The Relationship between Pre-service Primary School Teachers' Perception of 21st-Century Skills, Mathematical Literacy Self-Efficiency, and Financial Literacy Attitudes and Behaviors

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Abstract. Primary school teachers are one of the main actors in basic education. In this context, their 21st-century skills, math literacy, and financial literacy affect the quality of their teaching. This study aims at examining the relationship between pre-service primary school teachers' mathematical literacy, 21st-century skills, and financial literacy levels. This study used a relational survey model, and the study group involved a total of 276 pre-service primary school teachers. "Mathematical Literacy Self-Efficacy Scale," "21st-Century Skills Efficacy Perceptions Scale," and "Financial Literacy Attitude and Behavior Scale" were used in the study. The results showed that pre-service primary school teachers' perceptions of 21st-century skills efficiency were high, the mathematical literacy self-efficacy of the pre-service primary school teachers was above the average, and the pre-service primary school teachers' financial literacy attitude and behavior levels were low. Also, a positive and significant relationship was found between the mathematical literacy self-efficacy of pre-service primary school teachers and their perceptions of 21st-century skills efficiency. In addition, a negative and significant correlation was found between the mathematical literacy self-efficacy of the pre-service primary school teachers and their financial literacy attitudes and behaviors.

Keywords: pre-service teachers, primary school, 21st-century skills, mathematical literacy, financial literacy

INTRODUCTION ~ There are some skills that people need to master to be successful in the twenty-first century. The key to acquiring these skills passes through education. Along with the advancing technologies and innovations, the education policies in countries are also affected in this direction. Providing students with 21st-century skills, in other words, raising individuals who have high-level thinking skills that produce and continue with the times, is among the education policies of countries. In current information societies, the use of the knowledge in necessary places disseminating that knowledge and the foundation of the tools that will enable it to be reinforced with new knowledge are also within the scope of education. According to the International Twenty-First Century Education Commission report, four basic skills have been revealed: learning to know, learning to do, learning to be, and learning to live together (Perdanasari et al., 2019). The first basic skill, learning how to know, also has four

themes, which are global awareness, financial and algebraic literacy, civic literacy, and health literacy (Delors, 1998).

The World Economic Forum (2016) on A New Vision for Education: Promoting Social and Emotional Learning through Technology explained that having basic literacy skills is one of the acquirements of the 21st-century. These basic literacy skills have six subcomponents. These include literacy, science literacy, information technology and communication literacy; financial literacy, cultural literacy, and civic literacy. The report also mentions the importance of teaching all these skills to children (OECD, 2016).

Another development that increased the importance of 21st-century skills education was adding these skills to the education programs. In many curriculums, these skills are defined to raise students who can compete in the dynamic, global market in 21st-century educational institutions (Tuğluk & Özkan, 2019). In addition to basic courses such as Mathematics Education, Turkish Language, and Social Studies, many different curriculums include thinking in a critical and creative way, problem-solving, communication, researching, decision-making, and entrepreneurship skills.

The view of financial literacy, which is one of the special themes of the ability to learn to know that forms the basis of 21st-century skills, is one of the *sine qua non* of today's global world. Financial literacy education is provided early in almost all OECD member countries (PISA, 2012). The expectation of especially the young population to have a high quality of life in the future requires them to be financially literate. Despite this situation, it has been determined in most of the studies that the number of individuals with individual financial responsibility is quite low (Lusardi & Mitchell, 2014).

According to the Program for International Student Assessment (PISA), financial literacy is defined as having financial knowledge, evaluating risks, and solving problems to ensure individual or social-financial well-being (OECD, 2013). According to Atkinson & Messy (2013), financial literacy is the process of directing individuals to save and use these savings correctly. The ability to apply relevant financial knowledge to financial decisions in daily life, especially those that include interaction with the financial services industry, is a common characteristic of the financial literacy (Henderson et al., 2021). In this context, literacy education in children should be realized not only by introducing concepts but also by introducing wise financial management and making them gain the skills to make financial expenses by distinguishing what is necessary and what is just a desire.

