administrators viewed parents (n=24), non-governmental organizations (n=6), and unions (n=1) as educational stakeholders. Based on the responses provided, some of the opinions of primary school administrators are as follows:

S.A21: "Teachers, school administrators, parents, civil society organizations, and unions."

When examining the opinions of primary school administrators in the Official Corporate Stakeholders category, it was noted that primary school administrators viewed the Provincial and District MEB (n=6), Official Institutions and Organizations (n=5), and Local and Administrative Units (n=1) as educational stakeholders. Based on the responses provided, the views of some primary school administrators are as follows:

S.A2: "Provincial and district MEB..."

S.A13: "Official institutions and organizations are important stakeholders..."

S.A7: "Local and administrative units..."

When the opinions of elementary school administrators in the Academic Stakeholders category were examined, it was noted that elementary school administrators viewed universities (n=2) as educational stakeholders. Based on the responses provided, some of the opinions of elementary school administrators are as follows:

S.A19: "Universities are also among our stakeholders."

According to the opinions of primary school teachers, Table 2 was examined and four categories were created with the codes obtained: "İnternal School Stakeholders," "Family and Community-Based Stakeholders," "Official Institutional Stakeholders," and "Academic Stakeholders." These categories were grouped under the theme of "Multidimensional Stakeholder Perception Shaping Education." Within the School-Based Stakeholders category under the theme of Multidimensional Stakeholder Perceptions Shaping Education, "Teachers" received the most opinions, while "School Administration" received the fewest opinions. Within the Family and Community-Based Stakeholders category, 'Parents' received the most opinions, while "Social Media" received the fewest opinions. Within the Official Institutional Stakeholders category, "Provincial and District MEB" received the most views, while "Official Institutions and Organizations" received the fewest views. Within the Academic Stakeholders category, there was only one opinion, namely "Scientists."

When the opinions of primary school teachers in the İnternal School Stakeholders category were examined, primary school teachers stated that they saw teachers (n=22), students (n=17), and school administrators (n=16) as educational stakeholders. Based on the answers given, some of the primary school teachers' opinions are as follows:

T3: “Teachers, students...”

T18: “School administrators...”

When the opinions of primary school teachers in the Family and Community-Based Stakeholders category were examined, primary school teachers stated that they viewed parents (n=24) and social media (n=3) as educational stakeholders. Based on the responses provided, some of the primary school teachers' opinions are as follows:

T8: “My parents...”

T17: “Social media is now on its way to becoming an educational stakeholder.”

When the opinions of primary school teachers in the Official Institutional Stakeholders category were examined, it was noted that primary school teachers viewed the Provincial and District MEB (n=5), Non-Governmental Organizations (n=3), and Official Institutions and Organizations (n=2) as educational stakeholders. Based on the responses provided, some of the primary school teachers' opinions are as follows:

T12: “Official institutions and organizations, CSOs...”

T15: “Provincial and district MEB...”

When the opinions of primary school teachers in the Academic Stakeholders category were examined, it was found that primary school teachers viewed scientists (n=4) as educational stakeholders. Based on the responses provided, some of the primary school teachers' opinions are as follows:

T2: “Scientists...”

According to the opinions of elementary school students, Table 2 was examined and two categories were created with the codes obtained: “İnternal School Stakeholders” and “Family and Close Environment Stakeholders.” These categories were grouped under the theme of “Multidimensional Stakeholder Perception Shaping Education.” Within the School-Based Stakeholders category under the theme of “Multidimensional Stakeholder Perception Shaping Education,” ‘Teacher’ received the most opinions, while “Guidance Counselor” received the fewest opinions. Within the Family and Close Environment Stakeholders category, “Parent” received the most opinions, while “Private Teacher” received the fewest opinions.

When examining the opinions of elementary school students in the İnternal School Stakeholders category, elementary school students indicated that they viewed teachers (n=20), school administrators (n=12), classmates (n=16), and guidance counselors (n=5) as educational stakeholders. Based on the responses provided, some of the elementary school students' opinions are as follows:

S7: “My teacher and my friends...”

S13: “My guidance counselor at school...”

S20: “The principal and vice principals...”

When examining the opinions of elementary school students in the Family and Close Environment Stakeholders category, elementary school students indicated that they viewed their parents (n=10), siblings (n=6), and private teachers (n=4) as educational stakeholders. Based on the responses provided, some of the elementary school students' opinions are as follows:

S1: “My mom and dad.”

S19: “My brother/sister.”

S11: “The teacher who comes to our house.”

According to the opinions of parents whose children are enrolled in primary school, Table 2 was examined and three categories were created based on the codes obtained: "İnternal School Stakeholders" "Family and Community-Based Stakeholders" and "Official and Academic Stakeholders." These categories were grouped under the theme of "Multidimensional Stakeholder Perception Shaping Education." Within the School-Based Stakeholders category under the theme of Multidimensional Stakeholder Perceptions Shaping Education, "Teachers" received the most opinions, while "School Staff" received the fewest opinions. Within the Family and Community-Based Stakeholders category, 'Parents' received the most opinions, while "Social Media" received the fewest opinions. Within the Official and Academic Stakeholders category, "Provincial and District MEB" received the most opinions, while "Scientists" received the fewest opinions.

When the opinions of parents whose children attend elementary school were examined in the İnternal School Stakeholders category, parents indicated that they viewed teachers (n=23), students (n=16), school administrators (n=14), and school staff (n=5) as educational stakeholders. Based on the responses provided, some parents' opinions are as follows:

P15: "Teachers, school administration, and other people working in schools."

P2: "Children..."

When the opinions of parents whose children attend elementary school in the Family and Community-Based Stakeholders category were examined, parents indicated that they viewed Parents (n=19) and Social Media (n=2) as education stakeholders. Based on the responses provided, some of the parents' opinions are as follows:

P17: "We parents..."

P6: "Internet environments..."

When the opinions of parents whose children are enrolled in primary school were examined in the Official and Academic Stakeholders category, parents indicated that they viewed the Provincial and District MEB (n=6) and Scientists (n=5) as education stakeholders. Based on the responses provided, some of the parents' opinions are as follows:

P4: "The MEBs in the province and district..."

P11: "Our esteemed scientists."

Findings Related to the Second Sub-Problem

The second sub-problem of the study was "Who do you think should interact the most among education stakeholders? Please explain." Based on the data obtained, coding was performed and the frequency values of the codes are presented in Table 3.

Table 3. Thoughts Of Education Stakeholders On Bilateral Cooperation And İts Objectives

Scale	*Stakeholder*	*Category*	*Code*	*f*
Perception Of Interactive Stakeholder Collaboration In Education	School Administration	Stakeholder Pairs Where Interaction İs A Priority	Teacher-Parent	18
			Teacher-Student	8
			Between Each Stakeholder	3
			Teacher-School Administration	2
		Reasons and Objectives Of Interaction	Because It Forms The Basis Of Stakeholders	7
			ıe Idea That They Need To Get Together The Most	3

		For Student Self-Confidence	2
		To Achieve Academic Success	2
		Responsibility-Related	2
		In A Behavioral Context	1
Teacher	Stakeholder Pairs Where Interaction İs A Priority	Teacher-Parent	15
		Teacher-Student	9
		Teacher-School Administration	4
		Teacher- Teacher	3
		Between Each Stakeholder	2
	Reasons and Objectives Of Interaction	For Cooperation	6
		cause He Was A Student At The Center	2
Student	Stakeholder Pairs Where Interaction İs A Priority	Teacher-Parent	7
		Teacher-School Administration	6
		My Family-Me	4
		Me - My Friends	2
		Teacher- Teacher	2
		Student-School Administration	1
	Reasons and Objectives Of Interaction	Because I Love You So Much	4
		They Support	3
		Communication Training Improves	2
		You Should Make Them Feel Loved	1
Parent	Stakeholder Pairs Where Interaction İs A Priority	Student-Teacher	17
		Student-Parent	13
		Teacher-School Administration	3
	Reasons and Objectives Of Interaction	Parent Supported	5
		achers Should Understand The Family Environment	3
		Education Begins At Home	2
		Teachers Should Be Dedicated	1

According to the opinions of primary school administrators, Table 3 was examined and two categories were created with the codes obtained: “Stakeholder Pairs Where Interaction is a Priority” and “Reasons and Purposes of Interaction.” These categories were grouped under the theme of “Perception of Interactive Stakeholder Cooperation in Education.” Within the category of Stakeholder Pairs Where Interaction is a Priority, which falls under the theme of Perception of Interactive Stakeholder Collaboration in Education, “Teacher-Parent” received the most opinions, while “Teacher-School Administration” received the fewest opinions. Within the category of Reasons and Purposes for Interaction, “Because it forms the basis of stakeholders” received the most opinions, while “In a behavioral context” received the fewest opinions.

When examining the opinions of elementary school administrators in the category of Stakeholder Pairs with Priority Interaction, it was found that elementary school administrators believe that the most interaction among stakeholders should be between Teacher-Parent (n=18), Teacher-Student (n=8), Among All

Stakeholders (n=3), and Teacher-School Administration (n=2). Based on the responses provided, the views of some elementary school administrators are as follows:

S.A24: "It should be between teachers and parents because..."

S.A16: "It should be between teachers and students."

S.A1: "It should be between all stakeholders for academic success."

S.A14: "Between school administration and teachers."

When examining the opinions of primary school administrators in the category of Reasons and Purposes of Interaction, it was found that the primary school administrators believed that the reason for interaction among stakeholders was Because it forms the basis of stakeholders (n=7), The Belief That They Need to Come Together Most Often (n=3), For Student Self-Confidence (n=2), To Achieve Academic Success (n=2), Due to Responsibility (n=2), and In a Behavioral Context (n=1). Based on the answers given, some elementary school administrators' views are as follows:

S.A10: "Teachers spend the most time with students at school, while parents spend the most time with them at home. That's why they form the foundation of stakeholders."

S.A4: "Teachers and students are always together, that's why."

S.A8: "Because of their responsibilities."

S.A1: "To achieve academic success..."

According to the opinions of primary school teachers, Table 3 was examined, and two categories were created with the codes obtained: "Stakeholder Pairs Where Interaction is a Priority" and "Reasons and Purposes of Interaction." These categories were grouped under the theme of "Perception of Interactive Stakeholder Cooperation in Education." Within the category of Stakeholder Pairs Where Interaction is a Priority under the theme of Perception of Interactive Stakeholder Collaboration in Education, "Teacher-Parent" received the most opinions, while "Between All Stakeholders" received the fewest opinions. Within the category of Reasons and Purposes for Interaction, "For Collaboration" received the most opinions, while "Because the Student is at the Center" received the fewest opinions.

When examining the opinions of primary school teachers in the category of Stakeholder Pairs with Priority Interaction, it was found that primary school teachers believe that the most interaction among stakeholders should be between Teacher-Parent (n=15), Teacher-Student (n=9), Teacher-School Administration (n=4), Teacher-Teacher (n=3), Between All Stakeholders (n=2). Based on the responses provided, some primary school teachers ' opinions are as follows:

T8: "On the one hand, it should be between teachers and parents, and on the other hand, it should be between teachers and students."

T2: "It should be between teachers."

T10: "It should be between teachers and administrators."

T20 "It should be between all stakeholders."

When examining the opinions of primary school teachers in the category of Reasons and Purposes of Interaction, primary school teachers stated that the reasons for interaction among stakeholders were Cooperation (n=6) and Student-Centeredness (n=2). Based on the answers given, some of the primary school teachers' opinions are as follows:

T6: "Dual cooperation is very important in this regard."

T16: "We need to put the student at the center."

According to the opinions of elementary school students, Table 3 was examined and two categories were created with the codes obtained: "Stakeholder Pairs Where Interaction is a Priority" and "Reasons and Purposes of Interaction." These categories were grouped under the theme of "Perception of Interactive Stakeholder Cooperation in Education." Within the category of Stakeholder Pairs Where Interaction is a Priority under the theme of Perception of Interactive Stakeholder Collaboration in Education, "Teacher-Parent" received the most opinions, while "Student-School Administration" received the fewest opinions. Within the category of Reasons and Purposes for Interaction, "Because I Love It Very Much" received the most opinions, while "It Should Make You Feel Loved" received the fewest opinions.

When examining the opinions of elementary school students in the category of Stakeholder Pairs with Priority Interaction, it was determined that the most interaction among elementary school students should be between Teacher-Parent (n=7), Teacher-School Administration (n=6), My Family-Me (n=4), Me-My Friends (n=2), Teacher-Teacher (n=2), and Student-School Administration (n=1). Based on the responses provided, the views of some elementary school administrators are as follows:

S1: "It should be between my mother and my teacher."

S8: "Between my teacher and the assistant principal."

S18: "I have a good relationship with my friends."

S2: "Me and my father."

When examining the opinions of elementary school students in the category of Reasons and Purposes of Interaction, elementary school students stated the following reasons for interaction among stakeholders: Because I Love Them Very Much (n=4), They Support Me (n=3), It Improves Communication Skills (n=2), They Should Make Me Feel Loved (n=1). Based on the answers given, the views of some elementary school administrators are as follows:

S16: "Because I love them very much (my family and my teacher)."

S9: "They are always behind me."

S17: "They should make me feel loved."

According to the opinions of parents whose children are enrolled in primary school, Table 3 was examined, and two categories were created based on the codes obtained: "Stakeholder Pairs Where Interaction is a Priority" and "Reasons and Purposes of Interaction." These categories were grouped under the theme of "Perception of Interactive Stakeholder Cooperation in Education." Within the category of Stakeholder Pairs Where Interaction is a Priority, under the theme of Perception of Interactive Stakeholder Cooperation in Education, "Student-Teacher" received the most opinions, while "Teacher-School Administration" received the fewest opinions. Within the category of Reasons and Purposes for Interaction, "Parent Support" received the most opinions, while "Teachers Should Be Self-Sacrificing" received the fewest opinions.

When examining the opinions of parents whose children are enrolled in elementary school in the category of Stakeholder Pairs with Priority Interaction, parents indicated that the most interaction among stakeholders should be between Student-Teacher (n=17), Student-Parent (n=13), and Teacher-School Administration (n=3). Based on the responses provided, some parents' opinions are as follows:

P9: "While our children should have a good relationship with their teachers, they should also get along well with us."

P17: "Teachers and school administration."

When examining the opinions of parents whose children are enrolled in elementary school in the category of Reasons and Purposes of Interaction, it was found that the reasons for interaction among stakeholders were Parent Support (n=5), Teachers Should Understand the Family Environment (n=3), Education Begins at Home (n=2), and Teachers Should Be Self-Sacrificing (n=1). Based on the answers given, some of the parents' opinions are as follows:

P18: "Teachers should understand the family and support us in relation to the student."

P9: "Because education begins at home, not at school."

Findings Related to the Third Sub-Problem

The third sub-problem of the study was "What level of interaction do you think currently exists among education stakeholders? Please explain." Based on the data obtained, coding was performed and the frequency values of the codes are presented in Table 4.

Table 4. Education Stakeholders' Opinions On The Level Of İnteraction Between Stakeholders

Scale	*Stakeholder*	*Category*	*Code*	*f*
Perceived Level Of Interaction Among Education Stakeholders	School Administration	Negative Reviews	Not Sufficient	17
			Social Media-Related	3
			Varies From Person To Person	3
			Know-It-All	2
			Inability To Update Themselves	2
			Irresponsibility	1
		Positive Reviews	Sufficient Level	9
		Influencing Factors	Social	3
			Cultural	2
			Economical	2
	Teacher	Negative Reviews	Not Sufficient	16
			Differences Of Opinion	5
			Parents' Lack Of Education	2
		Positive Reviews	Partially	3
			Sufficient Level	2
		Influencing Factors	Socio-Economically Influential	2
	Student	Positive Reviews	They Get Along Well	19
			Direct Communication	12
			Respectful Conversation	11
			Because There İs Love	8
			They Work Together	2
		Difficulty Statement	They're Pushing Hard In Between	2
	Parent	Negative Reviews	Independent Of Each Other	5
			Not Sufficient	3
			Very Different	2
			Should Be Increased	1
		Positive Reviews	Good Level	14
			Intermediate Level	4
			Solution-Oriented	1

According to the opinions of primary school administrators, Table 4 was examined and three categories were created with the codes obtained: "Negative Evaluations," "Positive Evaluations," and "Influencing Factors." These categories were grouped under the theme of "Perception of the Level of Interaction Among Education Stakeholders." Within the Negative Evaluations category under the theme of Perception of the Level of Interaction Among Education Stakeholders, "Not Sufficient" received the most opinions, while 'Irresponsibility' received the fewest opinions. Within the Positive Evaluations category, there was only one opinion, "Sufficient." Within the Influencing Factors category, "Social" received the most opinions, while 'Cultural' and "Economic" received the fewest opinions.

When examining the opinions of elementary school administrators in the Negative Evaluations category, it was found that elementary school administrators expressed opinions such as Not Sufficient Level (n=17), Social Media-Related (n=3), Varies Depending on the Person (n=3), Know-it-all (n=2), Unable to keep up to date (n=2), Irresponsibility (n=1) were mentioned. Based on the answers given, some of the primary school administrators' opinions are as follows;

S.A26: "Interaction between stakeholders is not sufficient. Our parents are know-it-alls. They do not fulfill their responsibilities."

S.A20: "It varies from stakeholder to stakeholder."

S.A15: "Our teachers are unable to update themselves. They have become slaves to social media."

When the opinions of elementary school administrators in the Positive Evaluations category were examined, elementary school administrators stated that the level of interaction among stakeholders was adequate (n=9). Based on the responses given, the opinions of some elementary school administrators are as follows:

S.A6: "The level of interaction among stakeholders is adequate."

When examining the opinions of primary school administrators in the Influencing Factors category, primary school administrators indicated their views on factors affecting the level of interaction among stakeholders in terms of social (n=3), cultural (n=2), and economic (n=2) factors. Based on the responses provided, some of the opinions of primary school administrators are as follows:

S.A23: "One of the biggest things that affects interaction among stakeholders is the social, cultural, and economic characteristics of the area."

According to the opinions of primary school teachers, Table 4 was examined and three categories were created with the codes obtained: "Negative Evaluations," "Positive Evaluations," and "Influencing Factors." These categories were grouped under the theme of "Perception of the Level of Interaction Among Education Stakeholders." Within the Negative Evaluations category under the theme of "Perception of the Level of Interaction Among Education Stakeholders," "Not Sufficient" received the most opinions, while "Parents' Lack of Education" received the fewest opinions. Within the Positive Evaluations category, "Partially" received the most opinions, while "Sufficient Level" received the fewest opinions. Within the Influencing Factors category, there was a single opinion stating "Socio-Economic Factors Are Influential."

When examining the opinions of primary school teachers in the Negative Evaluations category, elementary school administrators indicated that the level of interaction among stakeholders was Not Sufficient (n=16), Disagreements (n=5), and Parents' Lack of Education (n=2). Based on the responses given, some of the primary school teachers' opinions are as follows:

T24: "Communication between stakeholders is not very adequate in this era. No one respects anyone else's opinion."

T4: "Our parents misunderstand us and our teachers because they are uneducated."

When the opinions of primary school teachers in the Positive Evaluations category were examined, elementary school administrators indicated that the level of interaction among stakeholders was Partially Adequate (n=3) and Adequate (n=2). Based on the responses provided, some primary school teachers' opinions are as follows:

T11: "Communication between stakeholders is adequate at our school."

T13: "Interaction between stakeholders is partially adequate."

When examining the opinions of primary school teachers in the Influencing Factors category, primary school teachers stated that socio-economic factors influence the level of interaction among stakeholders (n=2). Based on the responses provided, some primary school teachers' opinions are as follows:

T22: "I have worked in many schools, and this situation can vary somewhat from a socio-economic perspective."

According to the opinions of elementary school students, Table 4 was examined and two categories were created with the codes obtained: "Positive Evaluations" and "Expression of Difficulty." These categories were grouped under the theme of "Perception of the Level of Interaction Among Education Stakeholders." Within the Positive Evaluations category under the theme of Perception of the Level of Interaction Among Education Stakeholders, "They get along well" received the most opinions, while "They work together" received the fewest opinions. Within the Expression of Difficulty category, there is only one opinion, "They struggle with each other."

When examining the opinions of elementary school students in the Positive Evaluations category, it was found that elementary school students expressed opinions such as They Get Along Well (n=19), Direct Communication (n=12), Respectful Conversation (n=11), Because There Is Love (n=8), and They Work Together (n=2). Based on the responses provided, some of the elementary school students' opinions are as follows:

S4: "My mother and my teacher get along well. When something happens, I can call my mother right away."

S10: "When I see my mother and teacher talking, I see that they speak very respectfully. They love each other."

S15: "My mother and teacher work at the same school."

When examining the opinions of elementary school students in the Difficulty Expression category, elementary school students expressed the opinion that the level of interaction among stakeholders was difficult (n=2). Based on the answers given, some of the elementary school students' opinions are as follows:

S21: "When they are together, they sometimes make it difficult for me. ☹"

According to the opinions of parents whose children are enrolled in primary school, Table 4 was examined, and two categories were created based on the codes obtained: "Negative Evaluations" and "Positive Evaluations." These categories were grouped under the theme of "Perception of the Level of Interaction Among Education Stakeholders." Within the Negative Evaluations category under the theme of "Perception of the Level of Interaction Among Education Stakeholders," "Independent of Each Other" received the most opinions, while "Should Be Increased" received the fewest opinions. Within the Positive Evaluations category, "Good Level" received the most opinions, while "Solution-Oriented" received the fewest opinions.

When examining the opinions of parents whose children are enrolled in elementary school in the Negative Evaluations category, parents expressed the following opinions regarding the level of interaction among stakeholders: Independent of Each Other (n=5), Not Sufficient (n=3), Very Different (n=2), Should Be Increased (n=1). Based on the responses provided, some parents' opinions are as follows:

P1: "Everyone acts independently. Very different."

P13: "Interpersonal interaction is not sufficient."

P24: "Not sufficient but should be increased."

When the opinions of parents whose children are enrolled in primary school were examined in the Positive Evaluations category, parents indicated Good Level (n=14), Medium Level (n=4), and Solution-Oriented (n=1) opinions regarding the level of interaction among stakeholders. Based on the responses provided, some parents' opinions are as follows:

P12: "We have a very good relationship with our teacher and always have solution-oriented conversations."

P20: "Moderate."

Findings Related to the Fourth Sub-Problem

The fourth sub-problem of the study was "Who do you trust the most among education stakeholders? Why?" Based on the data obtained, coding was performed and the frequency values of the codes are presented in Table 5.

Table 5. Thoughts Of Education Stakeholders Regarding The Other Stakeholder They Trust The Most

Scale	*Stakeholder*	*Category*	*Code*	*f*
The Most Trusted Stakeholder Among Education Stakeholders And The Reasons Why	School Administration	Trusted Stakeholders	Teacher	20
			School Administration	4
			Parent	3
			Provincial And District Education Directorates	2
		Reasons For Trust	Relevant	5
			Direct Impact	4
			Knowledgeable	2
			Accountable	2
	Teacher	Trusted Stakeholders	Teacher	20
			School Administration	7
			Student	4
			Parent	3
		Reasons For Trust	Being On The Field	5
			Hard Work	2
			Pure - Innocent	1
	Student	Trusted Stakeholders	Teacher	12
			My Family	9
		Reasons For Trust	I Don't Tell Anyone My Secrets	6
			I Trust Them More	5
			They Are Always Behind Me	4

			I Love Them	4
			I Know Him Better	4
			He Behaves Very Well	4
			He Gives Good Education	3
	Parent	Trusted Stakeholders	Teacher	23
			School Administration	3
			My Child	2
		Reasons For Trust	Transparent Communication	4
			Comes After Family	3
			The Most Important Person	3
			Objective	3
			Direct Impact	3
			Provides Good Education	2

According to the opinions of primary school administrators, Table 5 was examined and two categories were created with the codes obtained: "Trusted Stakeholders" and "Reasons for Trust." These categories were grouped under the theme of "The Most Trusted Stakeholders Among Education Stakeholders and the Reasons for Trust." Within the Trusted Stakeholders category under the theme of Most Trusted Stakeholders Among Education Stakeholders and Reasons for Trust, "Teachers" received the most opinions, while "District MEB" received the fewest opinions. Within the Reasons for Trust category, 'Relevant' received the most opinions, while "Responsible" received the fewest opinions.

When examining the opinions of primary school administrators in the Trusted Stakeholders category, the most trusted stakeholders among primary school administrators were identified as Teachers (n=20), School Administration (n=4), Parents (n=3), and Provincial/District Ministry of Education (n=2). Based on the responses provided, the opinions of some primary school administrators are as follows:

S.A10: "I trust my teachers and fellow administrators."

S.A18: "I trust parents."

S.A11: "I trust my institutional superiors, i.e., the individuals at the provincial and district MEB."

When examining the opinions of elementary school administrators in the Reasons for Trust category, the following opinions were expressed regarding why elementary school administrators trust so much: Relevant (n=5), Direct Impact (n=4), Knowledgeable (n=2), Responsible (n=2). According to the responses, some elementary school administrators' opinions are as follows:

S.A3: "Our teachers and parents are very concerned and knowledgeable. Both sides are aware of their responsibilities."

S.A9: "Our teachers are in direct communication with both us and the parents."

According to the opinions of primary school teachers, Table 5 was examined and two categories were created with the codes obtained: "Trusted Stakeholders" and "Reasons for Trust." These categories were grouped under the theme of "The Most Trusted Stakeholders Among Education Stakeholders and the Reasons for Trust." Within the Trusted Stakeholders category under the theme of Most Trusted Stakeholders Among Education Stakeholders and Reasons for Trust, "Teachers" received the most opinions, while 'Parents'

received the fewest opinions. Within the Reasons for Trust category, “Being on the Field” received the most opinions, while “Pure - Innocent” received the fewest opinions.

When the opinions of primary school teachers in the Trusted Stakeholders category were examined, the most trusted stakeholders among primary school teachers were identified as Teachers (n=20), School Administration (n=7), Students (n=4), and Parents (n=3). Based on the responses provided, some of the primary school teachers' opinions are as follows:

T19: “Among the stakeholders, I trust us teachers the most. Then my dear students.”

T1: “I trust my school principal.”

T23: “I trust my children's families.”

When examining the opinions of primary school teachers in the Reasons for Trust category, the following reasons for why primary school teachers trust them so much were mentioned: Being in the Field (n=5), Hardworking (n=2), Innocent (n=1). Based on the answers given, some of the primary school teachers' opinions are as follows:

T21: “I trust hardworking teachers who are present in the field.”

T19: “Because my children are very young, they are very innocent and pure.”

According to the opinions of elementary school students, Table 5 was examined and two categories were created with the codes obtained: “Trusted Stakeholders” and “Reasons for Trust.” These categories were grouped under the theme of “The Most Trusted Stakeholders Among Education Stakeholders and the Reasons for Trust.” Within the Trusted Stakeholders category under the theme of Most Trusted Stakeholders Among Education Stakeholders and Reasons for Trust, “Teacher” received the most opinions, while “My Family” received the fewest opinions. Within the Reasons for Trust category, “Doesn't Tell Anyone My Secrets” received the most opinions, while “Provides Good Education” received the fewest opinions.

When examining the opinions of elementary school students in the Trusted Stakeholders category, the most trusted stakeholders among elementary school students were identified as Teachers (n=12) and Family (n=9). Based on the responses provided, some of the opinions of elementary school students are as follows:

S5: “I trust my teacher.”

S14: “I trust my family.”

When examining the opinions of elementary school students in the Reasons for Trust category, the top reasons why elementary school students trust others are: They Don't Tell Anyone My Secrets (n=6), I Trust Them More (n=5), They Are Always Behind Me (n=4), I Love Them (n=4), I Know Them Better (n=4), They Behave Very Well (n=4), They Provide Good Education (n=3). Based on the answers given, some of the elementary school students' opinions are as follows:

S5: “I don't share my secrets with my friends in class.”

S14: “They are my family and always have my back. I trust them more.”

S17: “I love them more because they are my family.”

S21: “My teacher is very kind.”

S6: “Because they teach us lessons.”

According to the opinions of parents whose children are enrolled in primary school, Table 5 was examined, and two categories were created based on the codes obtained: “Trusted Stakeholders” and “Reasons for Trust.” These categories were grouped under the theme of “The Most Trusted Stakeholders Among

Education Stakeholders and the Reasons for Trust." Within the Trusted Stakeholders category under the theme of Most Trusted Stakeholders Among Education Stakeholders and Reasons for Trust, "Teachers" received the most opinions, while "My Child" received the fewest opinions. Within the Reasons for Trust category, "Transparent Communication" received the most opinions, while "Providing Good Education" received the fewest opinions.

When examining the opinions of parents whose children are enrolled in primary school in the Trusted Stakeholders category, the most trusted stakeholders were identified as Teachers (n=23), School Administration (n=3), and My Child (n=2). Based on the responses provided, some parents' opinions are as follows:

P7: "I trust our teacher very much."

P25: "I trust the school principal."

P16: "I trust my child more."

When examining the opinions of parents whose children are enrolled in elementary school in the "Reasons for Trust" category, the following views were expressed regarding why parents trust the school: Transparent Communication (n=4), Comes After Family (n=3), Most Important Person (n=3), Objective (n=3), Direct Impact (n=3), and Provides Good Education (n=2). Based on the responses provided, some parents' opinions are as follows:

P7: "Because after family comes the teacher, who has direct contact with the student."

P10: "Because the most important person in education is the teacher."

P19: "Because administrators are very impartial towards us."

P5: "Teachers provide good education."

Findings Related to the Fifth Sub-Problem

The fifth sub-problem of the study was "What are your thoughts on the factors that ensure trust among education stakeholders?" Based on the data obtained, coding was performed and the frequency values of the codes are presented in Table 6.

Table 6. Education Stakeholders' Thoughts On Factors That Build Trust Among Stakeholders

Scale	*Stakeholder*	*Category*	*Code*	*f*
Factors That Build Trust Among Education Stakeholders	School Administration	Individual Characteristics And Attitudes	Sense Of Duty	7
			Attitude	5
			Behavior	4
			Seriousness	3
			Honesty	3
		Social And Communication Elements	Effective Communication	8
			Mutual Understanding	6
			Teamwork	4
			Respect	3
			Tolerance	2
			Valuing Others	2

	Principles Of Justice And Equality	Behaving Fairly	4
		Behaving Equitably	3
	Knowledge And Equipment	Information Equipment	3
Teacher	Individual And Ethical Characteristics	Honesty	5
		Goodwill	3
		Sense Of Duty	3
		Love	3
		Sincerity	2
	Social And Communication Elements	Effective Communication	14
		Respect	8
		Cooperation	8
		Mutual Understanding	5
		Transparency	4
Student	Elements Of Trust And Emotional Support	Trustworthy	10
		Supportive	9
		Discreet	7
		Motherly	6
	Quality Of Education And Recognition	You Should Know Me Well	7
		he Quality Of The Education Provided	6
	Ethical And Behavioral Characteristics	Good Communication Skills	10
		Honesty	9
		Good Behavior	7
Parent	Ethical And Relationship-Based Elements	Love	6
		Respect	5
		Trustworthiness	4
		Sincerity	3
		Honesty	2
		Building Relationships	2
	Communication And Cooperation	Effective Communication	6
		Accessibility	3
		Cooperation	3
		Dynamism	2
	Quality And Equity In Education	Healthy Education	6
		Care	4
		Fairness	2

According to the opinions of primary school administrators, Table 6 was examined and the codes obtained were categorized into four categories: “Individual Characteristics and Attitudes,” “Social and Communication Elements,” “Principles of Justice and Equality,” and “Knowledge and Equipment.” These categories were grouped under the theme of “Factors that Build Trust Among Education Stakeholders.”

Within the Individual Characteristics and Attitudes category under the theme of Factors Creating Trust Among Education Stakeholders, "Sense of Duty" received the most opinions, while 'Seriousness' and "Honesty" received the fewest opinions. Within the Social and Communication Elements category, "Effective Communication" received the most opinions, while "Tolerance" and 'Valuing' received the fewest opinions. Within the Principles of Justice and Equality category, "Behaving Fairly" received the most opinions, while "Behaving Equitably" received the fewest opinions. Within the Knowledge and Equipment category, there is only one opinion, namely "Knowledge Equipment."

When examining the opinions of primary school administrators in the Individual Characteristics and Attitudes category, the following factors were identified as contributing to trust among stakeholders: Sense of Duty (n=7), Attitude (n=5), Behavior (n=4), Seriousness (n=3), and Honesty (n=3). Based on the responses provided, the views of some primary school administrators are as follows:

S.A25: "A sense of duty must be reflected in behavior. The rest will follow naturally."

S.A22: "People should do their jobs honestly."

S.A7: "If teachers do their jobs seriously, the people on the other side will also take steps toward this attitude."

When examining the opinions of primary school administrators in the Social and Communication Elements category, the following views were expressed regarding the factors that build trust among stakeholders: Effective Communication (n=8), Mutual Understanding (n=6), Teamwork (n=4), Respect (n=3), Tolerance (n=2), and Valuing (n=2). Based on the responses provided, the views of some primary school administrators are as follows:

S.A10: "Effective communication, cooperation, and mutual understanding are essential."

S.A6: "Mutual respect and tolerance."

S.A9: "One must value their work and the person."

When examining the opinions of primary school administrators in the Justice and Equality Principles category, it was noted that primary school administrators expressed opinions regarding factors that build trust among stakeholders, such as Acting Fairly (n=4) and Acting Equitably (n=3). Based on the responses provided, some of the opinions of primary school administrators are as follows:

S.A18: "One should act fairly and equitably."

When examining the opinions of elementary school administrators in the Knowledge and Equipment category, it was noted that elementary school administrators expressed their views on Knowledge Equipment (n=4) as a factor that builds trust among stakeholders. Based on the responses provided, some of the opinions of elementary school administrators are as follows:

S.A13: "If a person is knowledgeable and equipped, they will get along better with others."

According to the opinions of primary school teachers, Table 6 was examined and two categories were created with the codes obtained: "Individual and Ethical Characteristics" and "Social and Communication Elements." These categories were grouped under the theme of "Factors That Build Trust Among Education Stakeholders." Within the Individual and Ethical Characteristics category under the theme of Factors Contributing to Trust Among Education Stakeholders, "Honesty" received the most opinions, while "Sincerity" received the fewest opinions. Within the Social and Communication Elements category, "Effective Communication" received the most opinions, while "Transparency" received the fewest opinions.

When examining the opinions of primary school teachers in the Individual and Ethical Characteristics category, the following factors were mentioned as contributing to trust among stakeholders: Honesty (n=5), Goodwill (n=3), Sense of Duty (n=3), Love (n=3), and Sincerity (n=2). Based on the responses provided, some of the primary school teachers' opinions are as follows:

T5: "Honesty, sense of duty, and sincerity."

T14: "Goodwill is necessary."

When examining the opinions of primary school teachers in the Social and Communication Elements category, the following views were expressed regarding the factors that build trust among stakeholders: Effective Communication (n=14), Respect (n=8), Cooperation (n=8), Mutual Understanding (n=5), Transparency (n=4). Based on the responses provided, some of the primary school teachers' opinions are as follows:

T12: "Effective communication and cooperation are necessary."

T23: "Transparency and mutual understanding are important at this point."

According to the opinions of elementary school students, Table 6 was examined and three categories were created with the codes obtained: "Trust and Emotional Support Elements," "Education Quality and Recognition," and "Ethical and Behavioral Characteristics." These categories were grouped under the theme of "Factors Creating Trust Among Education Stakeholders." Within the Trust and Emotional Support Elements category under the theme of Factors That Build Trust Among Education Stakeholders, "Trust" received the most opinions, while "Should Be Like a Mother" received the fewest opinions. Within the Education Quality and Recognition category, "They Should Know Me Well" received the most opinions, while "The Education They Provide Should Be Good" received the fewest opinions. Within the Ethical and Behavioral Characteristics category, "They Should Communicate Well" received the most opinions, while "They Should Behave Well" received the fewest opinions.

When examining the opinions of elementary school students in the Trust and Emotional Support Factors category, the following opinions were expressed regarding the factors that create trust among stakeholders: Trust (n=10), Should Be Supportive (n=9), Should Be Able to Keep Secrets (n=7), Should Be Like a Mother (n=6). Based on the responses provided, some of the elementary school students' views are as follows:

S16: "I need to trust them; they should support me in every way."

S12: "I would trust my teacher if they were like a mother."

S9: "They should not share my secrets with anyone."

When examining the opinions of elementary school students in the Education Quality and Recognition category, the following opinions were expressed regarding the factors that build trust among stakeholders: "They should know me well" (n=7) and "The education they provide should be good" (n=6). Based on the answers given, some of the elementary school students' opinions are as follows:

S12: "They should know me well."

S3: "They should teach us well."

When examining the opinions of elementary school students in the Ethics and Behavioral Characteristics category, the following opinions were expressed regarding the factors that build trust among stakeholders: Good Communication (n=10), Honesty (n=9), and Good Behavior (n=7). Based on the answers given, some of the elementary school students' opinions are as follows:

S10: "They should talk to us openly about everything."

S21: "If they treat us well, I can trust them."

According to the opinions of parents whose children are enrolled in primary school, Table 6 was examined and three categories were created based on the codes obtained: "Ethical and Relationship-Based Elements," "Communication and Cooperation," and "Educational Quality and Justice." These categories were grouped under the theme of "Factors That Build Trust Among Education Stakeholders." Within the Ethical and Relationship-Based Elements category under the theme of Factors That Build Trust Among Education Stakeholders, "Love" received the most opinions, while 'Honesty' and "Establishing Connections" received the fewest opinions. Within the Communication and Cooperation category, "Effective Communication" received the most views, while 'Dynamism' received the fewest views. Within the Education Quality and Justice category, "Healthy Education" received the most views, while "Fairness" received the fewest views.

When examining the opinions of parents whose children are enrolled in elementary school in the Ethical and Relationship-Based Elements category, the following opinions were expressed regarding the factors that build trust among stakeholders: Love (n=6), Respect (n=5), Reliability (n=4), Sincerity (n=3), Honesty (n=2), and Bonding (n=2). Based on the responses provided, some parents' opinions are as follows:

P22: "Love, respect, honesty."

P6: "I need to trust the teacher."

When examining the opinions of parents whose children are enrolled in elementary school in the Communication and Cooperation category, parents indicated Effective Communication (n=6), Accessibility (n=3), Cooperation (n=3), and Dynamism (n=2) as factors that build trust among stakeholders. Based on the responses provided, some parents' opinions are as follows:

P14: "They need to collaborate with us and maintain constant communication."

P21: "They need to have a dynamic personality."

When examining the opinions of parents whose children are enrolled in primary school in the Education Quality and Justice category, parents expressed opinions regarding factors that build trust among stakeholders, such as Healthy Education (n=6), Caring (n=4), and Fairness (n=2). Based on the responses provided, some parents' opinions are as follows:

P23: "They need to communicate with us in a healthy way. We have had teachers who did not care about us and yelled at us."

Findings Related to the Sixth Sub-Problem

The sixth sub-question of the study was "What factors do you think cause mistrust among education stakeholders? Please explain." Based on the data obtained, coding was performed and the frequency values of the codes are presented in Table 7.

Table 7. Education Stakeholders' Thoughts On Factors Causing Mistrust Among Stakeholders

Scale	*Stakeholder*	*Category*	*Code*	*f*
Factors Causing Mistrust Among Education Stakeholders	School Administration	Individual And Ethical Shortcomings	Unfair Treatment	9
			Lack Of Professionalism	8
			Disrespect	3
			Lack Of Appreciation	2
			Lack Of Communication	9

	Communication And Relationship Problems	Inconsistency	4
	Differences In Perception And Understanding	Differences İn Perspective	7
		Making Distinctions	4
Teacher	Individual Ethical And Behavioral Deficiencies	Irresponsibility	5
		Disrespect	4
		Lack Of Objectivity	3
		Hypocrisy	2
		Dishonesty	2
		Indifference	1
	Communication And Social Relationship Problems	Lack Of Communication	8
		Prejudice	5
		Complaints	3
		Jealousy	3
		Gossip	2
	Negative Attitudes Toward Perceptions Of Justice And Trust	Injustice	4
Student	Behavioral Negativity That Undermines Trust	Telling Secrets	11
		Lying	8
		Stealing	3
		Cheating	1
	Issues Of Justice And Equality	Unfair Treatment	10
		Racist Attitude	1
	Physical Security Breaches	Physical Violence	9
Parent	Communication And Consistency Issues	Lack Of Communication	5
		Inconsistent Actions	3
		Failure To Keep Promises	2
	Ethical And Responsibility Deficiencies	Unfairness	5
		Disrespect	3
		Indifference	3
		Irresponsibility	2
	Structural And Socio-Cultural Factors	Level Of Education	3
		he Link Between Education And Politics	2

According to the opinions of primary school administrators, Table 7 was examined and three categories were created with the codes obtained: “Individual and Ethical Inadequacies,” “Communication and Relationship Problems,” and “Perception and Understanding Differences.” These categories were grouped under the theme of “Factors Causing Distrust Among Education Stakeholders.” Within the category of Individual and Ethical Inadequacies under the theme of Factors Causing Distrust Among Education Stakeholders, “Unfair Behavior” received the most opinions, while “Lack of Appreciation” received the fewest

opinions. Within the Communication and Relationship Problems category, "Lack of Communication" received the most opinions, while 'Inconsistency' received the fewest opinions. Within the Perception and Understanding Differences category, "Differences in Perspective" received the most opinions, while "Discrimination" received the fewest opinions.

When examining the opinions of primary school administrators in the category of Individual and Ethical Inadequacies, the following factors were identified as causing mistrust among stakeholders: Unfair Treatment (n=9), Lack of Awareness of Responsibilities (n=8), Disrespect (n=3), and Lack of Appreciation (n=2). Based on the responses provided, the views of some primary school administrators are as follows:

S.A9: "An administrator values their teachers and treats them fairly. If they don't, nothing will be right."

S.A24: "If no one does their job, the wheel won't turn."

When examining the opinions of elementary school administrators in the Communication and Relationship Problems category, it was noted that elementary school administrators cited Lack of Communication (n=9) and Inconsistency (n=4) as factors causing mistrust among stakeholders. Based on the responses provided, some of the opinions of elementary school administrators are as follows:

S.A15: "If there is a lack of communication, no connection can be established."

S.A6: "Inconsistent work should not be done. Everyone should stand behind the work they do."

When examining the opinions of elementary school administrators in the Perception and Understanding Differences category, the following opinions were expressed regarding factors causing mistrust among stakeholders: Perspective Differences (n=7) and Discrimination (n=4). Based on the responses provided, the opinions of some elementary school administrators are as follows:

S.A19: "There may be mistrust stemming from differences in perspective."

S.A16: "If administrators discriminate."

According to the opinions of primary school teachers, Table 7 was examined and the codes obtained were categorized into three categories: "Individual Ethical and Behavioral Deficiencies," "Communication and Social Relationship Problems," and "Negative Attitudes Toward Justice and Trust Perception." These categories were grouped under the theme of "Factors Causing Distrust Among Education Stakeholders." Within the category of Individual Ethical and Behavioral Deficiencies under the theme of Factors Causing Distrust Among Education Stakeholders, "Irresponsibility" received the most opinions, while "Indifference" received the fewest opinions. Within the Communication and Social Relationship Problems category, "Lack of Communication" received the most opinions, while 'Gossip' received the fewest opinions. Within the Negative Attitudes Towards Justice and Trust Perception category, there was only one opinion, namely "Injustice."

When examining the opinions of primary school teachers in the Individual Ethics and Behavioral Deficiencies category, the factors causing distrust among stakeholders were identified as Irresponsibility (n=5), Disrespect (n=4), Lack of Objectivity (n=3), Hypocrisy (n=2), Dishonesty (n=2), and Indifference (n=1). Based on the responses provided, some of the primary school teachers' opinions are as follows:

T11: "Irresponsibility and indifference."

T19: "If one is not objective."

T23: "In cases of hypocrisy and dishonesty."

When examining the opinions of primary school teachers in the Communication and Social Relationship Problems category, the following factors were identified as causing mistrust among stakeholders: Lack of

Communication (n=8), Prejudice (n=5), Complaints (n=3), Jealousy (n=3), and Gossip (n=2). Based on the responses provided, some of the primary school teachers' opinions are as follows:

T21: "Lack of communication and prejudice."

T1: "Complaints and gossip in the teachers' lounge."

When examining the opinions of primary school teachers in the category of Negative Attitudes Towards Perceptions of Justice and Trust, primary school teachers expressed the opinion of Injustice (n=4) regarding factors causing distrust among stakeholders. Based on the answers given, some of the primary school teachers' opinions are as follows:

T6: "Injustice is the most important factor at this point."

According to the opinions of elementary school students, Table 7 was examined and the codes obtained were categorized into three categories: "Behavioral Negativity that Undermines the Foundation of Trust," "Issues of Justice and Equality," and "Physical Security Violations." These categories were grouped under the theme of "Factors Causing Distrust Among Education Stakeholders." Within the category of Behavioral Negativity Undermining the Foundation of Trust, which falls under the theme of Factors Causing Distrust Among Education Stakeholders, "Sharing Secrets" received the most opinions, while "Cheating" received the fewest opinions. Within the category of Justice and Equality Issues, "Unfair Behavior" received the most opinions, while "Racist Approach" received the fewest opinions. Within the category of Physical Security Violations, there was only one opinion, namely "Physical Violence."

When examining the opinions of elementary school students in the category of Behavioral Negativity that Undermines Trust, the following factors were identified as causing distrust among stakeholders: Sharing Secrets (n=11), Lying (n=8), Stealing (n=3), and Cheating (n=1). Based on the responses provided, some of the elementary school students' views are as follows:

S9: "Sharing my secrets with others and lying..."

S17: "My friends cheating or stealing."

When examining the opinions of elementary school students in the Justice and Equality Issues category, it was noted that elementary school students expressed opinions regarding factors causing distrust among stakeholders, such as Unfair Behavior (n=10) and Racist Attitude (n=1). Based on the responses provided, some of the opinions of elementary school students are as follows:

S3: "My teacher's unfair behavior."

When examining the opinions of elementary school students in the Physical Security Violations category, elementary school students expressed opinions regarding Physical Violence (n=9) as a factor causing distrust among stakeholders. Based on the answers given, some of the elementary school students' opinions are as follows:

S20: "Our teacher beating us."

According to the opinions of parents whose children are enrolled in primary school, Table 7 was examined, and the codes obtained were categorized into three categories: "Communication and Consistency Problems," "Ethical and Responsibility Deficiencies," and "Structural and Socio-Cultural Factors." These categories were grouped under the theme of "Factors Causing Distrust Among Education Stakeholders." Within the Communication and Consistency Problems category under the theme of Factors Causing Distrust Among Education Stakeholders, "Lack of Communication" received the most opinions, while "Failure to Keep Promises" received the fewest opinions. Within the category of Ethical and Responsibility Deficiencies, "Unfair Treatment" received the most views, while 'Irresponsibility' received the fewest views. Within the

category of Structural and Socio-Cultural Factors, "Level of Education" received the most views, while "Education-Politics Link" received the fewest views.

When examining the opinions of parents whose children are enrolled in elementary school in the Communication and Consistency Problems category, parents indicated that the factors causing mistrust among stakeholders were Lack of Communication (n=5), Inconsistent Actions (n=3), and Failure to Keep Promises (n=2). Based on the responses provided, some parents' opinions are as follows:

P3: "The teacher's lack of communication and inconsistent actions."

P16: "Not keeping their promises."

When examining the opinions of parents whose children are enrolled in elementary school in the category of Ethical and Responsibility Deficiencies, parents indicated the following factors contributing to mistrust among stakeholders: Unfair Treatment (n=5), Disrespect (n=3), Indifference (n=3), and Irresponsibility (n=2). Based on the responses provided, some parents' opinions are as follows:

P11: "Discriminating between students and behaving indifferently."