Mathematical literacy, another 21st-century literacy skill, is one of the basic proficiencies that people should have and is emphasized by the OECD (Umbara & Suryadi, 2019). A mathematically literate individual can analyze, reason, and communicate ideas effectively

while posing, solving, or interpreting mathematical problems in various situations and contexts (OECD, 2006, 2011). At this point, it is essential to examine the results of a study conducted with American business managers. Within the scope of the related study, managers were asked to rank the most important creative skills necessary in the workforce of the 21st-century (Lichtenberg et al., 2008). The results showed that 85 percent of employers who want to recruit people with creative ideas could not find qualified candidates. Moreover, while the employers explained the first five aspects of creativity, they wrote the item "problem identification and solving" first.

The need to use the skills of 21st-century into the curriculum has been a call brought out by many individuals and institutions for many years. In addition to this call, the Information and Technology Institution of America has worked with professional organizations to create literacy maps and activities in "English, geography, science, math, and social sciences" courses to demonstrate the links between the tools and skills of the 21st-century. They pioneered the addition of these mind maps to the Americas Education Program (Gut, 2011). Also, in some states, financial literacy is integrated into other related courses such as mathematics and social sciences (California Department of Education, 2015; Ontario Ministry of Education, 2010). Many learning outcomes directly or indirectly include problem-solving skills in the curriculum of mathematics for the first four years of the students (primary school students) studying in Turkey (Talim Terbiye Kurulu Başkanlığı, 2017). In other words, there are standards in life sciences (7 units), social studies (6 units), Turkish Language lessons, and science curriculum (1 unit) related to financial literacy (Güvenç, 2017).

The lack of similar study in the literature examining the relationship between pre-service primary school teachers (PsPST)' mathematical literacy, 21st-century skills, and financial literacy levels increases the importance of this study. The purpose of this study is to examine the relationship between pre-service primary school teachers (PsPST)' mathematical literacy, 21st-century skills, and financial literacy levels. Established on this purpose, the questions below were answered:

1) What are the 21st-century skills efficiency perception levels of PsPST?
   - Do PsPST' perceptions of 21st-century skills efficiency differ significantly by gender?
   - Do PsPST' perceptions of 21st-century skills efficiency differ in a significant way according to the continuing level of grades?
2) What are the mathematical literacy self-efficacy levels of PsPST?
   - Do PsPST' mathematical literacy self-efficacy levels differ significantly by gender?
   - Do PsPST' mathematical literacy self-efficacy levels differ in a significant way according to the level of grade they continue?
3) What are the financial literacy attitudes and behavior levels of the PsPST?
   - Do PsPST' financial literacy attitudes and behaviors differ significantly by gender?

- Do PsPST' financial literacy attitude and behavior differ significantly according to the class level they continue?

4) Is there a significant relationship between PsPST' perception of 21st-century skills efficiency, mathematical literacy self-efficacy, and financial literacy attitude and behavior levels?

5) Do PsPST' mathematical literacy self-efficacy and financial literacy attitudes and behaviors predict their 21st-century skills efficiency perceptions?

METHOD

This study used a relational survey model to examine the relations among pre-service primary school educators (PsPST)' 21st-century skills, mathematical literacy, self-efficacy perceptions, and financial literacy levels. In the relational survey model, it is tried to define the relationship between special events and decide on the existence and/or degree of co-change between two or more variables to achieve certain goals (Karasar, 2020). The study group consists of a total of 276 PsPST in Turkey. The participant demographic information is reported in Table 1.

Table 1. Distribution *of the* PsPST' Demographic Characteristics

Demographic Information		*N*	%	Total
Gender	Male	80	29.0	276
	Female	196	71.0	
Grade Level	1st Year (Freshman)	86	31.2	276
	2nd Year (Sophomore)	72	26.1	
	3rd Year (Junior)	64	23.2	
	4th Year (Senior)	54	19.6	

Table 1 shows that 71% of participants were female, and 29% of participants were male. Also, the PsPST were mostly 1st year and at least 4th-year students. In addition, the number of participants attending the 2nd and 3rd years was close to each other.

Data Collection Tools

"Mathematical Literacy Self-Efficacy Scale", "21. Century Skills Efficacy Perceptions Scale", and "Financial Literacy Attitude and Behavior Scale" were used in the study. The permissions were obtained from the authors for the use of the scales. Detailed information about the scales is given below.