P23: "Behaving indifferently and irresponsibly."

When examining the opinions of parents whose children are enrolled in primary school in the Structural and Socio-Cultural Factors category, parents' opinions regarding factors causing mistrust among stakeholders were expressed in terms of Educational Level (n=3) and Education-Politics Connection (n=2). Based on the responses provided, some parents' views are as follows:

P5: "The lack of education of teachers and parents."

P25: "The political ties of teachers and school administrators."

Findings Related to the Seventh Sub-Problem

The seventh sub-problem of the study was "What are your expectations from other stakeholders in building trust among education stakeholders? Please explain." Based on the data obtained, coding was performed and the frequency values of the codes are presented in Table 8.

Table 8. Thoughts Of Education Stakeholders Regarding Their Expectations From Other Stakeholders İn Establishing Trust Among Stakeholders

Scale	*Stakeholder*	*Category*	*Code*	*f*
Expectations Of Education Stakeholders Regarding The Formation Of Trust	School Administration	Corporation And Participation	Cooperation	11
			Willingness	4
		Individual Attitude And Awareness	Responsibility İs A Must	7
			Be Conscious	5
			Open-Mindedness	3
		Ethical And Social Values	Healthy Communication	12
			Justice	7
			Respect	5
			Tolerance	3
	Teacher	Cooperation And Relationship Management	Healthy Communication	12
			Cooperation	11
			Understanding	4

		Empathy	3
		Sincerity	2
	Individual Attitude And Responsibility	Responsibility	6
		Honesty	2
	Social And Ethical Values	Respect	8
		Tolerance	4
		Interest	4
		Love	3
Student	Good Behavior And Emotional Support	Love	9
		Respect	8
		Be Kind	6
		Make Them Feel İmportant	2
	Family And Social Support	Family-Directed	11
	Ethical Values And Educational Quality	Honesty	5
		Good Education	2
Parent	Communication And Environment Management	Healthy Communication	11
		Comfortable Environment	5
		The System Must Be Fixed From The Top Down	5
		Family Education Must Be Provided	3
		Joint Decision-Making	3
		Teachers Must Be Freed From Pressure	2
	Ethical And Social Values	Respect	5
		Responsibility	4
		Understanding	3
		Fairness	3
		Cooperation	3
		Honesty	2
	Quality Of Education And Discipline	Order And Discipline	6
		Good Education	4
		Interest Should Be Increased	3

According to the opinions of primary school administrators, Table 8 was examined and three categories were created with the codes obtained: “Cooperation and Participation,” “Individual Attitude and Awareness,” and “Ethical and Social Values.” These categories were grouped under the theme of “Expectations of Education Stakeholders from Counterparties in Building Trust.” Within the Cooperation and Participation category under the theme of “Expectations of the Other Party in the Formation of Trust Among Education Stakeholders,” ‘Cooperation’ received the most opinions, while “Willingness” received the fewest opinions. Within the Individual Attitude and Awareness category, “Responsibility” received the most opinions, while “Open-mindedness” received the fewest opinions. Within the Ethical and Social Values category, “Healthy Communication” received the most opinions, while “Tolerance” received the fewest opinions.

When examining the opinions of primary school administrators in the Cooperation and Participation category, it was noted that primary school administrators expressed the views of Cooperation (n=11) and Willingness (n=4) regarding their expectations from other stakeholders in establishing trust among stakeholders. Based on the responses provided, the views of some primary school administrators are as follows:

S.A2: "There should be cooperation among stakeholders."

S.A8: "Each stakeholder should perform their duties with enthusiasm."

When examining the opinions of primary school administrators in the Individual Attitude and Awareness category, it was noted that primary school administrators expressed the following views regarding their expectations of other stakeholders in establishing trust among stakeholders: Responsibility (n=7), Awareness (n=5), and Open-mindedness (n=3). Based on the responses provided, the views of some primary school administrators are as follows:

S.A20: "If teachers are responsible, it makes our job easier."

S.A14: "Everyone should express their opinions clearly."

When examining the opinions of primary school administrators in the Ethical and Social Values category, it was noted that primary school administrators expressed opinions regarding expectations from other stakeholders in establishing trust among stakeholders, including Healthy Communication (n=12), Justice (n=7), Respect (n=5), and Tolerance (n=3). Based on the responses provided, the views of some primary school administrators are as follows:

S.A18: "Healthy communication, respect, and tolerance."

S.A21: "Justice must be upheld."

According to the opinions of primary school teachers, Table 8 shows that three categories were created with the codes obtained: "Cooperation and Relationship Management," "Individual Attitude and Responsibility," and "Social and Ethical Values." These categories were grouped under the theme of "Expectations of Education Stakeholders from Counterparties in Building Trust." Within the Cooperation and Relationship Management category under the theme of Educational Stakeholders' Expectations from Counterparties in Building Trust, "Healthy Communication" received the most opinions, while "Sincerity" received the fewest opinions. Within the Individual Attitude and Responsibility category, "Responsibility Should Be Present" received the most opinions, while "Honesty" received the fewest opinions. Within the Social and Ethical Values category, 'Respect' received the most opinions, while "Love" received the fewest opinions.

When examining the opinions of primary school teachers in the Cooperation and Relationship Management category, it was found that primary school teachers expressed opinions regarding the expectations of other stakeholders in establishing trust among stakeholders, such as Healthy Communication (n=12), Cooperation (n=11), Understanding (n=4), Cooperation (n=3), and Sincerity (n=2). Based on the responses given, some of the primary school teachers' opinions are as follows:

T17: "Cooperation should be achieved through healthy communication."

T24: "There should be mutual understanding; false sincerity should not be established."

When examining the opinions of primary school teachers in the Individual Attitude and Responsibility category, it was noted that primary school teachers expressed the views that Responsibility (n=6) and Honesty (n=2) should be expected from other stakeholders in order to build trust among stakeholders. Based on the responses provided, some of the primary school teachers' opinions are as follows:

T6: “Parents should be responsible.”

T4: “Parents should be honest and instill this in their children.”

When examining the opinions of primary school teachers in the Social and Ethical Values category, the following views were expressed regarding their expectations of other stakeholders in establishing trust among stakeholders: Respect (n=8), Tolerance (n=4), Interest (n=4), and Love (n=3). Based on the responses given, some of the primary school teachers' opinions are as follows:

T10: “Parents should not forget that we are human beings too and should approach us with love, respect, and tolerance.”

T18: “Parents should be interested in the education we provide.”

According to the opinions of elementary school students, Table 8 was examined and three categories were created with the codes obtained: “Good Behavior and Emotional Support,” “Family and Social Support,” and “Ethical Values and Education Quality.” These categories were grouped under the theme of “Expectations of Education Stakeholders from Counterparties in Building Trust.” Within the Good Behavior and Emotional Support category under the theme of Educational Stakeholders' Expectations of Counterparties in Building Trust, “Love” received the most opinions, while “Making Them Feel Important” received the fewest opinions. Within the Family and Social Support category, there is a single opinion: “My Family Should Guide Me.” Within the “Ethical Values and Educational Quality” category, ‘Honesty’ received the most opinions, while “Good Education” received the fewest opinions.

When examining the opinions of elementary school students in the Good Behavior and Emotional Support category, the following opinions were expressed regarding their expectations of other stakeholders in building trust among stakeholders: Love (n=9), Respect (n=8), Need to Be Good (n=6), and Make Me Feel Important (n=2). Based on the responses provided, some of the elementary school students' views are as follows:

S2: “There should be love and respect.”

S20: “My teacher should see me as an individual.”

When examining the opinions of elementary school students in the Family and Social Support category, it was noted that elementary school students expressed the opinion that their families should guide them (n=11) in terms of their expectations from other stakeholders in building trust among stakeholders. Based on the answers given, some of the opinions of elementary school students are as follows:

S15: “My family should guide me in this matter.”

When examining the opinions of elementary school students in the Ethical Values and Educational Quality category, it was noted that elementary school students expressed opinions regarding honesty (n=5) and good education (n=2) in relation to their expectations of other stakeholders in establishing trust among stakeholders. Based on the responses provided, some of the opinions of elementary school students are as follows:

S16: “They should be honest with me.”

S11: “My teacher should provide a good education.”

According to the opinions of parents whose children are enrolled in primary school, Table 8 was examined, and the codes obtained were categorized into three categories: “Communication and Environment Management,” “Ethical and Social Values,” and “Educational Quality and Discipline.” These categories were grouped under the theme of “Expectations of Education Stakeholders from Counterparties in Building Trust.”

Within the Communication and Environment Management category under the theme of Expectations of Counterparties in Building Trust among Education Stakeholders, "Healthy Communication" received the most opinions, while "Teachers Should Be Freed from Pressure" received the fewest opinions. Within the "Ethical and Social Values" category, "Respect" received the most opinions, while 'Honesty' received the fewest opinions. Within the "Education Quality and Discipline" category, "Order and Discipline" received the most opinions, while "Interest Should Be Increased" received the fewest opinions.

When examining the opinions of parents whose children are enrolled in primary school in the Communication and Environment Management category, it was found that parents' expectations of other stakeholders in terms of building trust among stakeholders were as follows: Healthy Communication (n=11), Comfortable Environment (n=5), The System Should Be Fixed from the Beginning (n=5), Family Education Should Be Provided (n=3), Joint Decision (n=3), Teachers Should Be Relieved of Pressure (n=2). Based on the responses given, some of the parents' opinions are as follows:

P20: "Teachers should communicate well with us. We should make decisions together on important issues."

P12: "Teachers should educate not only the child but also us."

P24: "Teachers should be relieved of pressure."

When examining the opinions of parents whose children are enrolled in elementary school in the Ethics and Social Values category, it was found that parents expressed expectations regarding the establishment of trust among stakeholders, including Respect (n=5), Responsibility (n=4), Understanding (n=3), Fairness (n=3), Cooperation (n=3), and Honesty (n=2). Based on the responses provided, some parents' opinions are as follows:

P1: "There should be an environment of love, respect, and tolerance."

P5: "There should be cooperation and understanding."

P18: "There should be honesty between the parties."

When examining the opinions of parents whose children are enrolled in primary school in the Education Quality and Discipline category, parents expressed their expectations of other stakeholders in terms of establishing trust among stakeholders, stating that there should be Order and Discipline (n=6), Good Education (n=4), and Increased Interest (n=3). Based on the responses provided, some parents' opinions are as follows:

P11: "Teachers should ensure order and discipline."

P3: "Teachers should increase their interest in students and parents."

Conclusion, Discussion and Suggestions

The first sub-question posed to the stakeholders participating in the study was, "When you hear the term 'education stakeholders,' who and what comes to mind?" Based on the results obtained, it was observed that most stakeholders predominantly associated the term with "teachers, students, parents, school administrators, and provincial/district MEB." It is noteworthy that school administrators and teachers have a more institutional perception of education stakeholders, while teachers and parents view "social media" as an education stakeholder. Karip (2015) revealed in his study that this is due to the areas of responsibility of administrators and teachers, whom he defined as education leaders. Kraft and Dougherty (2013) found in their study that social media and the internet are a necessity of the age, leading to them being seen as stakeholders in terms of ensuring the quality of education and the sharing of information (Greenhow & Lewin, 2016). This study also concluded that each stakeholder actually has some prior knowledge about education stakeholders in general. The reason for this may be that primary school teachers and administrators have

increased their pedagogical knowledge by pursuing postgraduate education rather than limiting themselves to undergraduate education. The reason for parents' extensive knowledge on this subject may be due to their good educational background, their concern for the education provided to their children, and their awareness of education. Students' knowledge of the subject may stem from spending time with stakeholders throughout the educational process. In general, it is evident that all stakeholders are aware that education is not limited to teachers and students, as school-family collaboration has increased in recent years.

The second sub-question posed to the stakeholders participating in the study was, "Who do you think should interact the most among education stakeholders? Please explain." Based on the results obtained, it was observed that most stakeholders focused on opinions such as "teacher-parent" and "teacher-student." This situation is consistent with Bryson's (2004) strategic stakeholder status within education. In education, harmony and agreement between actors such as teachers and parents, who are in managerial positions from the child's perspective, can facilitate better progress in the process of achieving the desired behavioral change (Leithwood & Jantzi, 2006). Tsuyuguchi (2023) concluded in his study that higher levels of trust among teachers within schools had a positive impact on their students' academic and social achievements. The reason for bringing stakeholders together under a limited common umbrella in this study may be that teachers, students, and parents, who are the three pillars of education, are seen as key stakeholders, that the teacher-parent duo acts as a bridge in the child's academic success, and that the student-teacher duo is at the heart of education. The reason why these two views are more popular among other stakeholders may be that while relationships among other stakeholders are more limited, relationships between these pairs are more sincere and frequent.

The third sub-question posed to the stakeholders participating in the study was, "What level of interaction do you think currently exists among education stakeholders? Please explain." Based on the results obtained, the majority opinion among teachers and administrators was that the level of interaction was insufficient and that they were independent of one another, while the majority opinion among parents and students was that the level of interaction was sufficient. Ainscow et al. (2012) considered collaboration among stakeholders to be an important step in ensuring inclusivity. In our study, the statement that stakeholders are independent of one another may actually stem from a lack of communication and collaboration among them. Teachers and administrators tend to view the interaction between stakeholders from an institutional perspective, while parents and students tend to view it from a social perspective, which is noteworthy. Epstein (2001) concluded in his study that cooperation between school and family positively affects children's academic achievement. Pianta and Stuhlman (2004) concluded that good relationships between students and teachers also positively affect children's social skills. In our study, administrators and teachers who said that the level was not sufficient may have had reduced immunity due to heavy workloads, viewed the situation more professionally, and had higher expectations. The reason parents and students find it sufficient may be due to their perception of a more sincere relationship, a shared educational goal, and their desire to experience this interaction in a more emotional and concrete way, while children may be more inclined to establish pure and innocent relationships compared to other stakeholders.

The fourth sub-question posed to the stakeholders participating in the study was "Who do you trust the most among education stakeholders? Why?" Based on the results obtained, it was observed that all stakeholders focused most on the "teacher" opinion. Babaoğlan and colleagues (2018) concluded in their study that parents exhibit inappropriate behavior toward teachers, while Özdoğru (2021) found in their study that parents do not trust teachers very much. Karataş and Çakar (2018) concluded in their study that parents' interference in primary school teachers' work was seen as a risk by teachers. In this study, on the contrary, it is noteworthy that all stakeholders trust teachers the most. This situation may be attributed to the socio-

cultural characteristics of the region where the study was conducted, such as the high value society places on teachers, the role model status of teachers within society, and the image of teachers within society.

The fifth sub-question posed to the stakeholders participating in the study was, "What are your thoughts on the factors that build trust among education stakeholders?" Based on the results obtained, it was observed that all stakeholders focused on views such as "communication, sense of duty, reliability, love, respect, justice, and sincerity." Calp and Kaşkaya (2020) concluded in their study that when primary school teachers get to know their students, the students' academic achievement takes precedence over other personality, emotional, interest, expectation, and other characteristics. Demirel (2008) and Öneren et al. (2016) concluded in their study with teachers that transparency and information sharing form the foundation of trust in organizational trust among stakeholders. Halıcı et al. (2015) concluded that cooperation is the basis of this trust. The literature also contains findings that communication, task distribution, and fairness are factors in establishing trust between managers and employees (Arslan & Gül, 2022). Holzer and Daumiller (2025) emphasized the importance of the concept of justice in building trust in the classroom in their study with teachers and students, concluding that classes with a developed sense of justice also had high levels of participation and motivation. In this study, the reason for the presence of factors such as effective communication, love, respect, justice, and sense of duty is that communication is seen as one of the important elements of interaction among stakeholders, and that the basis of the mistrust previously experienced by stakeholders is disrespect, injustice, lack of love, the perception that trust can naturally form when each stakeholder fulfills their role, and the fact that justice forms the foundation of trust.

The sixth sub-question posed to the stakeholders participating in the study was, "What do you think are the factors causing mistrust among education stakeholders? Please explain." Based on the results obtained, it was observed that all stakeholders focused on views such as "lack of communication, unfair treatment, inconsistencies, irresponsibility, disrespect, and physical violence." In their study, Karataş and Çakan (2018) found that teachers view the involvement of parents in many areas of the process as a problem. On the other hand, the inconsistencies and behavioral disorders of parents also hinder this situation, as evidenced in the literature (Orçan Kaçan et al., 2019). Özmen et al. (2016) concluded in their study that factors such as lack of communication and insufficient information lead to mistrust between parents and teachers. Altuntaş and Sulak (2022) revealed verbal and physical bullying among peers in primary schools in their study. They concluded that students exposed to such bullying were insecure. Zhao et al. (2024) concluded in their study that excessive psychological control reduces feelings of trust; they also concluded that the foundation of trust within the school is formed by factors within the family. This study also found that the reasons for such factors causing insecurity included stakeholders suffering from such situations, having been exposed to such problems in the past or from their peers, the possibility of teachers or administrators who have worked in the profession for a long time being involved in such cases or work environments, parents not fulfilling their promises, stakeholders not fulfilling their responsibilities, and students experiencing physical bullying from their teachers or peers.

The seventh sub-question posed to the stakeholders participating in the study was, "What are your expectations of other stakeholders in terms of building trust among education stakeholders? Please explain." Based on the results obtained, it is observed that all stakeholders focus on expectations such as "cooperation, healthy communication, justice, sense of responsibility, respect, and love." Bryk and Schneider (2002) concluded in their study that concepts such as mutual responsibility and cooperation would support the establishment of trust in the school environment. Similarly, teachers have also found that concepts such as tolerance, sincerity, and empathy are effective in building trust (Moran, 2004). Epstein (2001) concluded that systematic cooperation is necessary for a successful school system. In this study, the reason why stakeholders' expectations of each other are in this direction is that the reason for their expectation of cooperation is a

common good education, the reason for their expectation of healthy communication is to solve problems through open and transparent dialogue, the reason for their expectation of justice is their previous experience of biased attitudes, their expectation of responsibility stems from not wanting the process to be disrupted, and their expectation of respect and love stems from wanting to form an emotional bond with the other person.

Suggestions

Social or scientific activities can be organized to bring together education stakeholders inside or outside the school.

Agenda items related to the concept of "trust" can be created in cooperation with the school and families.

Provincial and district MEBs can organize training and seminars for education stakeholders on the concept of "trust."

School administrators and teachers can visit families. If they already do so, they can increase the frequency of visits.

A review of the literature reveals that there is little research on trust among educational stakeholders in primary schools. More research could be conducted to demonstrate the trust relationship between stakeholders in a more concrete manner.

Author Contribution Rates

All authors have taken equal responsibility for all stages of the article. All authors have read and approved the final version of the paper.

Ethics Committee Approval

This research has been approved by the Kahramanmaraş Sütçü İmam University Social and Human Sciences Ethics Committee with decision no. 7, taken at the meeting dated 03.11.2023 and numbered 2023-40. In addition, all authors mentioned in the study have contributed equally to the study and there is no conflict of interest among the authors.

Declaration of Conflict of Interest

The authors declare that they do not have a conflict of interest with any organizations or persons within the scope of the study.

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Mathematical Processing Errors and Self-Efficacy Levels in the Use of Mathematics among Pre-Service Science Teachers in Analytical Chemistry Course

Research Article

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ABSTRACT

This study aims to explore the relationship between pre-service science teachers' mathematical operation errors in the Analytical Chemistry course and their self-efficacy in applying mathematics within chemistry contexts. A mixed-methods approach was employed, specifically utilizing a convergent parallel design. The study sample consisted of 176 teacher candidates. Two instruments developed by the researchers were used for data collection: the "Achievement Test for Using Mathematics in Analytical Chemistry" and the "Self-Efficacy Scale for the Use of Mathematics in Chemistry." Both content and correlational analyses were performed to interpret achievement, error, and scale scores. Eighteen distinct types of mathematical errors were identified in responses to the achievement test, which were classified into four categories: operational errors, procedural errors, knowledge-based errors, and comprehension errors. The achievement test results indicated that participants exhibited frequent mathematical operation errors. The self-efficacy scores indicated a moderate level of confidence in using mathematics. Correlation analysis revealed that an increase in error scores was associated with a decrease in both achievement and self-efficacy scores.

Keywords:
Science education, analytical chemistry, mathematics, operational errors, self-efficacy

Introduction

Numerous studies have examined the challenges students face due to mathematical concepts in science classes. Students with insufficient mathematical knowledge often encounter significant difficulties in understanding and applying scientific content (Özdemir, 2006). A key factor contributing to these difficulties is students' inability to transfer mathematical knowledge to science contexts (Bing, & Redish, 2009; Karaca,

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2010). In other words, a fundamental issue is the inadequacy of students' mathematical background (Avcı, 2006; Stephens, Ellis, Blanton, & Brizuela, 2017).

This deficiency also poses challenges for teachers, making it difficult to explain mathematics-related topics in science courses. To address these challenges and promote meaningful learning, it is crucial to emphasize the interdisciplinary connection between mathematics and science (Aydın, 2011; Cengiz, Uzunoğlu & Daşdemir, 2012; Czerniak, Weber, Sandmann, & Ahern, 1999; Çavaş, 2002; Çeken & Ayas, 2010).

Mastery of mathematics and its accurate and effective use is a fundamental prerequisite for success in science education. A student who can correctly perform unit conversions between mathematical quantities is more capable of analyzing variable relationships in equations or scientific problems. Thus, students' ability to apply mathematical knowledge significantly affects their academic performance in science (Deringöl & Gülten, 2016; Kuo, Hull, Gupta, & Elby, 2013; Meltzer, 2002; Scott, 2012; Yaman & Gülten, 2015). One of the primary reasons for underachievement in both science and mathematics lies in the lack of integration between these two disciplines. Students' inadequate foundational skills in mathematics present challenges in both teaching and learning scientific concepts (Bütüner & Uzun, 2011; Redish, 2006; Tai, Sadler, & Loehr, 2005).

Given the mathematical procedures, concepts, and terminology embedded in science content, integrating mathematics into science instruction is essential. Only through such integration can learning become meaningful, enduring, and coherent between disciplines, ultimately improving learning outcomes (Berlin, & White, 1994;. Hurley, 2001; Lederman & Niess, 1997). According to Basista and Mathews (2002), mathematics serves as a language that enables detailed analysis of scientific content and applications. Presenting scientific knowledge within mathematical contexts helps learners develop more precise and reliable understandings.

Students with limited mathematical competence may develop negative attitudes toward science. To facilitate logical comprehension and long-term retention of knowledge and skills, science and mathematics must be taught in a complementary manner. Studies from various countries have demonstrated a positive correlation between mathematics achievement and science performance. These studies highlight that, although science and mathematics are distinct disciplines, they are inherently interconnected. Therefore, sustained science learning requires a strong mathematical foundation (Benbow, 1992; Hoban, Finlayson & Nolan, 2013).

The science curriculum is rich in mathematical relationships and patterns. For students to grasp these structures, they must relate them to their mathematical knowledge. Given the interdependence of science and mathematics, and the reliance of scientific concepts on numerical representation, mathematical understanding is essential for success in science (Brookhart, Walsh & Zientarski, 2006; Haigh & Rehfeld, 1995; Watanabe & Huntley, 1998).

Self-efficacy significantly influences students' task selection, motivation, learning persistence, and academic success (Pajares, 1996). From a socio-cognitive perspective, self-regulated learning requires students to implement strategies aligned with their capabilities and goals (Zimmerman, 1995). Belief in one's ability enhances predictability and facilitates goal setting, making academic objectives more concrete (Bandura, 1993). Confidence in one's competence fosters emotional, cognitive, and behavioral self-regulation, thereby enhancing awareness of how actions affect learning outcomes (Bandura, 1995).

Students with high self-efficacy tend to monitor their progress and assess their goal proximity effectively. Studies have shown that this positively influences academic performance (Schunk & Zimmerman, 1998). Moreover, such students outperform their peers in problem-solving and time management (Bouffard-Bouchard, Parent, & Larivee, 1991). Self-efficacy also interacts with students' knowledge and skill levels; it

does not function independently (Pajares & Miller, 1994). Therefore, self-efficacy is essential not only for acquiring new knowledge or skills but also for applying them effectively (Teti & Gelfand, 1991).

In this study, the "Achievement Test for the Use of Mathematics in Analytical Chemistry" was employed to identify the mathematical operation errors of pre-service science teachers. Additionally, the "Self-Efficacy Scale for the Use of Mathematics in Chemistry" was used to assess their perceived competence in applying mathematics. The study examined the relationship between error scores and self-efficacy levels, as well as the correlations among error scores, achievement test results, and self-efficacy scores within the context of analytical chemistry instruction.

Research Problem

What is the relationship between the mathematical operation errors made by pre-service science teachers in the analytical chemistry course and their self-efficacy levels and achievement test scores regarding the use of mathematics in chemistry?

Sub-Problems of the Research

1. What are the mathematical operation errors made by pre-service science teachers in the analytical chemistry course?

2. What are the self-efficacy levels of pre-service science teachers regarding the use of mathematics in chemistry?

3. Is there a relationship between pre-service science teachers' mathematical operation error scores in the analytical chemistry course and their scores on the Achievement Test for the Use of Mathematics in Analytical Chemistry?

4. Is there a relationship between pre-service science teachers' mathematical operation error scores in the analytical chemistry course and their scores on the Self-Efficacy Scale for the Use of Mathematics in Chemistry?

5. Is there a relationship between pre-service science teachers' scores on the Achievement Test for the Use of Mathematics in Analytical Chemistry and their scores on the Self-Efficacy Scale for the Use of Mathematics in Chemistry?

Methodology

This study employed a convergent parallel design, one of the fundamental mixed-methods research approaches, to examine the relationship between pre-service science teachers' mathematical operation errors in the Analytical Chemistry course and their self-efficacy levels concerning the use of mathematics in chemistry. As both quantitative and qualitative data provide distinct perspectives, their integration enabled the researchers to explore the research problem from multiple angles. Both data types were collected concurrently. To complement the quantitative data, open-ended questions corresponding to the items in the quantitative instrument were included. Additionally, this study aimed to assess science teacher candidates' self-efficacy and functioned as a scale development study. The research utilized two instruments developed by the authors: the "Achievement Test for the Use of Mathematics in Analytical Chemistry" and the "Self-Efficacy Scale for the Use of Mathematics in Chemistry."

Achievement Test for the Use of Mathematics in Analytical Chemistry

An open-ended achievement test was developed by the researchers to identify the mathematical operation errors made by pre-service science teachers when solving analytical chemistry problems. The test items covered operations with integers, decimal numbers, exponents, square roots, logarithmic calculations, ratio and proportion, and unit conversions. Content validity was ensured through expert reviews by two

chemistry education specialists and two mathematics education experts. The initial draft comprised nine open-ended questions. A pilot study was conducted with 54 pre-service science teachers. Based on expert feedback, certain questions were omitted, and others were revised for clarity. The final version, consisting of seven open-ended questions, was then administered to participants.

Self-Efficacy Scale for the Use of Mathematics in Chemistry

This scale was developed to assess pre-service science teachers' self-efficacy in applying mathematics in chemistry contexts. The development process comprised the following steps:

1. Defining the Construct: The goal was to design an instrument that measures pre-service science teachers' beliefs about their self-efficacy in using mathematics within chemistry.

2. Item Pool Development: Initially, 17 items were drafted 13 positively and 4 negatively worded. An expert evaluation form was created to assess each item's clarity and relevance. Content validity indices were calculated, and items were refined based on feedback.

3. Measurement Format Selection: A Likert-type scale was adopted based on expert recommendations. Positively worded items were scored from 1 (Strongly Disagree) to 5 (Strongly Agree), while negatively worded items were reverse-coded.

4. Expert Review: The draft scale was evaluated by nine faculty members three from educational sciences, one from Turkish education, three from science education, and two from mathematics education. Items were revised for grammatical accuracy, clarity, and content relevance. The finalized version contained 17 items.

5. Pilot Testing: A preliminary pilot study was conducted with 28 pre-service science teachers to identify ambiguous items and measure completion time. Following adjustments, the full pilot was conducted with 54 volunteer participants. Incomplete, inconsistent, or random responses were excluded from analysis.

6. Validity, Reliability, and Item Analysis:

- Validity: Construct validity was tested via Exploratory Factor Analysis (EFA) using Promax rotation to reduce variables and enhance variance explanation. A three-factor structure emerged based on eigenvalues greater than 1, confirmed by the scree plot.

- Reliability: Cronbach's alpha was computed for the entire scale and each sub-dimension, indicating high internal consistency.

- Item Analysis: Item-total correlation coefficients ranged from 0.304 to 0.694. Items with correlations below 0.30 were removed.

7. Finalizing the Scale: In alignment with Can, Günhan, and Erdal (2005) and expert recommendations, three sub-dimensions were established:

- Application of Mathematics (Items: 1, 8, 10, 12, 13, 16)
- Mathematical Skills (Items: 7, 9, 11, 15)
- Mathematical Self-Perception (Items: 2, 6, 17)

Analysis of Data

Qualitative Analysis

In the "Achievement Test for the Use of Mathematics in Analytical Chemistry," each question was scored independently based on its components, with a maximum of 10 points allocated per question. The total maximum score for the test was 70. To calculate each student's error score, one point was assigned for each

incorrect or unanswered item, whereas correct responses were scored as zero. The data obtained were analyzed using both qualitative and quantitative methods. Through this analysis, a total of 18 distinct types of errors were identified and categorized under four overarching themes.

Quantitative Analysis

The quantitative data were analyzed using SPSS version 21.0. The mean score of each item on the Self-Efficacy Scale for the Use of Mathematics in Chemistry was calculated to determine the participants' levels of self-efficacy. Tekin's (1993) scale interpretation chart was employed to evaluate levels of agreement, which in turn facilitated the assessment of teacher candidates' self-efficacy (Demirci, 2017). The self-efficacy scale consisted of 13 items, with possible total scores ranging from 13 to 65. To examine the relationships among achievement scores, error scores, and self-efficacy scores, correlation analysis was conducted. The interpretation of correlation coefficients is as follows: $r < 0.25$: very weak correlation; $r = 0.25–0.49$: weak correlation; $r = 0.50–0.69$: moderate correlation; $r = 0.70–0.89$: strong correlation; $r \geq 0.90$: very strong correlation (Çimen, 2015).

Findings

1. Findings of the First Sub-Problem

Based on the results of the content analysis, the errors identified in students' responses were classified into four main categories, as summarized in Table 1.

Table 1. Error categories and contents

Operational errors	Errors involving operations with whole numbers, decimals, and exponential numbers; errors in converting between decimal and exponential numbers; errors in calculating square roots of integers and exponentials; and unit conversion errors (e.g., grams to milligrams).
Errors caused by the solution path	Inability to establish correct mathematical equations, incorrect application of given formulas, incomplete or incorrect use of information provided in the question, failure to express proportional relationships, and inability to calculate percentages.
Errors Due to Lack of Knowledge	Errors resulting from insufficient knowledge needed to solve problems, such as calculating the mean of a data set, determining molecular weight, calculating ion concentrations, and understanding logarithmic properties.
Comprehension Errors	Use of values not provided in the question, failure to substitute given values into formulas, and unnecessary or inappropriate use of formulas during problem-solving.

The frequency and percentage values of the error types made by pre-service teachers are shown in Table 2.

Table 2. Frequency and % values of error types

Error Categories	f	%
Operational errors	**684**	**100**
With integers	114	16.67
With decimal numbers	92	13.45
With exponents	87	12.72
Decimal–exponential conversion	100	14.62
Square roots (integers)	86	12.57
Square roots (exponentials)	98	14.33
Unit conversion	107	15.64
Errors caused by the solution path	**135**	**100**

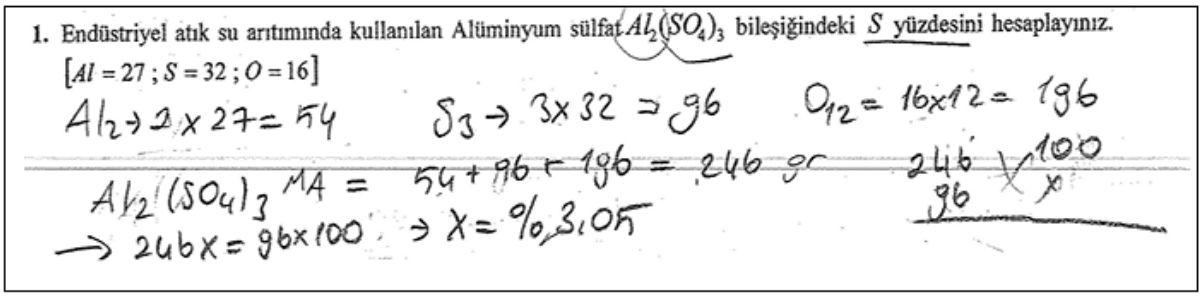
Ratio–proportion calculation	22	16.30
Percentage calculation	12	8.89
Mathematical equation formulation	39	28.89
Misuse of given information	19	14.07
Incorrect formula application	43	31.85
Errors Due to Lack of Knowledge	**297**	**100**
Mean value calculation	92	30.98
Molecular weight calculation	57	19.19
Ion concentration calculation	66	22.22
Logarithmic function properties	82	27.61
Comprehension Errors	**149**	**100**
Unnecessary data/formula usage	44	29.53
Incorrect or incomplete formula use	105	70.47

An analysis of Table 2 reveals the following findings: Within the category of operational errors, the most frequently occurring issue was related to integer operations (16.67%), whereas the least frequent error involved square root calculations with integers (12.57%). In the category of solution-path errors, the most common mistake was the incorrect application of formulas (31.85%), while the least common error was the inability to calculate percentages (8.89%). For knowledge-based errors, the most frequent issue was the inability to calculate the mean value of a data set (30.98%), whereas errors in calculating molecular weight were the least frequent (19.19%). In the category of comprehension errors, the most prevalent mistake was the failure to correctly substitute values into formulas and carry out the required operations (70.47%), while the least common issue was the inclusion of unnecessary data or formulas (29.53%).

Examples of Student Responses According to Error Categories

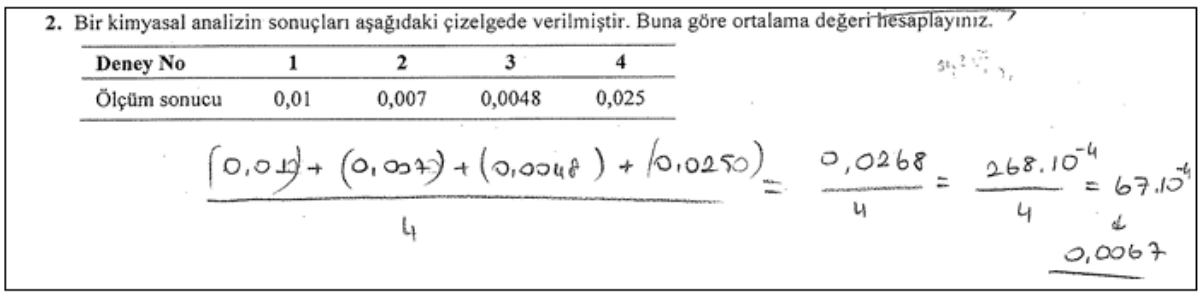
1) Operational errors

a) Integer Operation Error



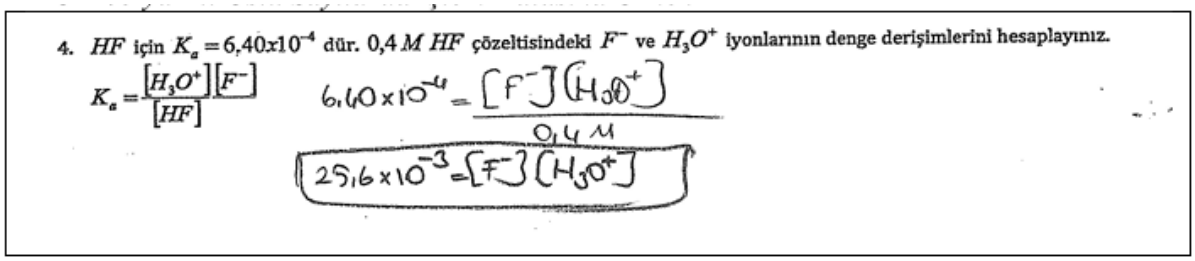
The student was unable to obtain the correct result due to an error in integer multiplication, which subsequently led to an inaccurate molecular weight calculation.

b) Decimal Number Error



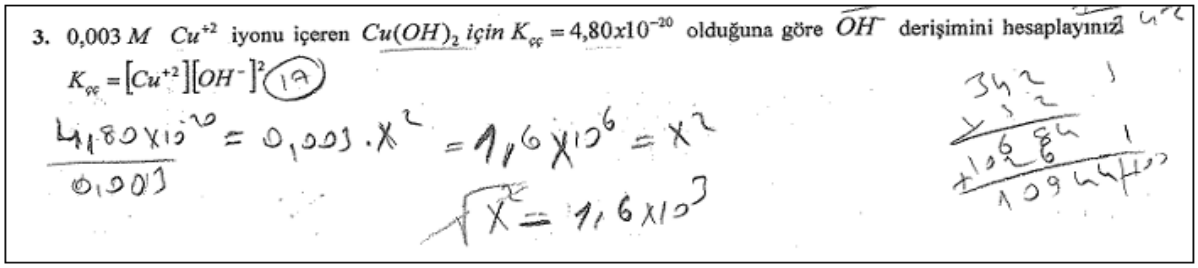
Although the student demonstrated an understanding of how to calculate the mean, an error in summing the decimal values led to an incorrect final answer.

c) Exponent Operation Error



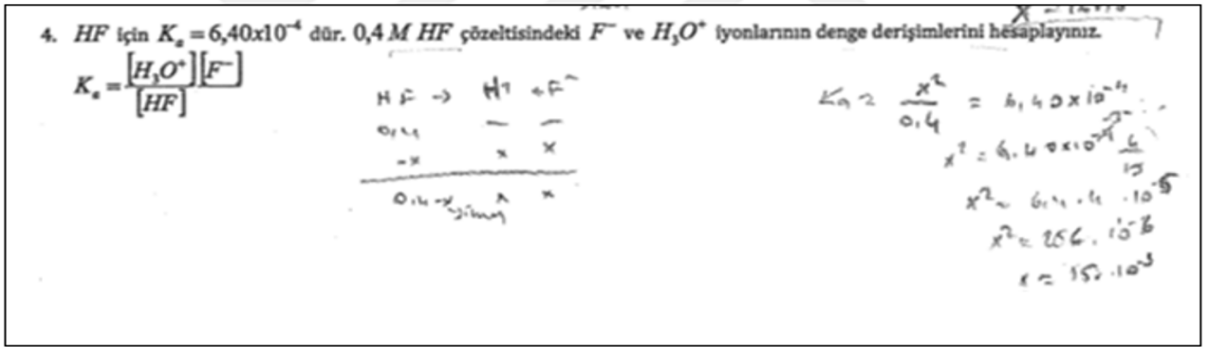
The student committed an error in the multiplication of exponential terms, specifically during the application of exponent rules.

d) Conversion Between Decimal and Exponential Numbers



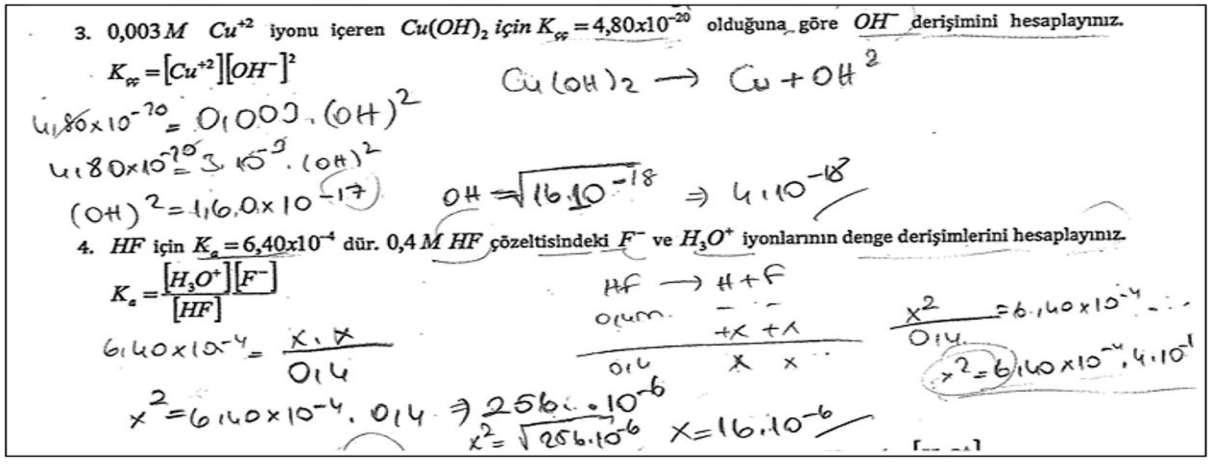
When dividing an exponential number by a decimal, the student failed to correctly reconcile the two numerical formats, resulting in an inaccurate calculation.

e) Integer Square Root Error



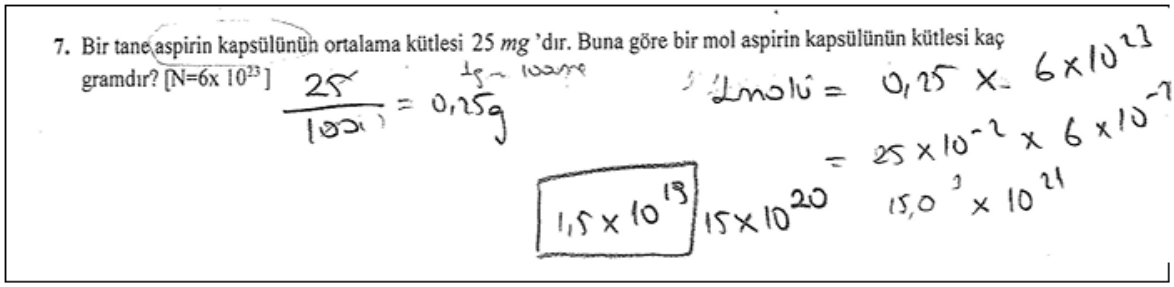
The student miscalculated the square root of an integer, leading to an erroneous result.

f) Exponential Square Root Error



The student accurately calculated the square root of the integer but failed to correctly apply this result within the context of an exponential expression.

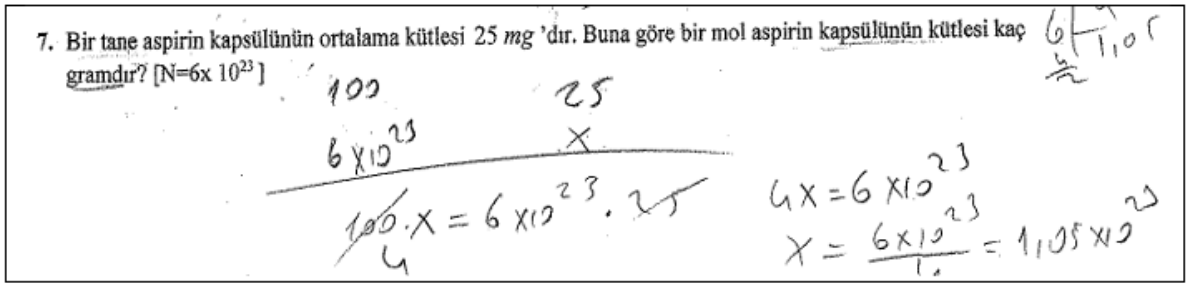
g) Unit Conversion Error



The student misinterpreted the conversion relationship between grams and milligrams, which led to an incorrect unit transformation.

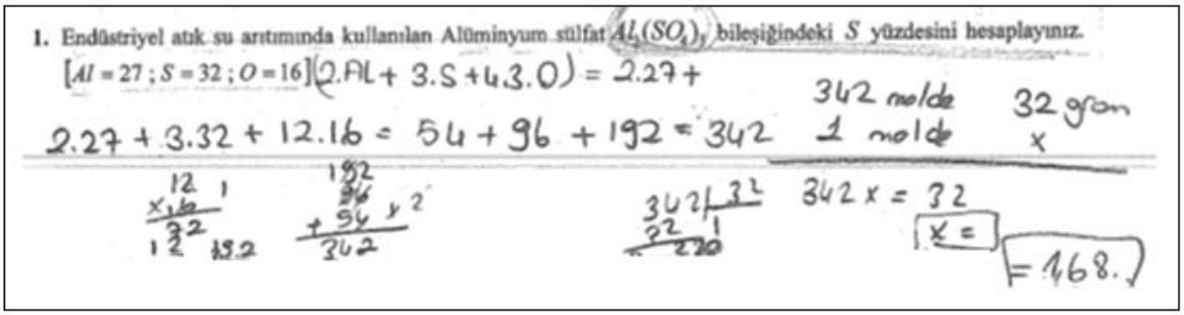
2) Errors caused by the solution path

a) Failure to calculate ratio-proportion



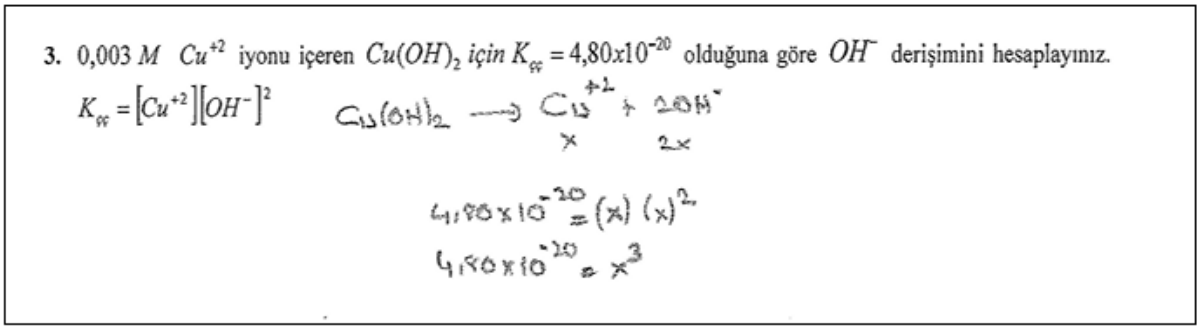
The student arrived at an incorrect conclusion due to a misrepresentation of the relationship between two directly proportional quantities.

b) Inability to calculate percentage



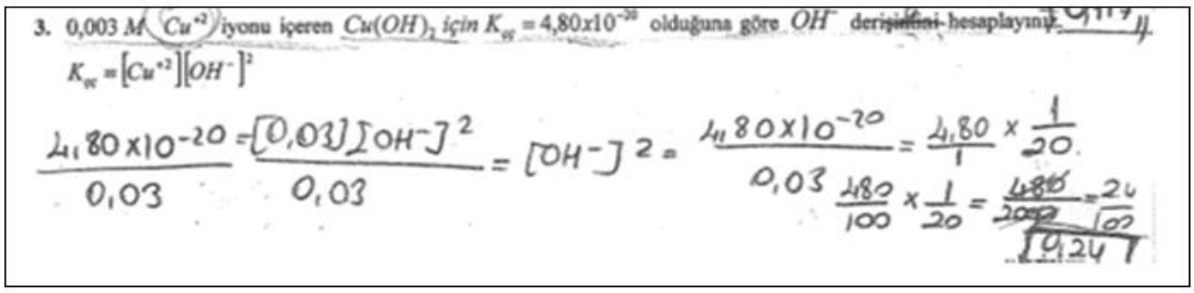
The student obtained an incorrect result due to a lack of understanding of how to calculate percentages.

c) Failure to establish mathematical equality



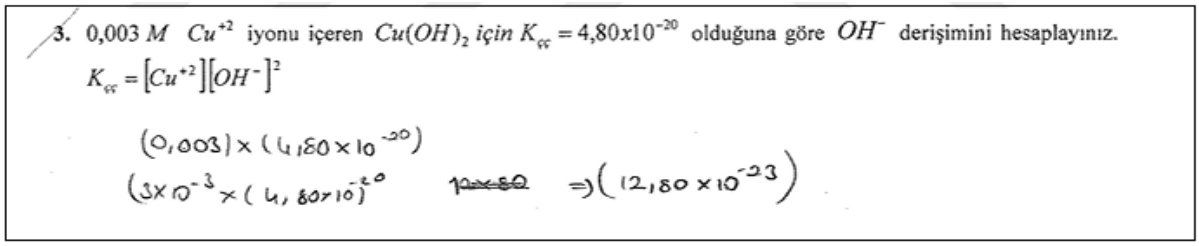
The student arrived at an incorrect conclusion due to an error in formulating or solving the mathematical equation.

d) Failure to use the questions correctly



Although the value of 0.003 M was provided in the question, the student mistakenly recorded it as 0.03 in the solution, leading to an incorrect final result.