21st-Century Skills Efficacy Perceptions Scale

The "21st-Century Skills Efficiency Perceptions Scale" developed by Anagün et al. (2016) was used to measure PST' perceptions of "21st-century skills efficiency". The "21st-century skills efficiency perceptions scale" consists of three sub-dimensions (learning and renewal skills, life skills, information-media and technology skills) and a total of 42 items. The related scale was improved in a five-point Likert type. This scale includes "never", "rarely", "sometimes", "often", and "always" options. The range of scores is between 42 (the lowest score) and 210 (the highest score). As a result of reliability analysis, the researchers found the Cronbach's alpha value of the entire scale to be .889. In this study, the Cronbach alpha value of the total score was counted to be .933. The Cronbach's alpha values for the sub-dimensions were .903, .855, and .845, respectively. These values show that the scale was reliable (Kayış, 2009).

Mathematical Literacy Self-Efficacy Scale

The "mathematical literacy self-efficacy scale" developed by Özgen & Bindak (2008) has one dimension and 25 items. The related scale is structured in a 5-point Likert type and includes options such as "strongly agree," "agree," "undecided," "disagree," and "strongly disagree." In addition, the Cronbach alpha reliability coefficient of the scale was determined as .942 during the scale development process. In this study, Cronbach's alpha reliability coefficient was found as .910. According to Kayış (2009), the Cronbach's alpha reliability coefficient of greater than 0.60 indicates that the scale is reliable for the study group. In this context, the reliability coefficient obtained is above the sufficient level. The score that can be obtained from the scale is between 25 and 125. As a result, a high score indicates that the "mathematical literacy self-efficacy levels" of the primary school teachers are high, and a low score indicates that the mathematical literacy self-efficacy levels of the primary school teachers were low.

Financial Literacy Attitude and Behavior Scale

"Financial Literacy Attitude and Behavior Scale" developed by Sarıgül (2015) consists of four sub-dimensions (spending, attitude, perception, and interest) and a total of 14 items. The related scale is structured in a five-point Likert type and includes options such as "strongly agree," "pretty much agree," "partially agree," "little agree," and "strongly disagree." The score that can be obtained from the scale is between 14 and 70. The Cronbach's alpha reliability coefficient of the whole scale was found to be 0.72 by the researcher, and 0.762 for the entire scale, similarly in this study. This finding explains that the scale was reliable for the study group (Kayış, 2009).

DATA ANALYSIS

To analysis the data SPSS software was used. First of all, skewness and kurtosis values were scanned and the skewness and kurtosis values for each scale were counted to be between +1.5 and -1.5, and it was determined that the data obtained showed a normal distribution

(Tabachnick & Fidell, 2013) (Tables 2, 5, and 9). Since the data showed normal distribution, independent sample t-test (for two groups) and one-way ANOVA (for three or more groups) tests were applied. Pearson correlation analysis was performed for the data showing normal distribution to explain the relation between participants' "Mathematical Literacy Self-efficacy," "21st-Century Skills Efficiency Perceptions," and "Financial Literacy Attitudes and Behaviors." Besides that, multiple regression analysis was conducted to determine the predictive effect of "mathematical literacy self-efficacy" and "financial literacy attitudes and behaviors" of PsPST on their 21st-century skills efficiency perceptions.

RESULTS

Findings on 21st-Century Skills Efficiency Perceptions

Statistical information about the 21st-century skills efficiency perception scores are presented in Table 2.

Table 2. Statistical Information on the 21st-Century Skills Efficiency Perceptions

	N	$\bar{x}$	ss	$Sh_{\bar{x}}$	Min.	Max.	Skewness	Kurtosis
21st-Century Skills Efficiency Perceptions	276	165.00	17.64	.92	111.00	210.00	-.267	.552

Table 2 states that the proximate score of PsPST 21st-century skills efficiency perception scale was 165.00. This finding indicates that the 21st-century skills efficiency perceptions of the PsPST were generally high.

The t-test was conducted to explore whether the 21st-century skills efficiency perception scores of the PsPST in the study was significantly difference based on gender variables. The results related to this analysis are presented in Table 3.