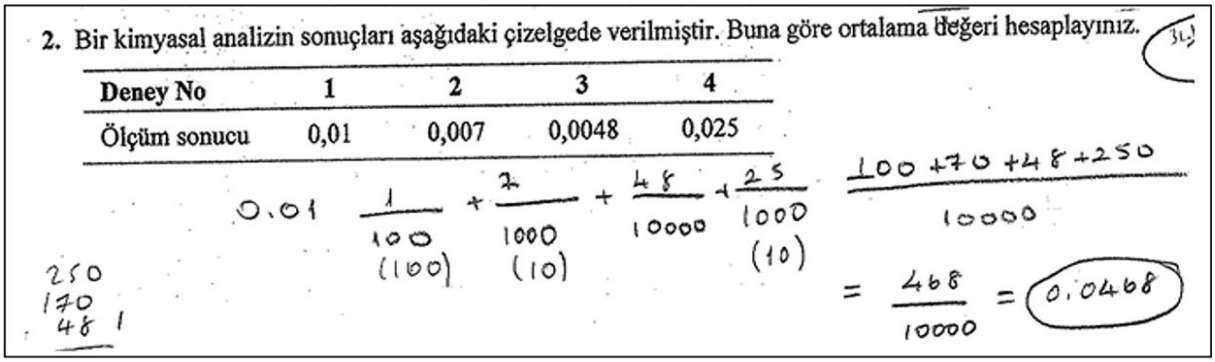
e) Failure to use the formula correctly



The student misapplied the formula provided in the question by incorrectly multiplying the given values, which resulted in an inaccurate solution.

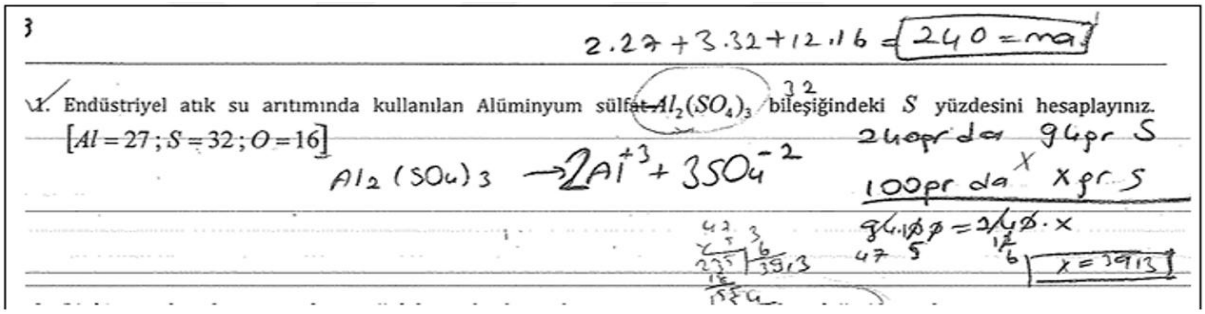
3) Lack of information errors

a) Not knowing the average value calculation



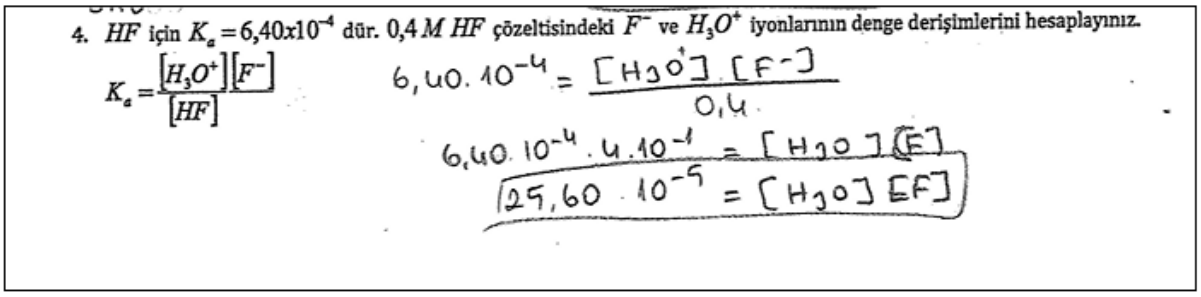
The student correctly added the decimal numbers; however, they arrived at an incorrect result because they did not know how to compute the average value of a data set.

b) Lack of knowledge of molecular weight calculation



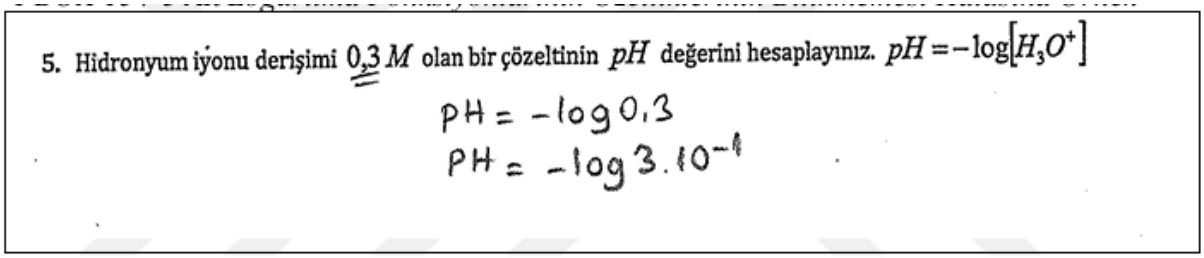
The student arrived at an incorrect answer for this question due to errors in calculating both the total molecular weight of the compound and the atomic weight of sulfur.

c) Lack of knowledge of ion concentration calculation



Since the student lacked the knowledge to calculate ion concentration, they were unable to proceed with the solution and consequently failed to obtain the correct result.

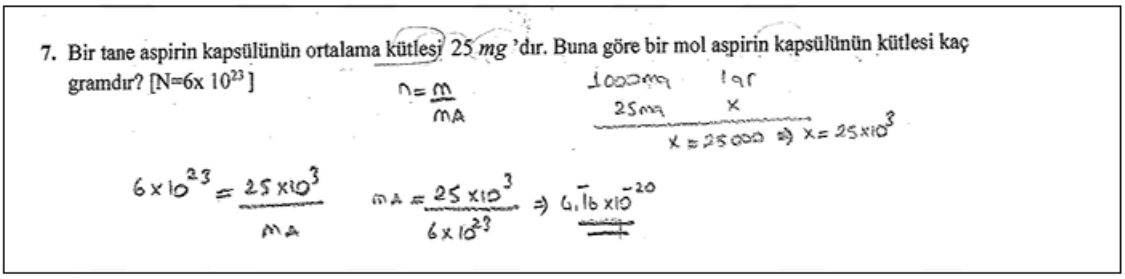
d) Lack of knowledge of properties of logarithm functions



The student was unable to arrive at the correct answer in this question due to a lack of understanding of the properties of logarithmic functions, particularly in the context of multiplication.

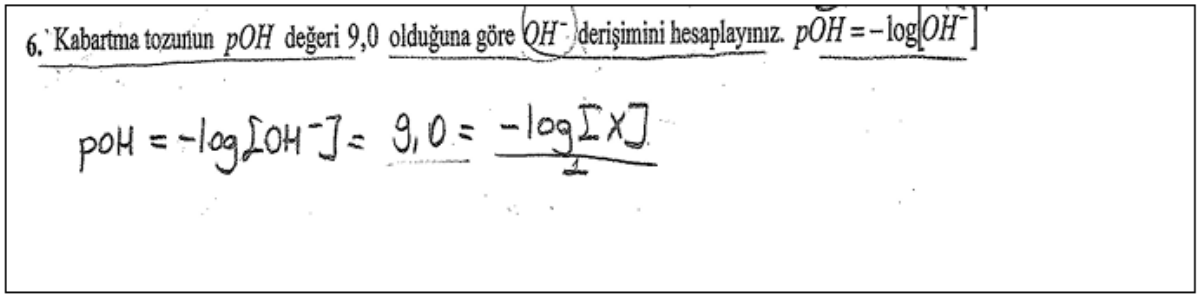
4) Not being understood

a) Adding unnecessary data or using formulas



The student attempted to solve the problem by incorporating an unnecessary formula that was not provided in the question, which led to an incorrect outcome.

b) Inability to write and perform operation in a formula



The student was unable to substitute the given information into the appropriate formula and carry out the necessary calculations.

2. Findings of the Second Sub-Problem

The second sub-problem is to determine the self-efficacy levels of science teacher candidates regarding the use of mathematics in chemistry. For this purpose, a scale was tried to be developed with the help of "Exploratory Factor Analysis".

Validity

Kaiser-Meyer-Olkin and Bartlett's sphericity test results are given in Table 3.

Table 3. Kaiser-Meyer-Olkin and Bartlett's sphericity test results

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		**0.777**
Bartlett's Test of Sphericity	Approx. Chi-Square	2133.982
	df	78
	Sig.	0.000

As a result of the factor analysis in Table 3, the Kaiser-Meyer-Olkin value was found to be 0.777. According to the value found, the sample size was found to be "good" for factor analysis. According to the Bartlett Sphericity Test results, the chi-square value was also found to be significant ($x^2_{(242)}$ = 2133.982; sd=78; p=<0.00).

Correlation matrix results are given in Table 4.

Table 4. Correlation matrix results

	M 1	**M 2**	**M 6**	**M 7**	**M 8**	**M 9**	**M 10**	**M 11**	**M 12**	**M 13**	**M 15**	**M 16**	**M 17**
M 1	1.000	0.243	0.226	0.157	0.459	0.055	0.511	0.349	0.367	0.390	0.182	0.473	0.286
M 2	0.243	1.000	0.647	0.184	0.293	0.149	0.228	0.246	0.301	0.189	0.229	0.320	0.732
M 6	0.226	0.647	1.000	0.316	0.347	0.231	0.242	0.219	0.286	0.224	0.362	0.315	0.586
M 7	0.157	0.184	0.316	1.000	0.299	0.527	0.268	0.645	0.323	0.271	0.444	0.290	0.725
M 8	0.459	0.293	0.347	0.299	1.000	0.197	0.913	0.451	0.513	0.510	0.274	0.720	0.361
M 9	0.055	0.149	0.231	0.527	0.197	1.000	0.189	0.298	0.180	0.166	0.520	0.181	0.403
M 10	0.511	0.228	0.242	0.268	0.913	0.189	1.000	0.496	0.506	0.576	0.204	0.717	0.310
M 11	0.349	0.246	0.219	0.645	0.451	0.298	0.496	1.000	0.428	0.517	0.292	0.488	0.575
M 12	0.367	0.301	0.286	0.323	0.513	0.180	0.506	0.428	1.000	0.363	0.321	0.566	0.386
M 13	0.390	0.189	0.224	0.271	0.510	0.166	0.576	0.517	0.363	1.000	0.353	0.521	0.297
M 15	0.182	0.229	0.362	0.444	0.274	0.520	0.204	0.292	0.321	0.353	1.000	0.378	0.399
M 16	0.473	0.320	0.315	0.290	0.720	0.181	0.717	0.488	0.566	0.521	0.378	1.000	0.401
M 17	0.286	0.732	0.586	0.725	0.361	0.403	0.310	0.575	0.386	0.297	0.399	0.401	1.000

*M1-M17 indicates the item numbers of the scale.

As seen in Table 4, the correlation matrix is suitable for factor analysis since there are many correlations of r = .3 or greater.

The number of factors and the percentage of variance explained for the items that were decided to remain in the scale as a result of the factor analysis are shown in Table 5.

Table 5. Total variance explained results for eigenvalues

	First eigenvalues			**Eigenvalues after rotation**		
	Cumulative %	**Total**	**Variance %**	**Cumulative %**	**Total**	**Variance %**
M 1	5.590	43.003	43.003	3.951	30.389	30.389
M 2	1.882	14.476	57.479	2.632	20.250	50.638
M 6	1.329	10.226	67.705	2.219	17.066	67.705
M 7	0.873	6.712	74.417			
M 8	0.666	5.124	79.541			
M 9	0.626	4.813	84.355			

M 10	0.598	4.600	88.955
M 11	0.413	3.181	92.136
M 12	0.381	2.931	95.067
M 13	0.276	2.122	97.188
M 15	0.244	1.874	99.062
M 16	0.069	0.532	99.594
M 17	0.053	0.406	100.000

As shown in Table 5, the eigenvalues of the three factors identified in the scale are 5.590, 1.882, and 1.329, respectively—all exceeding the threshold value of 1. This indicates the presence of three distinct factors based on the eigenvalue criterion. The first factor, labeled "Application of Mathematics," accounts for 30.389% of the total variance. The second factor, "Mathematical Skills," explains 20.250% of the variance, while the third factor, "Mathematical Self-Perception," contributes 17.066%. Collectively, these three factors explain 67.705% of the total variance.

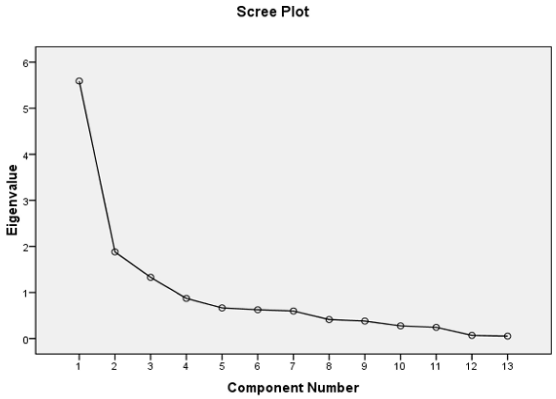


Figure 1. Line Graph of Factor Eigenvalue

In Figure 1, the number of factors is identified at the point where the slope of the eigenvalue line graph begins to level off. From the third factor onward, the graph shows a noticeable decline in slope. Beginning with the fourth and fifth factors, the variance contributions become relatively similar, indicating diminishing explanatory power. This pattern confirms that the scale exhibits a three-factor structure.

To determine the factor structure, an oblique rotation method (Promax) was employed, based on the assumption that the factors are interrelated. The results of this analysis are presented in Table 6.

Table 6. Factor loading values of the scale

	Components		
	1	**2**	**3**
M 10	0.910		
M 8	0.862		
M 16	0.810		
M 13	0.682		
M 1	0.655		
M 12	0.612		
M 7		0.844	
M 9		0.798	
M 15		0.659	
M 11		0.568	
M 2			0.915
M 6			0.814
M 17			0.700

*Values below ±0.30 are not shown

An examination of Table 6 reveals that the scale comprises three distinct factors. Based on the factor variance results, all items were deemed suitable for inclusion in the factor analysis. Specifically, the first factor consisted of six items, the second factor included four items, and the third factor comprised three items. As indicated in the table, all factor loadings are 0.30 or higher, with values ranging from 0.568 to 0.915. These results suggest that all 13 items demonstrate acceptable quality and contribute meaningfully to the scale structure.

Reliability

To assess the reliability of the final version of the Self-Efficacy Scale for the Use of Mathematics in Chemistry, which consists of 13 items, internal consistency was evaluated by calculating the Cronbach's alpha coefficient. The results are presented in Table 7.

Table 7. Findings regarding reliability coefficients

Factors	Number of items	Cronbach's Alfa
Self-Efficacy Scale for Using Mathematics in Chemistry	13	0.883
Application of Mathematics	6	0.873
Mathematical Skills	4	0.770
Mathematical Self-Perception	3	0.842

Item Analysis

The item-total correlation was calculated as the item statistics of the items in the scale that was being developed (Table 8).

Table 8. Self-efficacy scale for using mathematics in chemistry ıtem-total correlations

Items	Item mean	Item standard deviation	Item total correlation	Reliability coefficient when ıtem ıs deleted
M 1	3.70	1.060	0.471	0.880
M 2	2.74	0.970	0.468	0.880
M 6	2.86	1.031	0.501	0.878
M 7	3.13	0.937	0.553	0.875
M 8	3.16	0.934	0.703	0.867
M 9	3.13	0.949	0.378	0.884
M 10	3.25	1.025	0.674	0.868
M 11	3.28	0.899	0.642	0.871
M 12	3.26	0.998	0.582	0.874
M 13	2.93	1.034	0.562	0.875
M 15	3.15	0.928	0.499	0.878
M 16	2.99	0.953	0.703	0.867
M 17	3.21	0.777	0.705	0.869

In Table 8, it was determined that the item-total correlation coefficients were between 0.378-0.705.

3. Findings Regarding the Third Sub-Problem

The analysis revealed a strong negative correlation between students' error scores and their achievement test scores ($r = -0.867$, $p = 0.001$), as presented in Table 9.

Table 9. Correlation between error score and success score

		Error score	Success score
Error score		1	0.867**
		176	176
Success score		0.867**	1
		176	176

4. Findings Regarding the Fourth Sub-Problem

The results indicated a strong negative correlation between students' error scores and their self-efficacy scale scores (r = -0.726, p = 0.001), as shown in Table 10.

Table 10. Correlation between error score and scale score

		Error score	Scale score
Error score		1	0.726**
		176	176
Scale score		0.726**	1
		176	176

5. Findings Regarding the Fifth Sub-Problem

According to the results obtained, there was a positive and high level (r=0.850; p=0.001) correlation between the students' achievement test scores and scale scores (Table 11).

Table 11. Correlation between achievement score and scale score

		Achievement score	Scale score
Achievement score		1	0.850**
		176	176
Scale score		0.850**	1
		176	176

Conclusion and Discussion

The mathematical operation errors made by pre-service science teachers in the Analytical Chemistry course were classified into four main categories: operational errors, errors arising from the solution method, knowledge-based errors, and comprehension errors. Within the category of operational errors, it was observed that teacher candidates struggled with operations involving integers and decimal numbers; performing shortcuts in multiplication or division by 10, 100, and 1000; handling numbers expressed as powers of ten; interpreting the relationship between the integer and fractional parts of decimal representations; expressing numbers using different integer exponents of ten; converting exponential expressions; understanding square root relationships involving perfect squares and exponents; and converting between grams and milligrams. The frequent use of such operations in Analytical Chemistry and the pre-service teachers' deficiencies in these areas appear to be major contributors to their academic underperformance in the course. These results are consistent with findings from previous studies: Aydın (2011) identified errors in square roots, exponential expressions, and decimals; Kızılcık (2019) noted difficulties in operations involving radicals; Temel, Dündar, and Şenol (2015) emphasized that science teachers struggled with basic arithmetic; and Bilir (2012) reported arithmetic, rounding, and unit conversion errors in chemistry problem-solving contexts.

Regarding errors stemming from the solution process, pre-service teachers exhibited difficulties in representing proportional relationships, calculating percentages, constructing mathematical equations, correctly interpreting given data, and accurately applying formulas. These findings are in line with those of

Ulu, Tertemiz, and Peker (2016), who identified problems in translating verbal statements into mathematical expressions; Çalış (2018), who reported inadequacies in ratio and proportion concepts; and Temel et al. (2015) and Bilir (2012), who highlighted similar difficulties in mathematical formulation and problem interpretation in chemistry education.

Knowledge-based errors were observed in areas such as calculating averages, understanding logarithmic properties, determining ion concentrations, and computing molecular weights. These outcomes support the findings of Kızılcık (2019), who noted gaps in logarithmic knowledge, and Bilir (2012), who reported that pre-service teachers lacked competence in molecular formula calculations.

In the category of comprehension errors, students often inserted irrelevant data or formulas and were unable to complete computations after substituting values into formulas. This aligns with Bilir's (2012) findings, which showed that pre-service teachers tended to subjectively interpret problem data and relate it to unrelated information.

Despite the inclusion of necessary chemistry formulas in the Achievement Test, many pre-service teachers were unsuccessful. This suggests that their underperformance stems more from deficiencies in mathematical reasoning, skills, and computational abilities than from a lack of content knowledge in chemistry.

As part of this study, a Self-Efficacy Scale for the Use of Mathematics in Chemistry was developed and administered to 176 pre-service science teachers. The scale's suitability for factor analysis was confirmed through a Kaiser-Meyer-Olkin value of 0.777, indicating an adequate sample size. Bartlett's Test of Sphericity also yielded statistically significant results ($\chi^2(242) = 2133.982$; $df = 78$; $p < 0.00$), confirming the scale's construct validity. Exploratory Factor Analysis revealed a three-factor structure: Application of Mathematics (6 items), Mathematical Skills (4 items), and Mathematical Self-Perception (3 items). The overall reliability, as measured by Cronbach's alpha, was 0.883, with subscale coefficients of 0.873, 0.770, and 0.842, respectively. The scale accounted for 67.705% of the total variance. Item-total correlation coefficients ranged from 0.378 to 0.705, indicating a reliable scale.

Correlation analyses revealed a strong negative relationship between students' error scores and achievement scores ($r = -0.867$, $p = 0.001$), suggesting that increased errors are associated with decreased achievement. The coefficient of determination ($r^2 = 0.75$) indicated that 75% of the variation in achievement scores could be explained by error scores. Similarly, there was a strong negative correlation between error scores and self-efficacy scores ($r = -0.726$, $p = 0.001$), with $r^2 = 0.53$. Furthermore, a strong positive correlation was found between achievement and self-efficacy scores ($r = 0.850$, $p = 0.0001$), with 72% of the variance in self-efficacy scores explained by achievement scores ($r^2 = 0.72$). These results collectively underscore the interdependence between mathematical accuracy, achievement, and self-efficacy in the context of analytical chemistry.

Suggestions

Based on the findings obtained within the scope of this study, the following recommendations are proposed:

Recommendations for the Science Teacher Education Program:

- A compulsory basic mathematics course focusing on essential mathematical skills and operations should be incorporated into the science teacher education curriculum to reduce the frequency of mathematical operation errors among pre-service teachers.

- A dedicated course titled "Mathematics for Science Education" could be introduced to help future science teachers better integrate mathematical concepts into their scientific understanding.

Recommendations for Teachers:

- Teachers should place emphasis on the most frequently encountered mathematical operation errors during instruction, raising students' awareness and encouraging greater attentiveness to such issues.

- The results from the Achievement Test on the Use of Mathematics in Analytical Chemistry indicate that students' failure was often due not to a lack of chemistry knowledge, but rather to errors in mathematical operations—even when the relevant chemistry formulas were provided. Thus, in exams involving fundamental mathematical operations, such as those in analytical chemistry, it is advisable to include a supplementary sheet summarizing essential mathematical concepts and formulas to enhance assessment validity.

Recommendation for Students:

- Students should acknowledge that achieving success in analytical chemistry requires more than a solid grasp of chemistry content; it also demands proficiency in basic mathematical skills. Therefore, it is recommended that they review core mathematical concepts prior to taking the analytical chemistry course.

Recommendation for Researchers:

- This study found that 75% of pre-service science teachers' failure in the Analytical Chemistry course could be attributed to mathematical operation errors. Future research should aim to investigate the remaining 25% of unexplained variance to identify additional contributing factors.