Table 3. Results of 21st-Century Skills Efficiency Perception Scores by Gender

	Groups	N	$\bar{x}$	ss	$Sh_{\bar{x}}$	t	Sd	p
						t-Test		
21st-Century Skills Efficiency Perceptions	Female	196	165.02	17.05	1.21	-0.38	274	.97
	Male	80	164.92	19.15	2.14			

*p<.05

In Table 3, PsPST perceptions of the 21st-century skills efficiency do not differ significantly by gender ($t_{(274)}=0.38$, $p>.05$). In other words, the 21st-century skills efficiency perceptions of PsPST do not significantly change according to gender. Female ($\bar{x}$ =165.02) participants perceptions of 21st-century skills efficiency are slightly higher than male pre-service teachers ($\bar{x}$ =164.92). In

addition, when the effect values for the t-test are examined, effect value (d) was found to be 0.0056, and the degree of the effect (η^2) was 0.00. This data indicates that the level of effect was low.

ANOVA analysis was conducted to show whether the "21st-century skills efficiency perception" scores of the PsPST changed based on the grade level variable. The results are presented in Table 4.

Table 4. Results of 21st-Century Skills Efficiency Perception Scores by Continuing Grade Level Variable

	Group	N	$\overline{x}$	ss	Var. L.	KT	Sd	KO	F	p
21st-Century	1st Year	94	163.60	19.29	**Between G.**	3276.52	3	1092.18	3.61	.014*
Skills	2nd Year	77	170.64	15.85	**Within G.**	82384.44	330	302.88		
Efficiency	3rd Year	70	161.66	16.30	**Total**	85660.97	333			
Perceptions	4th Year	93	163.61	17.47						

*p<.05

According to Table 4, the grade level variable that PsPST attend differed significantly over the average scores of 21st-century skills efficiency perceptions (F= 3.61, p<.05). Scheffe test, one of the post-hoc analyses, was conducted to determine at which class level this significant difference occurred. Post-hoc test result is presented in Table 5.

Table 5. Scheffe Test Statistics Regarding the Average Scores of 21st-Century Skills Efficiency Perceptions by Attending Grade Level

Score	Grade (i)	Grade (j)	i-j	sh	p
	1st Year	2nd Year	-7.034	2.78	.096
		3rd Year	1.948	2.87	.928
		4th Year	-.0064	3.02	1.000
	2nd Year	1st Year	7.034	2.78	.096
		3rd Year	8.982*	2.98	.031*
		4th Year	7.027	3.13	.172
21st-Century Skills Efficiency Perceptions	3rd Year	1st Year	-1.948	2.87	.928
		2nd Year	-8.982*	2.98	.031*
		4th Year	-1.954	3.21	.946
	4th Year	1st Year	.0064	3.02	1.000
		2nd Year	-7.027	3.13	.172
		3rd Year	1.954	3.21	.946

*p<.05

Table 5 shows that the significant difference was found between the "21st-century skills efficiency perceptions" of the PsPST attending the 2nd year and the 3rd year (i-j= 8.982, p<.05). PsPST attending the 2nd year had higher perceptions of 21st-century skills efficiency than those attending the 3rd year. Also, significant difference was not found between the 21st-century skills efficiency perceptions among the other grade levels, except for the PsPST' attending the 2nd and 3rd year (p>.05).

Findings Regarding the "Mathematical Literacy Self-Efficacy Scale"
The statistical information regarding the mathematical literacy self-efficacy scores are presented in Table 6.

Table 6. Statistical Information on "Mathematical Literacy Self-Efficacy Scores"

	N	$\overline{x}$	ss	$Sh_{\overline{x}}$	Min.	Max.	Skewness	Kurtosis
Mathematical Literacy Self-Self-Efficacy	276	87.74	11.27	.68	35.00	119.00	-.437	1.583

Table 6 shows that the proximate score of 'the mathematical literacy self-efficacy' scale of the PsPST was 87.75. On the other hand, the "mathematical literacy self-efficacy" of the PsPST was as a moderate level.

The "mathematical literacy self-efficacy scores" of the PsPST differed significantly in terms of gender. The findings related to this analysis are given in Table 7.

Table 7. Results of "Mathematical Literacy Self-Efficacy" Scores by Gender

	Groups	N	$\overline{x}$	ss	$Sh_{\overline{x}}$	t-Test		
						t	Sd	p
Mathematical Literacy Self-Efficacy	Female	196	86.62	12.10	.86	3.04	209.47	.003*
	Male	80	90.05	8.37	.94			

*p<.05

Table 7 shows that the "mathematical literacy self-efficacy" scores of the PsPST differed significantly by gender ($t_{(209.47)}$=3.04, *p*<0.05). Self-efficacy average scores of male participants ($\overline{x}$= 90.05) pre-service teachers are higher than female candidates ($\overline{x}$=86.62). As a result of the analyzes made, when the effect sizes for the t-test are examined, effect value (d) was found to be 0.32, and the degree of effect (η 2) was found to be 0.025. The effect was low,

and only 2.5% of the difference between self-efficacy perceptions could be explained by the gender variable.

ANOVA test was applied to determine the "mathematical literacy self-efficacy" scores of the PsPST in terms of the grade level variable. The findings are represented in Table 8.

Table 8. ANOVA Results of 'Mathematical Literacy Self-Efficacy' Scores by Continuing Grade Level Variable

	Group	N	$\overline{x}$	ss	Var. L.	KT	Sd	KO	F	p
Mathematics Literacy Self-Efficacy	1st Year	86	88.60	8.15	Between the G.	290.88	3	96.96	0.761	.517
	2nd Year	72	88.17	13.02	Within G.	34673.37	272	127.48		
	3rd Year	64	85.92	10.75	Total	34964.25	333			
	4th Year	54	88.00	13.53						

*p<.05

According to Table 8, the grade level variable that PsPST attend did not differ significantly on mathematical literacy self-efficacy scores (*F*= 0.761, *p*>.05). This finding points out that the grade level of the PsPST did not make a difference in mathematical literacy self-efficacy.

Findings on Financial Literacy Attitudes and Behaviors

The statistical information regarding the financial literacy attitude and behavior scores of participants is presented in Table 9.

Table 9. Statistical Information on Financial Literacy Attitude and Behavior Scores

Financial Literacy Attitudes and Behaviors	N	$\overline{x}$	ss	Min.	Max.	Skewness	Kurtosis
	276	35.48	7.88	18.00	61.00	.624	.646

Table 9 shows that the financial literacy attitude and behavior scale mean score of the PsPST was 35.48. This statistic could be expressed as that the financial literacy attitude and behavior levels of PsPST were low.

The t-test was applied to the data set in order to explain whether the financial literacy attitude and behavior scores of the PsPST differed significantly in terms of gender variables. Statistics for this test are pointed out in Table 10.

Table 10. T-Test Results of Financial Literacy Attitude and Behavior Scores by Gender

	Groups	N	$\overline{x}$	ss	$Sh_{\overline{x}}$	t Test		
						t	Sd	p
Financial Literacy Attitudes and Behaviors	Female	196	36.04	8.21	.59	-1.85	274	.065
	Male	80	34.11	6.83	.76			

*p<.05

Table 10 shows that the 'financial literacy attitude and behavior levels of the PsPST did not differ significantly by gender ($t_{(274)} = -1.85$, $p>.05$). In other words, financial literacy attitude and behavior levels of PsPST did not change significantly according to gender. Financial literacy attitude and behavior levels of female (= 36.04) pre-service teachers were slightly higher than male (= 34.11). As a result of the analyzes made, when the effect size for the t-test was examined, the effect value (d) was 0.26, and the degree of effect (η^2) was 0.012. It is seen that the effect was low, and the gender variable explained only 1.2% of the difference between financial literacy attitude and behavior levels.

ANOVA test was conducted to determine whether the 'financial literacy attitude and behavior' scores of the PsPST changed in terms of the grade level. Table 11 shows the ANOVA test scores.

Table 11. ANOVA Results of Financial Literacy Attitude and Behavior Scores by Continuing Grade Level Variable

	Group	N	$\overline{x}$	ss	Var. L.	KT	Sd	KO	F	p
Financial Literacy Attitudes and Behaviors	1st Year	94	36.40	19.29	Between the G.	239.42	3	79.805	1.29	.278
	2nd Year	77	35.880	15.85	within G.	16833.50	330	61.89		
	3rd Year	70	33.90	16.30	Total	17072.90	333			
	4th Year	93	3.46	17.47						

*p<.05

Table 11 shows that the grade level variable of the PsPST in the study did not make a significant difference to their financial literacy attitude and behavior scores *(F= 1.29, p>.05)*. This data indicates that the PsPST grade level was not effective on financial literacy attitudes and behaviors.