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Prospective Teachers' Views on Problem Solving Skills*

Research Article

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ABSTRACT

This research aims to reveal the problem solving skills of pre-service teachers and their views on this. In this study the preferred method was the mixed method where both quantitative and qualitative data is used conjointly. The data in the quantitative dimension of the study were collected with the 'Problem Solving Skill Scale' developed by Yaman (2003). The data in the qualitative dimension of the study were collected through an interview form developed by the researchers. Quantitative data were analyzed by a statistics software program and qualitative data were construed by descriptive analysis. The study group of the research consisted of pre-service teachers attending the Faculty of Education of a university in Turkey. In this context, evaluations were made according to the gender and grade level variables of pre-service teachers. Accordingly, when the problem-solving skills scale of pre-service teachers was taken into consideration, no significant difference was found in terms of gender. However, in terms of grade level, it was determined that third-year pre-service teachers had higher problem-solving skills than those in the first and second years; fourth-year pre-service teachers had higher skills than those in the first and second years; and graduate pre-service teachers had higher problem-solving skills than first-year pre-service teachers. At the same time, pre-service teachers' views on problem solving skills were also obtained. It was concluded that pre-service teachers have the opinion that they may encounter some problems related to the profession they will carry out in the future.

Keywords:
Problem solving skills, faculty of education, pre-service teacher

Introduction

Today's society needs individuals who can think creatively rather than individuals who blindly adhere to their values. Because individuals face many difficulties and problems throughout their lives. In order to overcome these difficulties and problems they face, they try problem solving ways. As a society, there is a need for individuals who can approach these problems rationally and creatively, produce different solutions and turn them into skills. Although problem solving was first used as a concept by Howard Barrows in the

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1960s, it was first used and systematized in education by American educator John Dewey (Gömleksiz & Bozpolat, 2012). Problem solving is the selection and use of effective and useful tools and behaviors among many possibilities in order to achieve the desired goal (Demirel, 1993). According to Heppner (1978), problem solving is cognitive and effective behavioral processes for the harmony of various internal and external demands. Problem solving is a process that includes affective and behavioral skills in addition to cognitive skills and covers the period from the person's realization of the problem to finding a solution to the problem (Demirtaş & Dönmez, 2008). Problem solving primarily involves many efforts and practices to eliminate obstacles that arise in order to reach a certain goal (Korkmaz & Kaptan, 2001). Problem solving helps individuals to realize their own abilities, to ensure their development and to meet their needs (Erden & Akman, 2012).

Problem solving is one of the methods that enable students to apply the knowledge they learn at school, that is, it makes students active both in life and in the learning-teaching process and gives students the opportunity to learn how to learn (Özcan, 2007). Problem solving is also a social activity and is directly related to all people throughout all stages of its development. Because problem solving is the process of reaching a goal, developing tools and materials to reach that goal, and overcoming obstacles that may arise while doing so (Koray & Azar, 2008). Problem solving skills come first among the important skills needed for the realization of problem solving. Problem solving skill, which is one of the factors directly affecting the success of the individual, is an important element that enables the individual to enjoy his/her life (Sonmaz, 2002). Problem solving skill is the skill necessary for students to solve possible obstacles that they may encounter in their lives (MEB, 2009a). In the curricula, the stages of problem solving skills are named as sub-skills and these sub-skills are listed as follows;

1. Recognizing the problem,

2. Identify to whom the problem belongs,

3. Formulate appropriate questions to illuminate the problem,

4. Define and explain the problem,

5. Recognize problem-specific sources of information,

6. Identify solution options for the problem,

7. Think about the possible consequences of each solution,

8. Choosing the most appropriate path,

9. Whether help is needed in solving the problem

Determination,

10. Applying the appropriate solution (MEB, 2009b).

Problem solving skill is the level of being able to use the rules that will provide a solution to a problem by combining them in such a way that they are ready for use (Bilen, 2006). Problem solving skill is one of the valuable skills in one's professional life. Because in one's professional life, it is necessary to recognize problematic situations and at the same time to do what needs to be done quickly (Akpınar, 2014). The 21st century's prominent teaching method is the problem solving method. For this reason, having problem solving skills has left its mark on the current century and has found an important place among the goals of education and training systems (Kılıç & Samancı, 2005). Problem solving skills provide many benefits to individuals. These benefits are listed by Keenan (1997) as follows (as cited in Sezgin, 2011):

- It teaches how to overcome problems.

- It enables the prediction of problems that may arise.
- Immediately after a problem arises, it helps to eliminate it with creative ideas.
- It helps individuals to be successful in finding solutions.
- It enables the person to make decisions with confidence.
- It facilitates action without wasting time during the discussion.

Problem solving skills are among the most important factors in the process of self-knowledge of the individual and overcoming the situations in his/her environment and the events he/she experiences with other individuals. When this point is taken into consideration, it can be said that problem solving skill affects the development, change and progress of humanity. In addition to being an important skill that should be present in everyone in society, problem solving skills are more important for people in some professional groups, especially for those who perform professions whose focus is on people (Hamamcı & Çoban, 2009). Teachers may encounter many problems in the school environment. In the face of these problems, teachers' perspective on events, empathy skills and positive approaches to problems are very important. Teachers who are aware of the contributions of problem solving skills to the individual want to raise students with high problem solving skills. In this respect, determining the problem solving skills of teachers and prospective teachers has become one of the important issues (Güçlü, 2003). Accordingly, the aim of this study is to reveal the problem solving skill levels of the students of the faculty of education (undergraduate and graduate group course) and their views on problem solving. Accordingly, answers to the following sub-objectives were sought:

1. Do pre-service teachers' problem solving skills differ significantly according to demographic characteristics (gender, grade level)?

2. What are pre-service teachers' views on problem solving skills in the context of teaching profession?

Methodology

Research Model

In this study, the mixed method, in which both quantitative and qualitative data were used together, was preferred. Mixed method is a research approach that involves collecting, analyzing and combining qualitative and quantitative data together or sequentially (Creswell, Plano-Clark, Gutmann, & Hanson, 2003). Mixed method is an effort to create something new and independent by collecting numbers using quantitative methods and words using qualitative methods (Creswell & Plano-Clark, 2011). In this study, a convergent parallel design was used. Accordingly, qualitative and quantitative data are collected together, analyzed separately, and the findings obtained are reviewed in this context and whether they support each other (Creswell, 2014). The comparison of the problem solving skill levels of the pre-service teachers within the scope of the research shows that the research is in the single survey model, one of the general survey model types. In the single survey model; the variables belonging to the event, item, individual, group, etc. unit and situation of interest are tried to be described separately (Karasar, 2016). In the qualitative dimension of the study, the phenomenology design was used. Researchers who try to reveal the meaning and essence of the lived experience of a particular phenomenon prefer to use the phenomenology design (Edmonds & Kennedy, 2017).

Working Group

In the quantitative dimension of the study, the population consists of pre-service teachers studying at a university in Turkey. An attempt was made to reach the entire population and 1612 pre-service teachers were included in the study on a voluntary basis. Non-random convenience sampling method was used to determine the sample. Convenient sampling method is the selection of the sample from easily accessible and applicable

units due to the limitations in terms of time, money and labor force (Büyüköztürk, Kılıç Çakmak, Akgün, Karadeniz, & Demirel, 2009). In the qualitative dimension of the study, the voluntariness of the participants was taken as a basis. In the interviews with pre-service teachers, convenience sampling, which is considered as one of the forms of purposive sampling, was used. Convenience sampling can be explained as the researcher choosing the situation that is close and easy to reach (Yıldırım & Şimşek, 2016). In this context, interviews were conducted with 20 volunteer prospective teachers, 10 female and 10 male.

Data Collection Tools

The quantitative data of the study were collected with the "Problem Solving Skills Scale" developed by Yaman (2003). In this scale, there are items that include pre-service teachers' perspectives on the problems they encounter and the efforts they show while producing solutions to these problems. There are 30 items in the scale prepared in five-point Likert type. The Cronbach Alpha (α) reliability coefficient of the scale is 0.87. In the current study, the Cronbach Alpha (α) value was 0.82. In the qualitative dimension of the study, an interview form developed by the researchers was used to determine the views of pre-service teachers on problem solving. The interview form was examined by three experts in the field of Educational Sciences and arrangements were made.

Data Analysis

A computer-aided program was used to analyze the data related to the quantitative dimension of the study. In the study, t-test, one-way analysis of variance and LSD tests were used. The qualitative data obtained during the study process were analyzed by descriptive analysis. Descriptive analysis is used to illuminate an event, make evaluations, reveal possible connections between events and explain the event under study (Çepni, 2007). In order for the research to be accepted in a scientific sense, the results of the research process must be clear, consistent and confirmable by other researchers. In this respect, the data obtained to ensure the validity and reliability of the research were analyzed by two different researchers (Yıldırım & Şimşek, 2016). In addition, in order to support the analysis and findings, direct quotations were made from the sentences of the pre-service teachers and presented in the findings section. Furthermore, to ensure internal consistency, the reliability formula developed by Miles and Huberman (1994) [Reliability = Agreement / (Agreement + Disagreement)] was used, and the level of agreement between the researchers was determined to be 88%. For this rate, which indicates inter-coder agreement, to be considered reliable, it must be at least 80% (Miles & Huberman, 1994).

Findings

In the quantitative dimension of the research, the data obtained from the scale applied to determine the problem solving skill levels of pre-service teachers were compared according to different variables and necessary statistical analyzes were performed. These are t-test, one-way analysis of variance and LSD test analyzes. In the section related to the qualitative dimension of the research, the analysis of the data obtained from the interview form applied to determine the problem solving skill levels of pre-service teachers and the findings related to this were included. The findings were presented in tables and interpreted. Direct quotations reflecting the views of the participants regarding the findings are presented under the comments.

Findings Related to the Quantitative Dimension of the Study

In this section, statistical analyses of the data obtained from pre-service teachers are presented. The results of the analyzes are presented in the tables below:

Table 1. T-Test Results of Pre-Service Teachers' Problem Solving Skill Levels According to Their Gender

Gender	*n*	$\bar{X}$	*ss*	*sd*	*t*	*p*
Woman	1044	3.68	.38	1610	-.1.505	.380
Male	568	3.70	.46			

Table 1 presents the results of the t-test comparing the problem solving skill levels of pre-service teachers according to their gender. According to the findings obtained from the t-test, it was determined that the problem solving skills of pre-service teachers did not differ significantly according to their gender ($t(1610)=-1.505$, $p>.05$). The opinions of female and male pre-service teachers' problem solving skill levels correspond to the "frequently" range of the scale. In other words, it can be said that the pre-service teachers in the study have problem solving skills at an above average level.

Table 2. Analysis of Variance Results Related to Pre-Service Teachers' Problem Solving Skills According to Their Grade Levels

Class level	*n*	$\bar{X}$	*ss*	*sd*	*F*	*P*	*Difference (LSD)*
1st grade	109	3.59	.43	4	4.709	.001	3-1,2 4-1,2 G-1
2nd grade	287	3.62	.36				
3rd grade	791	3.72	.43				
4th grade	294	3.70	.42				
Graduate/Course Student	131	3.70	.35				

According to the findings obtained from the analysis of variance conducted to determine the problem solving skills of the pre-service teachers according to their grade level, the problem solving skills of the pre-service teachers differed statistically according to their grade level ($F(4)=4.709$, $p<.05$). It was determined that 3rd grade pre-service teachers had higher problem solving skills than 1st and 2nd grade pre-service teachers; 4th grade pre-service teachers had higher problem solving skills than 1st and 2nd grade pre-service teachers; and graduate pre-service teachers had higher problem solving skills than 1st grade pre-service teachers. Accordingly, it can be said that the higher the grade level, the higher the problem solving skill level. In addition, the problem solving skills of pre-service teachers studying in the 1st, 2nd, 3rd and 4th grades correspond to the "frequently" range of the scale.

Findings from the Qualitative Dimension of the Study

This section includes the analysis of the data obtained from the interview forms applied to the participants within the scope of the research. As a result of the analysis, the opinions of the participants are presented in the tables below.

Table 3. Opinions on What to Do in Solving a Problem Encountered

Opinions		*f*
What to do to recognize the problem	Looking at the root/source of the problem	9
	Trying to understand the problem	7
What needs to be done for data collection	Gathering information and materials by conducting detailed research to solve the problem	7
	Getting help from the environment	3
What needs to be done to produce solutions	Finding solutions	10
	Towards the most appropriate solution	2
	Result-oriented thinking	2
	Break the problem into small pieces and solve it step by step	1

In Table 3, the opinions of the participants regarding the opinions that should be made in solving a problem encountered were analyzed. When the opinions were examined, it was seen that the opinions were gathered in three different categories: recognizing the problem, collecting data and producing solutions. In this context, it can be said that the stages of problem solving are emphasized. The pre-service teachers who expressed opinions on recognizing the problem emphasized looking at the basis/source of the problem and trying to understand the problem. While the pre-service teachers who expressed opinions on collecting data emphasized collecting information and materials by conducting detailed research to solve the problem and getting help from the environment, the pre-service teachers who expressed opinions on generating solutions emphasized generating solutions, orienting towards the most appropriate solution, result-oriented thinking and solving the problem step by step by dividing it into small parts. Among the pre-service teachers who expressed opinions on the subject (7 additional), *"First of all, I determine the source of the problem, then I produce solutions, while producing solutions, I get ideas from my immediate environment and ....."* (5 kk) said, *"I identify the problem and review what can be done to solve it. I try to find the most effective solution. I look to see if the solution is easy and effective in terms of applicability."* and (20 kk) said, *"I look at where the problem originated. Then I start looking for ways to solve it. After finding several solutions, I choose the best one."*

Table 4. Opinions on What to Do When a Solution Cannot Be Produced to a Problem Encountered

Opinions	*f*
Asking for help from experienced people	13
Stop looking for solutions/ despair	4
Trying to find solutions through different searches and methods	3
Getting to the root of the problem	1
Keep trying	1

When the pre-service teachers in the study were asked about their opinions on what to do when a solution cannot be produced to a problem encountered, these opinions were listed as asking for help from experienced people, stopping looking for a solution/despair, trying to produce a solution with different searches and methods, going to the source of the problem and continuing to try. The most emphasized view

was to ask for help from experienced people. (6 participants) expressed themselves by saying *"I consider it important to get the opinions of many people who have experience and can help me with their general knowledge, as it will add vision to me."* (5 participants) emphasized their opinion by saying *"My desire to solve the problem decreases and I give up when I see that I cannot do it over time."*

Table 5. Opinions on Possible Problems That May Be Encountered While Practicing Teaching Profession in The Future

Opinions	***f***
Problems caused by students	10
Communication problem	4
Difficulty in classroom domination	3
Lack of self-confidence	2
Problems arising from the educational environment	2
Time management	2

Table 5 presents the opinions of pre-service teachers about the possible problems they may encounter while practicing the teaching profession in the future. In this context, the most coding was done for student-related problems and communication problems. In addition to these; classroom dominance, lack of self-confidence, deficiencies in the educational environment and time management were also emphasized. Related to the subject (13 pk) *"... will I be able to understand my students correctly, clearly and well?... I am very worried about this issue...."*, and (19 respondents) said, *"There may be problems about classroom management. There may be problems in the process of classroom dominance and getting to know the class."*

Table 6. Opinions on the Steps to Be Followed When Solving Possible Problems Encountered in The Future While Practicing the Profession

Opinions	***f***
Understanding the problem/identifying its source	11
Choosing the most suitable solution	6
Identifying solutions	6
Gather information about the problem	4
Getting support from individuals with the same problem	4

When the prospective teachers were asked about the steps they would follow in solving possible problems they would encounter in the future while carrying out their profession, the opinions were determined as understanding the problem and determining the source of the problem, choosing the most appropriate solution, determining the ways of solution, collecting information about the problem, getting support from individuals who have the same problem, and giving time/patience for the solution. One of the participant pre-service teachers (6 kk) expressed her opinion on the subject by saying *"When I become a teacher, I think I will focus on situations such as going to the source of the problem, researching the problem and determining the ways to solve it....."*. Another participant pre-service teacher (8 additional) said, *"First of all, I would try to understand why the problem arose. Secondly, I would go to the stage of confronting the problem. As the third and last stage, I would try to produce a positive solution to that problem by using the empathy method."*

Conclusion, Discussion and Suggestions

According to the results obtained, the problem solving skill levels of pre-service teachers did not differ according to their gender. Similarly, Akpınar (2014) revealed that there was no difference in the problem solving skills of pre-service teachers according to gender variable. In Bilgin's (2010) study, no statistically significant difference was found in the problem solving skill perception scores of university students according to gender variable. In Aslan and Uluçınar-Sağır's (2012) study, no significant difference was found in the problem solving skills of prospective teachers according to gender variable. In the study of Genç and Kalafat (2010), in which they investigated the empathic skills and problem solving skills of prospective teachers, the problem solving skills of prospective teachers did not differ according to the gender variable. Yıldırım and Yalçın (2008) concluded that the gender variable did not have a significant effect on students' problem solving skills. Eyvaz (2017) reached a similar conclusion in his study and concluded that the gender variable did not create a statistically significant difference in the problem solving skills of prospective teachers. Similarly, in Dündar's (2009) study, no significant difference was found in the problem solving skills of university students according to gender. There are also studies with different results in the literature (Korkut, 2002; Birel, 2012; Ocak & Eğmir, 2016). In the study conducted by Katkat and Mızrak (2003), which examined the problem solving skills of pre-service teachers, a significant difference was determined in favor of female students in the problem solving skill levels of pre-service teachers. In the study conducted by Serin and Derin (2008), a significant difference was found in the problem solving skills of students according to their gender in favor of female students. In Sezen and Paliç's (2011) study, students' perceptions of problem solving skills showed a significant difference according to gender in favor of female students. In a study conducted by Altunçekiç, Yaman, and Koray (2005), the problem solving skills of prospective classroom, mathematics and science teachers differed significantly in favor of male prospective teachers in terms of gender variable.

Considering the grade level of the pre-service teachers, it was seen that the problem solving skill levels of the pre-service teachers within the scope of the research differed statistically. It was determined that 3rd grade pre-service teachers had higher problem solving skill levels than 1st and 2nd grade pre-service teachers; 4th grade pre-service teachers had higher problem solving skill levels than 1st and 2nd grade pre-service teachers; and graduate pre-service teachers had higher problem solving skill levels than 1st grade pre-service teachers. This situation can be explained by the fact that pre-service teachers in higher grades gain more academic experience, participate in applied courses, and have opportunities to encounter different problem situations and produce solutions. This result is consistent with Dündar's (2009) study. According to Dündar's (2009) study, there is a significant difference between the mean problem solving skill scores of students according to grade level. In the study, it was determined that the problem solving skills of the students in the third grade were higher than the students in the first grade, and the problem solving skills of the students in the fourth grade were higher than the students in all other grades. Tümkaya and İflazoğlu (2000) concluded that grade level created a significant difference in problem solving skills. In the study, it was concluded that 1st grade students perceived themselves more inadequate in terms of problem solving skills than 4th grade students. In Aslan and Sağır's (2012) study, problem solving skills of pre-service teachers showed a significant difference according to grade level. According to the results of the study, the difference between the scores of first and second, first and third, first and fourth grade prospective teachers was significant. In the study of Ocak and Eğmir (2016), the problem solving skills of pre-service teachers differed according to the grade level in favor of the pre-service teachers studying in the first grade. However, in a study conducted by Serin (2001), it was determined that the grade level of pre-service teachers did not make a significant difference on their problem solving skills. Although the problem solving skills of pre-service teachers increased as the grade level increased, this increase was not significant. Similarly, in the study of Altunçekiç et al. (2005), it was determined that the problem solving skills of pre-service teachers studying at different grade levels did not differ

significantly. In the study conducted by Bilgin (2010), no statistically significant difference was found in the problem solving skill perceptions of students according to the grade they attended.

Another result obtained in the study is related to what needs to be done in solving any problem encountered. Accordingly, the participants expressed opinions on recognizing the problem, collecting data and producing solutions for the solution of the problem they encountered. Participant pre-service teachers emphasized looking at the basis/source of the problem and trying to understand the problem in order to recognize the problem. In terms of collecting data, they emphasized collecting information and materials by conducting detailed research to solve the problem and getting help from experienced people in the environment. In terms of generating solutions, they emphasized generating solution paths, orienting towards the most appropriate solution, result-oriented thinking, and solving the problem step by step by breaking the problem into small pieces. Generating solutions was the most emphasized view in this group.

Another result obtained within the scope of the research is related to what to do when a solution cannot be produced to a problem encountered. In this regard, pre-service teachers mostly emphasized asking for help from experienced people. In addition to this, the participants also mentioned to stop looking for a solution and despair, to try to find a solution with different searches and methods, to go to the source of the problem and to keep trying without giving up in the face of the problem.

Regarding the possible problems that may be encountered while carrying out the teaching profession in the future, pre-service teachers emphasized student-related problems, communication problems, classroom dominance, lack of self-confidence, deficiencies in the educational environment, time management and inability to produce practical solutions. The most emphasized opinion was student-related problems.

Regarding the steps to be followed in solving possible problems to be encountered in the future while carrying out their profession, pre-service teachers prioritized situations such as understanding the problem and going to the source of the problem, choosing the most appropriate solution to the problem, determining the ways of solution, collecting information about the problem, and getting support from individuals who have similar problems. When the results of the research are taken into consideration, it is noteworthy that there is not a very negative situation regarding the problem solving skill levels of pre-service teachers in general, but it is noteworthy that the problem solving skill level of the lower grades is less adequate than the upper grades. In this context, it can be suggested to carry out activities to improve problem solving skills especially in the courses conducted. At the same time, it is pleasing that pre-service teachers know and list the stages of problem solving as stated in the literature. However, it was observed that they were anxious about the problems they might encounter in their professional lives in the future. In order to reduce this anxiety, it can be suggested to increase the number of communication-themed courses and activities.

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An Investigation of Preschool Teachers' Epistemological Beliefs and Digital Literacies

Research Article

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ABSTRACT

This study aimed to examine the epistemological beliefs and digital literacy levels of preschool teachers. The research employed a descriptive and cross-sectional quantitative design within the general survey model. The study population consisted of 920 preschool teachers working in the central districts of Şanlıurfa, and the sample comprised 301 teachers selected through convenience sampling. Data were collected using a personal information form, the Epistemological Beliefs Scale, and the Digital Literacy Scale. Analyses were conducted using IBM SPSS v26, employing descriptive statistics, t-tests, ANOVA, Pearson correlation, and regression analyses.Findings revealed that preschool teachers had high levels of belief in learning as effort-dependent, low levels of belief in learning as ability-dependent, and moderate levels of belief in the existence of a single truth. Their digital literacy levels were found to be very high across all dimensions. Significant differences emerged in digital literacy levels in relation to age and the purposes of internet usage. At the same time, epistemological beliefs did not vary significantly across these demographic variables, except in the dimension of belief in a single truth. Correlation analyses revealed a moderate, positive, and significant relationship between digital literacy and the belief in learning as effort-dependent, as well as a weak but significant relationship between digital literacy and the belief in a single truth. Regression analyses revealed that digital literacy significantly predicted beliefs in learning as effort-dependent and in a single truth, although the effect size for the latter was small.The results suggest that improving teachers' digital literacy contributes to the development of their epistemological beliefs, particularly in relation to the role of effort in the learning process. In light of these findings, it is recommended that digital literacy training be provided, especially to teachers over the age of 35, and that further research explore the interaction between epistemological beliefs, digital literacy, and demographic variables.

Keywords:
Epistemological beliefs, digital literacy, preschool teacher, technology

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Introduction

In Turkey, preschool education corresponds to a critical period in an individual's developmental process (Tuncer, 2015). This period has a lasting impact on students' social and cognitive development (Barnett, 1992; Pianta et al., 2009). Students' development in these areas is closely related to the quality of preschool education. Teachers are also a highly influential factor in determining the quality of preschool education (Zigler et al., 2006, p. xvi). The competencies expected from preschool teachers for effective preschool education have changed over time. One of these competencies is technology. With the widespread use of technology and its integration into all aspects of life, safe technology use has become a part of educational systems. Preschool teachers play a significant role in equipping students with the ability to use technology safely and effectively (Masoumi & Bourbour, 2024). In the current Preschool Education Curriculum in use in Turkey, the ability to use technology safely and effectively is defined as "digital literacy" (MEB, 2024, p. 14; 334).

Digital literacy is expressed as an individual's ability to use technology effectively, contribute to their personal development through technology, solve problems they encounter by using technological tools, as well as their competence in the legal, ethical, and safe use of technology (Özerbaş & Kuralbayeva, 2018). It can be argued that preschool teachers themselves need to be digitally literate in order to equip students with digital literacy skills. A report published by UNICEF supports this view. The report emphasized that the most significant barrier to students' digital education during the preschool period is the lack of qualified teachers (Nascimbeni & Vosloo, 2019, p. 25). This highlights the importance of examining the digital literacy of preschool teachers. It can also be stated that preschool teachers being digitally literate would facilitate their effective use of technologies that are increasingly employed in education.

Advancing technologies have increased the use of technology in education and have paved the way for the emergence of a new scientific field known as "educational technology." Educational technology has expanded the variety of activities and resources used in education by enabling education stakeholders—such as teachers, school administrators, and students—to effectively utilize various technological tools in the learning process (Brückner, 2015; Karaman & Karataş, 2009). Educational technology has also allowed the Ministry of National Education (MEB) to develop various projects aimed at strengthening the integration of technology and education.

The FATİH (Movement to Increase Opportunities and Improve Technology) project, initiated by the Ministry of National Education in 2011, is one of the most comprehensive initiatives implemented to support the effective use of technology in education. The project is based on five core components: the effective use of information technologies in curricula, safe and measurable technology use, in-service teacher training, the provision of educational e-content, and the establishment of hardware/software infrastructure (Kurt, Kuzu, Dursun, Güllüpınar, & Gültekin, 2013; MEB, 2022). Within this framework, the project aimed to enhance teachers' competence in technology-based teaching processes, and to support this process, the digital platform EBA (Education Informatics Network) was developed (Bal & Boz, 2017).

The importance of EBA further increased during the COVID-19 pandemic, when millions of students and teachers worldwide transitioned to distance education, and in Turkey, teachers continued their instructional activities through EBA. During this period, the platform was accessed 23.8 billion times, making it one of the most widely used systems globally (MEB Directorate General for Innovation and Educational Technologies, 2020). These developments have clearly highlighted the need to support equity of opportunity in education, to make instructional processes more flexible, and to improve teachers' competencies in educational technologies (UNESCO, 2020; Kurtoğlu & Seferoğlu, 2013).

These developments demonstrate that knowledge is rapidly disseminated, used effectively, analyzed, and critically examined from various perspectives, and that technologies enabling knowledge communication are undergoing rapid advancement (Karaman & Karataş, 2009). The rapid increase in the amount of knowledge has expanded the pool of information accessible without quality distinction. Therefore, in order for individuals to utilize the growing mass of information effectively, they must not only develop the ability to access qualified knowledge but also strengthen their understanding of the nature and metacognition of knowledge (Yordamlı, 2020).

In this context, the concept of epistemological belief emerges. Epistemological belief is defined as an individual's personal interpretations regarding what knowledge is, how it is learned and taught, as well as the qualities and methods of knowledge (Deryakulu & Bıkmaz, 2003). According to Schommer (1993), epistemological beliefs influence a variety of academic skills, such as the ability to solve mathematical problems (Schoenfeld, 1983, 1985), persistence when confronted with challenging tasks (Dweck & Leggett, 1988), and reading comprehension, understanding, and interpretation of knowledge (Ryan, 1984; Schommer, 1990). To acquire these skills, individuals must remain open to continuous learning and develop an inquisitive attitude toward understanding the nature of learning. It is the teachers' responsibility to foster such an inquisitive profile. Since teachers hold a critical role in the learning process, their qualifications must be updated in line with these requirements, and their epistemological beliefs need to be examined (Alkan, 2005). Teachers' epistemological beliefs play an important role in their selection of learning methods, the implementation of activities, and the criteria for assessment (Duell & Schommer-Aikins, 2001; Kıssack, 2002). Therefore, it can be stated that teachers' epistemological beliefs have a significant qualitative and quantitative impact on both instructional practices and students' learning outcomes (Deryakulu, 2006).

Another factor influencing the development of epistemological beliefs is technology. The use of technology in learning environments can support the development of epistemological beliefs by providing faster access to knowledge, a variety of activities, opportunities for individual and active learning, the development of critical thinking, opportunities for collaborative work, increased student interaction, global educational opportunities, and enhanced motivation for learning (İşman & Eskicumalı, 2001). This situation can be said to contribute to students asking more sophisticated questions, engaging in critical and creative thinking, and developing as individuals who not only acquire knowledge but also interpret, question, evaluate, and communicate effectively in collaboration. Thus, students can develop more advanced epistemological beliefs. From this perspective, it can be argued that teachers' recognition of their own epistemological beliefs and digital literacy skills, along with their efforts to develop in these areas, play a crucial role in enhancing the quality of education. These forms of knowledge and skills enable teachers to develop more conscious and effective educational strategies, thereby creating a learning environment in which students can realize their full potential.

In conclusion, the awareness and development of teachers' epistemological beliefs and digital literacy skills are crucial in enhancing the quality of education, particularly in terms of teachers' instructional practices, assessment, and evaluation. These two factors significantly impact how students acquire knowledge and utilize it, thereby maximizing student achievement at every stage of the learning process. Teachers' technological competence and up-to-date knowledge also facilitate their understanding of students and strengthen the bond between teacher and learner (Karakuş & Er, 2021).

Purpose of the Research

The purpose of this research is to examine preschool teachers' epistemological beliefs and their digital literacy. Within the framework of this general purpose, the following sub-problems were formulated and addressed:

1. What is the level of preschool teachers' epistemological beliefs?

2. Do preschool teachers' epistemological beliefs show statistically significant differences according to gender, age, daily internet usage time, the primary purpose of internet use, trust in information obtained from the internet, and the most frequently used tool for following news?

3. What are the levels of preschool teachers' digital literacy?

4. Do preschool teachers' digital literacy levels show statistically significant differences according to gender, age, daily internet usage time, the primary purpose of internet use, trust in information obtained from the internet, and the most frequently used tool for following news?

5. Is there a statistically significant relationship between preschool teachers' epistemological beliefs and their digital literacy levels?

6. Do preschool teachers' digital literacy levels predict their epistemological beliefs?

Methodology

This quantitative study, descriptive and cross-sectional in nature, was conducted using the general survey model. In this study, preschool teachers' digital literacy and epistemological beliefs were examined using the descriptive survey model to determine whether they differed significantly according to variables such as gender, age, daily internet usage, primary purpose of internet use, trust in information obtained from the internet, and the tool most frequently used to follow news. The descriptive survey model refers to studies conducted on a large group in which events and phenomena are described, and data are collected to obtain participants' views and understand their experiences related to a subject or phenomenon (Karakaya, 2012).

To examine the relationship between preschool teachers' digital literacy and epistemological beliefs, a correlational research model, one of the relational survey models, was employed. The correlational research model is a research design that utilizes statistical analyses to examine the relationship between variables, aiming to determine the direction of this relationship (Karasar, 2016). To investigate the effect of preschool teachers' digital literacy on their epistemological beliefs, regression analysis was applied. Regression is a statistical analysis method used to understand, examine, predict, and model the relationship between two or more variables that have a causal or consequential relationship (Vural, 2007).

Population and Sample

The study population consists of 920 preschool teachers working in kindergartens and preschool classes within primary schools located in the central districts of Şanlıurfa Province. According to Raosoft (2004), a study conducted with a population of this size requires at least 272 participants to achieve a sufficient and representative sample size at a 95% confidence level with a 5% margin of error. The sample of this research consists of 301 participants selected from the population using the convenience sampling technique. The convenience sampling method can be defined as the researcher beginning with the most easily accessible respondents to reach the required sample size, or working with respondents who are the most accessible in the shortest amount of time and with the least amount of financial resources (Cohen, Manion, & Morrison, 2005).

The results of the descriptive statistical analysis regarding the distribution of participants according to their demographic characteristics are presented in Table 1.

Table 1. Demographic Characteristics of Participants

Variable	Category	*N*	%
Gender	Female	237	78,7
	Male	64	21,3
Age	Under 30	123	40,9
	30-35	117	38,9
	Over 35	61	20,3
Professional seniority	1-5 years	101	33,6
	6-10 years	112	37,2
	Over 10 years	88	29,2
Daily internet use	0-1 hours	41	13,6
	1-3 hours	154	51,2
	Over 3 hours	106	35,2
The primary purpose of internet use	Social media	175	58,1
	News	54	17,9
	Research	72	23,9
The validity of information obtained online	If the information is from a trusted source, I assume it is correct	98	32,6
	Even if the information is from a trusted source, I verify it through other sources	203	67,4
Primary tool for following the news	News websites	171	56,8
	Social media	98	32,6
	TV/Newspaper	32	10,6

When Table 1 is examined, it is observed that the sample mainly consists of participants who are female (n = 237; 78.7%), under the age of 30 (n = 123; 40.9%), have 6–10 years of professional experience (n = 112; 37.2%), use the internet 1–3 hours daily (n = 154; 51.2%), use social media 0–3 hours daily (n = 219; 72.8%), primarily use the internet for social media purposes (n = 175; 58.1%), verify information obtained from the internet through other sources (n = 203; 67.4%), and most frequently use news websites to follow current events (n = 171; 56.8%).

Data Collection Tools

The data collection instrument prepared for this study consists of three parts: the Digital Literacy Scale (DLS), the Epistemological Belief Scale (EBS), and the Personal Information Form.

Personal Information Form

The first part of the data collection instrument includes a personal information form created by the researcher. This form contains a total of eight questions regarding the participants' gender, age, and internet usage habits.

Epistemological Belief Scale

The second part of the data collection instrument is the Epistemological Belief Scale. The scale was developed by Schommer (1990) and adapted into Turkish by Deryakulu and Büyüköztürk (2002). This five-

point Likert-type scale (1 = Strongly Disagree, 5 = Strongly Agree) consists of 35 items and three dimensions. In the Turkish adaptation study, the reliability coefficient of the overall scale was reported as $\alpha = 0.71$; for the "Belief in Learning Depending on Effort" dimension (items 1–18) $\alpha = 0.83$; for the "Belief in Learning Depending on Ability" dimension (items 19–26) $\alpha = 0.62$; and for the "Belief in the Existence of a Single Truth" dimension (items 27–35) $\alpha = 0.59$ (Deryakulu & Büyüköztürk, 2002). The results of the reliability analysis conducted for the Epistemological Belief Scale in this study are presented in Table 2.

Table 2. Reliability Analysis Results of the Epistemological Belief Scale

Dimension	Number of Items	Cronbach's α
Belief that Learning Depends on Effort	18	,941
Belief that Learning Depends on Talent	8	,845
Belief in the Existence of a Single Truth	9	,817

When Table 2 is examined, it can be observed that the reliability coefficients of all dimensions are above 0.80; therefore, it can be stated that the epistemological belief measurements are highly reliable (Özdamar, 2004).

Digital Literacy Scale

The third part of the data collection instrument is the Digital Literacy Scale. The scale was developed by Ng (2012) and adapted into Turkish by Hamutoğlu et al. (2017). This five-point Likert-type scale (1 = Strongly Disagree, 5 = Strongly Agree) consists of 17 items and four dimensions. In the Turkish adaptation study, the reliability coefficient of the overall scale was reported as $\alpha = 0.93$; for the "Attitude" dimension (items 1–7) $\alpha = 0.88$; for the "Technical" dimension (items 8–13) $\alpha = 0.89$; for the "Cognitive" dimension (items 14–15) $\alpha = 0.70$; and for the "Social" dimension (items 16–17) $\alpha = 0.72$ (Deryakulu & Büyüköztürk, 2002). The results of the reliability analysis conducted for the Digital Literacy Scale in this study are presented in Table 3.

Table 3. Reliability Analysis Results of the Digital Literacy Scale

Dimension	Number of Items	Cronbach's α
Attitude	7	,952
Technical	6	,932
Cognitive	2	,743
Social	2	,721
Digital Literacy Scale Total	17	,958

When Table 3 is examined, it can be observed that the reliability coefficients of all dimensions are above 0.70; therefore, it can be stated that the digital literacy measurements are reliable (Özdamar, 2004).

Data Collection

First, the necessary permissions were obtained from the Ethics Committee of Dicle University, as per the letter dated December 27, 2021, and numbered 201434, and from the Şanlıurfa Provincial Directorate of National Education, as per the letter dated December 14, 2021, and numbered 192559, to collect the data. Additionally, permission to use the Epistemological Belief Scale and the Digital Literacy Scale was obtained from the respective researchers via e-mail. Afterwards, the data collection instruments were prepared on Google Forms, and the link was shared with participants via e-mail and social media.

It was assumed that all participants in the study were preschool teachers and that they completed the data collection instruments independently. Before administering the instruments, participants were informed about the purpose of the study, and it was stated that participation was voluntary, no personal information

would be requested, the data would not be shared with third parties, and the data would be used anonymously for scientific purposes only. Voluntary participation consent was obtained on this basis. The researcher conducted the data collection between 01 and 31 March 2022.

Data Analysis

The analysis of the data collected within the scope of the study was carried out using IBM SPSS v26 software. Scores were calculated for the sub-dimensions of the scales used in the study, thereby forming the research variables.

First, Mahalanobis distance values were examined to determine whether there were outliers in the dataset, and no outliers were found at the 0.001 significance level. Then, in order to determine whether parametric or non-parametric analysis methods would be applied, the normality of the data distribution was examined using skewness and kurtosis values. The results of these analyses are presented in Table 4.

Table 4. Skewness and Kurtosis Values of the Scales Used in the Study

Scale	Dimension	Skewness	Kurtosis
Epistemological Belief Scale	Belief that Learning Depends on Effort	-2,059	1,172
	Belief that Learning Depends on Talent	,992	,759
	Belief in the Existence of a Single Truth	,249	-,002
Digital Literacy Scale	Attitude	-1,754	2,782
	Technical	-,864	,565
	Cognitive	-,544	,011
	Social	-,729	-,047
	Scale Total	-1,443	2,315

In the literature, no consensus standards have been reached regarding the cut-off values of skewness and kurtosis that indicate whether the data are typically distributed. While some sources state that skewness and kurtosis values should fall between -1 and +1 in order for the data to be considered normally distributed (Leech, Barrett, & Morgan, 2005), other sources suggest that values within the range of -3 to +3 are also acceptable (Kline, 1998; Kalaycı, 2016). In this context, according to the skewness and kurtosis values presented in Table 4, the data were determined to be normally distributed. Therefore, parametric analyses were employed in the study.

Descriptive statistical analyses were conducted to determine the levels of participants' epistemological beliefs and digital literacy. Since both scales are five-point Likert-type, the score intervals of the scales were calculated using the formula (n-1)/n, which results in (5-1)/5 = 0.80. Accordingly, scores between 1.00 and 1.80 were classified as "very low," scores between 1.81 and 2.60 as "low," scores between 2.61 and 3.40 as "moderate," scores between 3.41 and 4.20 as "high," and scores between 4.21 and 5.00 as "very high."

To examine whether participants' epistemological beliefs and digital literacy levels differed significantly according to their demographic characteristics, the t-test was used for two-category variables. At the same time, ANOVA was applied for variables with more than two categories. In ANOVA analyses, the Tukey post hoc test was used to determine which groups showed a significant difference. Additionally, effect size (eta squared) values were examined to assess the degree of influence of the independent variable on the dependent variable. In this study, eta squared values were interpreted as follows: $0.01 \leq \eta^2 < 0.06$ = "small effect," $0.06 \leq \eta^2 < 0.14$ = "medium effect," and $\eta^2 \geq 0.14$ = "large effect" (Cohen, 1988).

The relationships between epistemological beliefs and digital literacy were examined using Pearson correlation analysis. To investigate how preschool teachers' digital literacy levels predicted their

epistemological beliefs, multiple regression analysis was conducted. In all analyses, the significance level was set at $p < .05$.

Findings

Findings on Preschool Teachers' Epistemological Beliefs

The descriptive statistics regarding the study participants' responses to the Epistemological Belief Scale are presented in Table 5.

Table 5. Descriptive Statistics on Preschool Teachers' Epistemological Beliefs

Dimension	*M*	*SD*	Interpretation
Belief that Learning Depends on Effort	3,95	,81	High level
Belief that Learning Depends on Talent	2,32	,88	Low level
Belief in the Existence of a Single Truth	2,76	,85	Medium level

When Table 5 is examined, it is observed that participants' beliefs in learning depending on effort are at a high level ($\bar{x}$ = 3.95; SD = 0.81), whereas their beliefs in learning depending on ability are at a low level ($\bar{x}$ = 2.32; SD = 0.88). On the other hand, participants' beliefs in the existence of a single truth are at a moderate level ($\bar{x}$ = 2.76; SD = 0.85).

Findings on Preschool Teachers' Epistemological Beliefs According to Demographic Variables

Findings by Age

The results of the ANOVA analysis conducted to examine whether preschool teachers' epistemological beliefs differ statistically significantly according to age are presented in Table 6.

Table 6. Epistemological Beliefs of Preschool Teachers According to the Age Variable

Dimension	Age Group	*N*	*M*	*SD*	Source of variance	Sum of Squares	*df*	Mean Square	*F*	*p*	η^2	Sig.
Belief that Learning Depends on Effort	1) Under 30	123	3,95	0,83	Between groups	1,494	2	,747	1,131	,324	-	-
	2) 30-35	117	4,03	0,70	Within groups	196,867	298	,661				
	3) Over 35	61	3,84	0,97	Total	198,362	300					
Belief that Learning Depends on Talent	1) Under 30	123	2,28	0,79	Between groups	1,243	2	,621	,786	,457	-	-
	2) 30-35	117	2,30	0,90	Within groups	235,641	298	,791				
	3) Over 35	61	2,45	1,05	Total	236,884	300					
Belief in the Existence of a Single Truth	1) Under 30	123	2,71	0,82	Between groups	,935	2	,467	,635	,531	-	-
	2) 30-35	117	2,77	0,84	Within groups	219,284	298	,736				
	3) Over 35	61	2,86	0,96	Total	220,218	300					

When Table 6 is examined, it is revealed that the dimensions of the Epistemological Belief Scale do not show statistically significant differences according to age ($p > .05$).

Findings According to the Purpose of Internet Use

The results of the ANOVA analysis conducted to examine whether preschool teachers' epistemological beliefs differ significantly according to their purposes of internet use are presented in Table 7.

Table 7. Epistemological Beliefs of Preschool Teachers According to the Purpose of Internet Use Variable

Dimension	Purpose of internet use	*N*	*M*	*SD*	Source variance	Sum of Squares	*df*	Mean Square	*F*	*p*	η^2	Sig.
Belief that Learning Depends on Effort	1) Social media	175	4,01	0,78	Between groups	1,174	2	,587	,887	,413	-	-
	2) News	54	3,92	0,76	Within groups	197,188	298	,662				
	3) Research	72	3,86	0,93	Total	198,362	300					
Belief that Learning Depends on Talent	1) Social media	175	2,26	0,82	Between groups	4,345	2	2,172	2,784	,063	-	-
	2) News	54	2,58	0,93	Within groups	232,539	298	,780				
	3) Research	72	2,28	0,98	Total	236,884	300					
Belief in the Existence of a Single Truth	1) Social media	175	2,72	0,82	Between groups	5,374	2	2,687	3,727	,025	,024	2 > 1 2 > 3
	2) News	54	3,05	0,81	Within groups	214,844	298	,721				
	3) Research	72	2,67	0,94	Total	220,218	300					

When Table 7 is examined, it is revealed that the dimensions of belief in learning depending on effort and belief in learning depending on ability do not show statistically significant differences according to the purpose of internet use ($p > .05$). On the other hand, it was observed that the level of belief in the existence of a single truth shows a statistically significant difference with a small effect size ($\eta^2 = 0.024$) according to the participants' purpose of internet use ($F = 3.727$; $p < .05$). According to the results of the Tukey test conducted to determine between which groups the differences occurred, it was found that the belief levels in the existence of a single truth of participants who use the internet for following news ($\bar{x} = 3.05$; SD = 0.81) were significantly higher than those who use the internet for social media ($\bar{x} = 2.72$; SD = 0.82) and research purposes ($\bar{x} = 2.67$; SD = 0.94).

Findings on Preschool Teachers' Digital Literacy

The descriptive statistics regarding the study participants' responses to the Digital Literacy Scale (DLS) are presented in Table 8.

Table 8. Descriptive Statistics on Preschool Teachers' Digital Literacy

Dimension	*M*	*SD*	Interpretation
DLS Total	3,86	0,85	High level
Attitude	4,15	0,94	High level
Technical	3,69	0,95	High level
Cognitive	3,54	0,99	High level
Social	3,67	1,05	High level

When Table 8 is examined, it is revealed that the digital literacy levels of the participants ($\bar{x} = 3.86$; SD = 0.85) are at a high level. In addition, when the sub-dimensions of the digital literacy scale are analysed, it is observed that all dimensions are also at a high level.

Findings on Preschool Teachers' Digital Literacy by Demographic Variables

In this part of the study, the results of the analyses conducted to determine whether preschool teachers' digital literacy differs statistically according to their demographic characteristics are presented.

Findings by Age

To examine whether preschool teachers' digital literacy levels differ statistically according to their age, the results of the ANOVA analysis are presented in Table 9.

Table 9. Digital Literacy of Preschool Teachers According to the Age Variable

Dimension	Age	*N*	*M*	*SD*	Source variance	ofSum Squares	of *df*	Mean Square	*F*	*p*	η^2	Sig.
DLS Total	1) Under 30	123	4,01	0,81	Between groups	8,574	2	4,287	6,081	,003	,039	3 < 1 3 < 2
	2)30-35	117	3,87	0,85	Within groups	210,096	298	,705				
	3) Over 35	61	3,55	0,89	Total	218,671	300					
Attitude	1) Under 30	123	4,27	0,86	Between groups	4,531	2	2,266	2,575	,078	-	-
	2)30-35	117	4,13	0,93	Within groups	262,222	298	,880				
	3) Over 35	61	3,94	1,08	Total	266,754	300					
Technical	1) Under 30	123	3,87	0,89	Between groups	13,527	2	6,764	7,865	,000	,050	3 < 1 3 < 2
	2)30-35	117	3,71	0,91	Within groups	256,254	298	,860				
	3) Over 35	61	3,30	1,04	Total	269,782	300					
Cognitive	1) Under 30	123	3,71	0,93	Between groups	15,298	2	7,649	8,151	,000	,052	3 < 1 3 < 2
	2)30-35	117	3,60	1,00	Within groups	279,640	298	,938				
	3) Over 35	61	3,11	0,99	Total	294,939	300					
Social	1) Under 30	123	3,81	1,00	Between groups	7,045	2	3,522	3,239	,041	,021	3 < 1 3 < 2
	2)30-35	117	3,68	1,09	Within groups	324,048	298	1,087				
	3) Over 35	61	3,39	1,03	Total	331,093	300					

When Table 9 is examined, it is revealed that participants' digital literacy shows a statistically significant difference with a small effect size ($\eta^2 = 0.039$) according to age ($F = 6.081$; $p < .01$). Based on these data, it can be stated that participants' age affects their digital literacy levels. According to the results of the Tukey test conducted to determine between which groups the differences occurred, it was observed that the digital literacy levels of participants over the age of 35 ($\bar{x} = 3.55$; SD = 0.89) were significantly lower than those of participants under 30 years old ($\bar{x} = 4.01$; SD = 0.81) and those between 30–35 years old ($\bar{x} = 3.87$; SD = 0.85). When the sub-dimensions of the Digital Literacy Scale were examined, similar results were found for the technical, cognitive, and social dimensions. In contrast, the attitude dimension did not show statistically significant differences according to age.

It was observed that participants' digital literacy levels in the technical dimension showed a statistically significant difference with a small effect size ($\eta^2 = 0.050$) according to age ($F = 7.865$; $p < .01$). According to the results of the Tukey test, participants over the age of 35 had significantly lower digital literacy levels in the technical dimension ($\bar{x} = 3.30$; SD = 1.04) compared to participants under 30 years old ($\bar{x} = 3.87$; SD = 0.89) and those between 30–35 years old ($\bar{x} = 3.71$; SD = 0.91).

It was observed that participants' digital literacy levels in the cognitive dimension showed a statistically significant difference with a small effect size ($\eta^2 = 0.052$) according to age ($F = 8.151$; $p < .01$). According to the results of the Tukey test, participants over the age of 35 had significantly lower digital literacy levels in the cognitive dimension ($\bar{x} = 3.11$; SD = 1.99) compared to participants under 30 years old ($\bar{x} = 3.71$; SD = 0.93) and those between 30–35 years old ($\bar{x} = 3.60$; SD = 1.00).

It was observed that participants' digital literacy levels in the social dimension showed a statistically significant difference with a small effect size ($\eta^2 = 0.041$) according to age ($F = 3.239$; $p < .05$). According to the results of the Tukey test, participants over the age of 35 had significantly lower digital literacy levels in the social dimension ($\bar{x} = 3.39$; SD = 1.03) compared to participants under 30 years old ($\bar{x} = 3.81$; SD = 1.00) and those between 30–35 years old ($\bar{x} = 3.68$; SD = 1.09).

Findings According to the Purpose of Internet Use

The results of the ANOVA analysis conducted to examine whether preschool teachers' digital literacy differs significantly according to their purposes of internet use are presented in Table 10.

Table 10. Digital Literacy of Preschool Teachers According to the Purpose of Internet Use Variable

Dimension	Purpose of internet use	*N*	*M*	*SD*	Source of variance	Sum of Squares	*df*	Mean Square	*F*	*p*	η^2	Sig.
DLS Total	1) Social media	175	4,01	0,79	Between groups	9,185	2	4,592	6,533	,002	,042	1 > 3
	2) New	54	3,72	0,87	Within groups	209,486	298	,703				
	3) Research	72	3,61	0,93	Total	218,671	300					
Attitude	1) Social media	175	4,30	0,83	Between groups	10,108	2	5,054	5,868	,003	,038	1 > 3
	2) New	54	4,07	0,99	Within groups	256,646	298	,861				
	3) Research	72	3,86	1,08	Total	266,754	300					
Technical	1) Social media	175	3,84	0,91	Between groups	9,114	2	4,557	5,210	,006	,034	1 > 3
	2) New	54	3,51	0,92	Within groups	260,667	298	,875				
	3) Research	72	3,47	1,01	Total	269,782	300					
Cognitive	1) Social media	175	3,72	0,92	Between groups	12,902	2	6,451	6,816	,001	,044	1 > 3
	2) New	54	3,25	1,03	Within groups	282,037	298	,946				
	3) Research	72	3,34	1,05	Total	294,939	300					
Social	1) Social media	175	3,79	1,03	Between groups	5,988	2	2,994	2,745	,066	-	-
	2) New	54	3,56	1,01	Within groups	325,105	298	1,091				
	3) Research	72	3,47	1,11	Total	331,093	300					

When Table 10 is examined, it is revealed that participants' digital literacy shows a statistically significant difference with a small effect size ($\eta^2 = 0.042$) according to their purposes of internet use ($F = 6.533$; $p < .01$). According to the results of the Tukey test conducted to determine between which groups the

differences occurred, it was found that participants who use the internet for social media purposes ($\bar{x}$ = 4.01; SD = 0.79) had significantly higher levels of digital literacy compared to those who use it for research purposes ($\bar{x}$ = 3.61; SD = 0.93).

It was also revealed that the attitude dimension of the Digital Literacy Scale shows a statistically significant difference with a small effect size (η^2 = 0.038) according to the participants' purposes of internet use (F = 5.868; p < .01). According to the Tukey test results, participants who use the internet for social media purposes had significantly higher digital literacy levels in the attitude dimension ($\bar{x}$ = 4.30; SD = 0.83) compared to those who use it for research purposes ($\bar{x}$ = 3.86; SD = 1.08).

It was observed that participants' digital literacy levels in the technical dimension showed a statistically significant difference with a small effect size (η^2 = 0.034) according to their purposes of internet use (F = 5.210; p < .01). According to the Tukey test results, participants who use the internet for social media purposes ($\bar{x}$ = 3.84; SD = 0.91) had significantly higher levels in the technical dimension compared to those who use it for research purposes ($\bar{x}$ = 3.47; SD = 1.01).

It was observed that participants' digital literacy levels in the cognitive dimension showed a statistically significant difference with a small effect size (η^2 = 0.044) according to their purposes of internet use (F = 6.816; p < .01). According to the Tukey test results, participants who use the internet for social media purposes ($\bar{x}$ = 3.72; SD = 0.92) had significantly higher levels in the cognitive dimension compared to those who use it for research purposes ($\bar{x}$ = 3.34; SD = 1.05).

On the other hand, it was observed that participants' digital literacy levels in the social dimension did not show statistically significant differences according to the purpose of internet use (p > .05).

Findings on the Relationship Between Preschool Teachers' Epistemological Beliefs and Digital Literacy Levels

The results of the Pearson correlation analysis conducted to examine the relationships between preschool teachers' epistemological beliefs and their digital literacy levels are presented in Table 11.

Table 11. Examination of the Relationships Between Preschool Teachers' Epistemological Beliefs and Digital Literacy Levels

	EBS1	**EBS2**	**EBS3**	**DLS**	**DLS Attitude**	**DLS Technical**	**DLS Cognitive**	**DLS Social**
EBS1	1							
EBS2	,125*	1						
EBS3	,359**	,628**	1					
DLS	,544**	0,013	,124*	1				
DLS Attitude	,595**	-0,028	,134*	,918**	1			
DLS Technical	,416**	0,061	,118*	,912**	,705**	1		
DLS Cognitive	,372**	0,002	0,017	,812**	,629**	,781**	1	

DLS Social	,413**	0,014	0,096	,789**	,694**	,638**	,576**	1

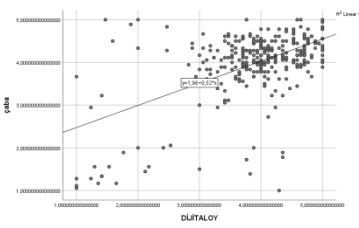
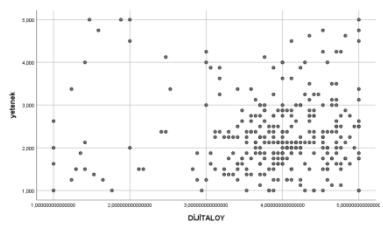
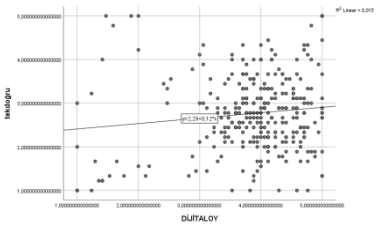
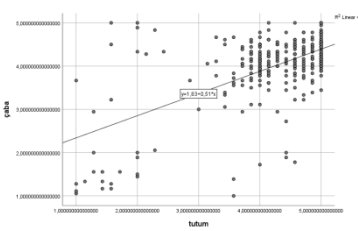
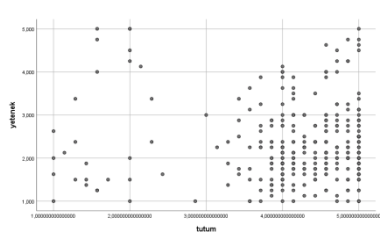
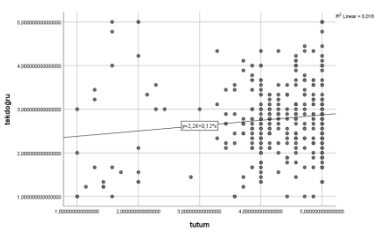
EBS1= The Belief Dimension That Learning Depends on Effort
EBS2= The Belief Dimension That Learning Depends on Talent
EBS3= The Dimension of Belief in the Existence of a Single Truth
DLS=Digital Literacy Scale
*p<0,05
**p<0,01

In the literature, correlation coefficients are generally interpreted as follows: between 0–0.2 as "very weak," between 0.2–0.4 as "weak," between 0.4–0.6 as "moderate," between 0.6–0.8 as "strong," and between 0.8–1 as "very strong" (Gürbüz & Şahin, 2014).

When Table 11 is examined, it is observed that there is a moderate, positive, and statistically significant relationship between digital literacy and belief in learning depending on effort (r = 0.544; p < .01). In addition, it was determined that there is a very weak, positive, and statistically significant relationship between digital literacy and belief in the existence of a single truth (r = 0.124; p < .05). On the other hand, no statistically significant relationship was found between digital literacy and belief in learning depending on ability.

When examined in terms of the sub-dimensions of the Digital Literacy Scale, it was found that there are positive and statistically significant relationships between belief in learning depending on effort and the attitude dimension of the scale at a moderate level (r = 0.595; p < .01), the technical dimension at a moderate level (r = 0.416; p < .01), the cognitive dimension at a weak level (r = 0.372; p < .01), and the social dimension at a moderate level (r = 0.413; p < .01). In addition, it was determined that there are very weak, positive, and statistically significant relationships between belief in the existence of a single truth and the attitude dimension (r = 0.134; p < .05) and the technical dimension (r = 0.118; p < .05) of the Digital Literacy Scale. On the other hand, no statistically significant relationships were observed between belief in the existence of a single truth and the cognitive and social dimensions of the Digital Literacy Scale (p > .05). Furthermore, no statistically significant relationships were found between belief in learning depending on ability and the sub-dimensions of the Digital Literacy Scale (p > .05).

The scatter plots are presented in Figure 1.

	Belief that Learning Depends on Effort	Belief that Learning Depends on Talent	Belief in the Existence of a Single Truth
Digital Literacy			
DLS Attitude			

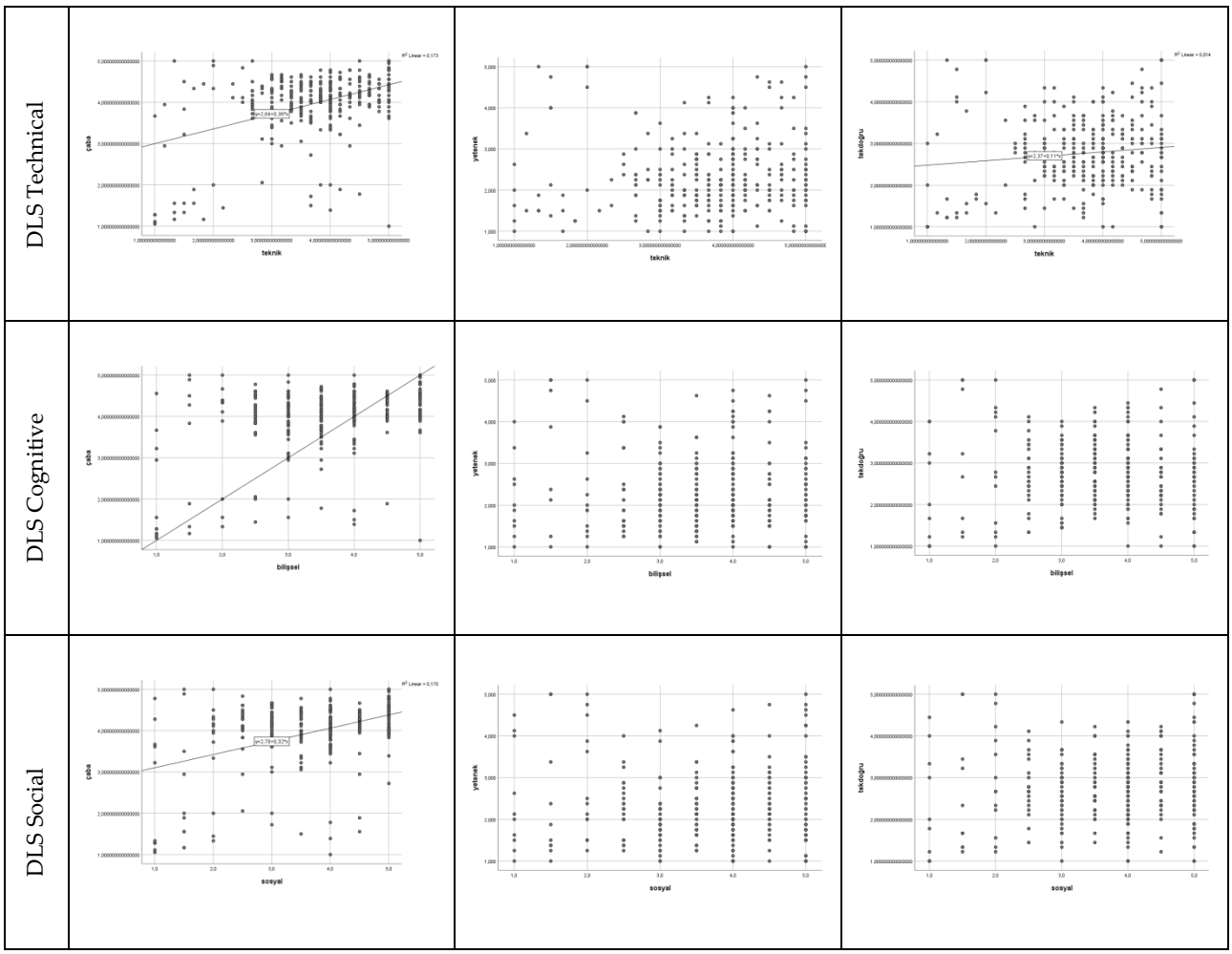


Figure 1. Linearity Scatter Plots

Findings on the Prediction of Preschool Teachers' Epistemological Beliefs by Their Digital Literacy Levels

In this part of the study, the results of the regression analysis conducted to examine whether preschool teachers' digital literacy levels predict their epistemological beliefs are presented.

Findings on the Prediction of the Belief in Learning Depending on Effort

The results of the regression analysis, conducted to examine the effect of preschool teachers' digital literacy levels on their belief in learning depending on effort, are presented in Table 12.

Table 12. Examination of the Effect of Digital Literacy on Belief in Learning Depending on Effort

Predictor	B	SE	β	t	p
Constant	1,957	,183	-	10,709	,000
Digital Literacy	,518	,046	,544	11,210	,000
Model Summary: R^2=0,294; F=125,656; p=0,000					

When Table 12 is examined, it is observed that the regression model is significant (F = 125.656; p < .01) and explains 29.4% of the variance in the belief in learning depending on effort. In addition, it was found that digital literacy has a positive and statistically significant effect on belief in learning depending on effort (β = 0.544; p < .01). The regression equation regarding the prediction of belief in learning depending on effort by the digital literacy variable is presented below:

BELIEF IN LEARNING DEPENDING ON EFFORT = 1.957 + 0.518 * DIGITAL LITERACY

The results of the multiple regression analysis conducted to examine the effect of the sub-dimensions of the Digital Literacy Scale on belief in learning depending on effort are presented in Table 13.

Table 13. Examination of the Effect of Digital Literacy Dimensions on Belief in Learning Depending on Effort

Predictor	B	SE	β	t	p	Tolerance	VIF
Constant	1,833	,178	-	10,309	,000	-	-
Attitude	,515	,064	,598	8,058	,000	,397	2,520
Technical	-,008	,073	-,009	-,109	,913	,304	3,287
Cognitive	,001	,063	,002	,021	,983	,375	2,666
Social	,002	,053	,003	,047	,962	,471	2,125
Model Summary: R^2=0,345; F=40,456; p=0,000							

When Table 13 is examined, it is observed that the regression model is significant (F = 40.456; p < .01) and explains 34.5% of the variance in the belief in learning depending on effort. In addition, it was determined that the attitude dimension of the Digital Literacy Scale has a positive and statistically significant effect on belief in learning depending on effort (β = 0.515; p < .01), whereas the other dimensions do not have significant effects (p > .05). On the other hand, since the tolerance values are above 0.2. The VIF values are below 10, confirming that there is no multicollinearity problem among the variables. The regression equation regarding the prediction of belief in learning depending on effort by the dimensions of digital literacy is presented below:

BELIEF IN LEARNING DEPENDING ON EFFORT = 1.833 + 0.515 * ATTITUDE

Findings on the Prediction of the Belief in Learning Depending on Ability

Since it was observed (Table 11) that there is no linear relationship between the digital literacy variable and its sub-dimensions and the belief in learning depending on ability, no regression analysis was conducted regarding the prediction of the belief in learning depending on ability.

Findings on the Prediction of the Belief in the Existence of a Single Truth

The results of the regression analysis, conducted to examine the effect of preschool teachers' digital literacy levels on their belief in the existence of a single truth, are presented in Table 14.

Table 14. Examination of the Effect of Digital Literacy on Belief in the Existence of a Single Truth

Predictor	*B*	*SE*	*β*	*t*	*p*
Constant	2,286	,228	-	10,039	,000
Digital Literacy	,124	,058	,124	2,153	,032
Model Summary: R^2=0,012; F=4,634; p=0,032					

When Table 14 is examined, it is observed that the regression model is statistically significant (F = 4.634; p < .05) and explains 1.2% of the variance in the belief in the existence of a single truth. In addition, it was found that digital literacy has a positive and statistically significant effect on belief in the existence of a single truth (β = 0.124; p < .05). The regression equation regarding the prediction of belief in the existence of a single truth by the digital literacy variable is presented below:

BELIEF IN THE EXISTENCE OF A SINGLE TRUTH = 2.286 + 0.124 * DIGITAL LITERACY

The results of the regression analysis conducted to examine the effect of the sub-dimensions of the Digital Literacy Scale on belief in the existence of a single truth are presented in Table 15. Since no linear relationship was observed between the cognitive and social dimensions of digital literacy and the belief in the

existence of a single truth (Table 11), only the attitude and technical dimensions were included in the regression model.

Table 15. Examination of the Effect of Digital Literacy Dimensions on Belief in the Existence of a Single Truth

Predictor	***B***	***SE***	***β***	***t***	***p***	**Tolerance**	**VIF**
Constant	2,227	,228	-	9,746	,000	-	-
Attitude	,093	,074	,102	1,264	,207	,503	1,990
Technical	,041	,073	,046	,563	,574	,503	1,990
Model Summary: R^2=0,013; F=2,902; p=0,056							

Upon examining Table 15, it is observed that the regression model is not statistically significant ($p > 0.05$).

Discussion and Conclusion

When examining the epistemological beliefs of preschool teachers, it was found that their beliefs regarding learning as dependent on effort were at a high level, whereas their beliefs regarding learning as dependent on ability were at a low level; on the other hand, their beliefs regarding the existence of a single truth were at a moderate level. A review of the literature similarly shows that participants generally hold strong beliefs about learning being dependent on effort (Ekiçi, 2014; Güven & Belet, 2010; Kaleci, 2012; Yordamlı, 2020). In terms of age, no statistically significant differences were observed among the dimensions of learning, dependent on effort, dependent on ability, and the existence of a single truth. From this perspective, age does not appear to be a determining variable in epistemological beliefs. Ekiçi's (2014) study also reported a similar finding. Considering internet usage purposes, no statistically significant differences were found in the dimensions of learning as dependent on effort and learning as dependent on ability. However, participants who reported using the internet primarily to follow the news were found to have significantly higher levels of belief in the existence of a single truth compared to those who used it for social media or research purposes. It is observed that many individuals primarily use the internet for social media, as they spend a significant portion of their daily internet time on these platforms. Consequently, they do not primarily use the internet to access information, follow the news, or conduct research, but rather to stay in touch with friends and relatives. For this reason, the absence of differences between internet usage purposes and durations and epistemological beliefs is an expected outcome. This finding also helps to explain other related variables.

Preschool teachers were found to have very high levels of digital literacy, both overall and across all sub-dimensions of the scale. A review of the literature shows similar results, as studies conducted with preservice teachers (Babacan, 2022; Kozan & Özek, 2019; Ocak & Karakuş, 2019; Şahin & Kalkan, 2022) and with teachers (Arslan, 2019; Buzkurt, 2021; Aksoy, Karabay, & Aksoy, 2021) likewise reported high levels of digital literacy. When analysed by age, participants over the age of 35 were found to have significantly lower digital literacy levels compared to those under 30 and those between 30 and 35. Examination of the sub-dimensions revealed similar patterns for the technical, cognitive, and social dimensions, whereas the attitude dimension did not show statistically significant differences across age groups. The findings from the studies by Aksoy, Karabay, and Aksoy (2021) and Ogelman, Demirci, and Güngör (2022) are parallel, supporting the results of the present study. The decline in digital literacy levels with increasing age is thought to stem from younger individuals being more immersed in technology and spending more time with digital tools compared to older individuals. Participants who reported using the internet primarily for social media were found to have significantly higher digital literacy levels than those who used it mainly for research purposes. Analysis of the sub-dimensions revealed similar results for the attitude, technical, and cognitive dimensions, while no significant differences were observed in the social dimension. A comparable result was reported by Kara

(2021). From this perspective, social platforms may enhance individuals' competencies in various respects, including technical skills and security awareness, which in turn contribute to higher levels of digital literacy.

A moderate, positive, and statistically significant relationship was found between digital literacy and the belief that learning depends on effort. A weak but statistically significant positive relationship was observed between digital literacy and the belief in the existence of a single truth. On the other hand, no statistically significant relationship was identified between digital literacy and the belief that learning depends on ability. As participants' levels of digital literacy increased, they were more inclined to believe that effort is necessary for learning. The weak relationship observed between digital literacy and the belief in the existence of a single truth may stem from participants' tendency to pursue knowledge with the assumption that real and absolute knowledge can be attained.

Regarding the sub-dimensions of digital literacy, the belief that learning depends on effort was moderately and positively associated with the attitude, technical, and social dimensions, and weakly but significantly associated with the cognitive dimension. In addition, the belief in the existence of a single truth was weakly and positively associated with the attitude and technical dimensions. At the same time, no statistically significant associations were observed with the cognitive and social dimensions. Finally, no significant relationships were found between the belief that learning depends on ability and any of the sub-dimensions of the digital literacy scale.

Digital literacy was found to have a positive and statistically significant effect on both the belief that learning depends on effort and the belief in the existence of a single truth. At the sub-dimension level, only the attitude dimension of the digital literacy scale was found to have a positive and statistically significant effect on the belief that learning depends on effort. In contrast, the other dimensions did not exert a significant effect. No significant effects were observed for the sub-dimensions of digital literacy on the belief in the existence of a single truth, nor for digital literacy and its sub-dimensions on the belief that learning depends on ability. When individuals utilize information and communication technologies, learning becomes more engaging for them, motivating them to strive for new knowledge acquisition. Likewise, individuals with strong digital literacy skills are expected to continually engage in efforts to acquire the competencies necessary for effective use of these technologies. From this perspective, it is reasonable to expect that higher levels of digital literacy would contribute to the development of epistemological beliefs in this direction. A review of the literature revealed that no studies, either in Turkey or abroad, have specifically examined the predictive role of digital literacy on epistemological beliefs.

Recommendations

1. Upon examination of the results, it was found that participants over the age of 35 had lower levels of digital literacy compared to those under the age of 35. In this regard, digital literacy training can be provided to teachers over 35 years old. At the same time, since digital literacy increases individuals' epistemological beliefs and provides a broader perspective, it is necessary to offer this training to all teachers.

2. According to the study's results, an increase in time spent on social media led to higher digital literacy levels among participants. However, the literature (Akgül, Yıldız, & Turşucuoğlu, 2018; Şener & Yiğit, 2021; Koca & Tunca, 2020) also reveals that social media has disadvantages, including communication deficiencies among friends, weakened family ties, detachment from real life, depression, anxiety, and sleep disorders. Therefore, a more balanced and conscious use is recommended.

3. Since the study population was limited to the central districts of Şanlıurfa, the same research could be conducted with preschool teachers from various regions of Türkiye and with a larger sample size to achieve more generalizable results.

4. In future studies, the moderating effect of demographic variables on the relationship between digital literacy and epistemological beliefs can be examined.

5. Further research may be conducted to investigate epistemological beliefs and digital literacy, together with various sub-dimensions and other variables.

Ethical Commitment Statement

In this study, scientific ethical values and academic standards were adhered to; all sources were cited correctly. It is declared that, in the event of any contrary finding, full responsibility belongs to the corresponding author, and that this study has not been submitted for evaluation to any academic publication outlet.

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Ethics Committee Approval Information

This research was conducted with the approval of the Ethics Committee of Dicle University, dated December 27, 2021, and numbered 201434.

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