The Relationships between PsPST' "Mathematical Literacy Self-Efficacy" and "Perceptions of 21st-Century Skills Efficiency" and "Financial Literacy Attitudes and Behaviors"

In the study, the correlation between the scales applied to the PsPST was determined and shown in Table 12.

Table 12. Statistics on Correlation Between Scales Used in the Study

Scales	1	2	3
21st-Century Skills Efficiency (1)	1.00		
Mathematical Literacy Self-Efficacy (2)	.454*	1.00	
Financial Literacy Attitudes and Behaviors (3)	-.111	-.122*	1.00

*p<.05

Table 12 shows that a positive and significant relationship was detected between 'the 21st-century skills efficiency perceptions' of PsPST and their mathematical literacy self-efficacy (*r*=.454, *p*<.05). In addition, a negative and significant correlation was detected between the 'mathematical literacy self-efficacy' and 'financial literacy attitudes and behaviors' of the PsPST (*r*=-.122, *p*<.05). In addition, a negative and non-significant relationship was stated between the '21st-century skills efficiency perceptions' of the PsPST and their 'financial literacy attitudes and behaviors' (*r*=-.111, *p*>.05).

The Predictions of 'Mathematical Literacy Self-Efficacy' and 'Financial Literacy Attitudes and Behaviors' of PsPST' Perceptions of '21st-Century Skills Efficiency'

Multiple regression analysis was conducted to determine the predictive power of mathematical literacy self-efficacy and financial literacy attitudes and behaviors of PsPST in their 21st-century skills efficiency perceptions. For multiple regression analysis, it was necessary to examine whether there was a multicollinearity problem between variables. It is important to examine the VIF and tolerance values in the data set. it was recommended that tolerance values be above 0.10 (Hair et al., 2002) and VIF values below 2.5 (Allison, 1999). In this context, the VIF and tolerance values in the data set were examined and shown in Table 13.

Table 13. Multicollinearity Values of Predictive Variables Regarding the Prediction

Variable	VIF Values	Tolerance Values
Mathematical Literacy Self-Efficacy	1.015	.985
Financial Literacy Attitudes and Behaviors	1.015	.985

Table 13 shows that the VIF values of the predictor variables was below 2.5 (Allison, 1999), and the tolerance values were above 0.10 (Hair et al., 2002). These values indicate that the data set was suitable for multiple regression analysis, that was conducted to determine to what extent the "mathematical literacy self-efficacy" and "financial literacy attitudes and

behaviors" of PsPST affected their "21st-century skills efficiency perceptions". Table 14 represents the multiple regression analysis.

Table 14. Multiple Regression Analysis between 'Mathematical Literacy Self-Efficacy' and 'Perceptions of 21st-Century Skills Efficiency' and 'Financial Literacy Attitudes and Behavior'

Variable	Not Standardized				F	Adj. R²
	β	sh	t	p		
Constant	108.128	9.100	11.883	.000*		
Mathematical Literacy Self-Efficacy	.699	.085	8.238	.000*	36.069	.203
Financial Literacy Attitudes and Behavior	-.127	.121	-1.045	.297		

*p<.05

It is seen in Table 14 that 'the mathematical literacy self-efficacy' of the participants significantly predicts their '21st-century skills efficiency perceptions' (*p*<.05). According to the non-standardized beta coefficient, a one-unit change in 'mathematical literacy self-efficacy' of PsPST had a positive effect of 0.699 on their perceptions of '21st-century skills efficiency'. Additionally, the PsPST 'financial literacy attitudes and behaviors' did not significantly predict their '21st-century skills efficiency perceptions' (*p*>.05). Also, it was determined that 20% of the variability in "21st-century skills efficiency perceptions" was explained by "mathematical literacy self-efficacy" and "financial literacy attitudes and behaviors".

DISCUSSION

In this study, the mathematical literacy self-efficacy of the PsPST was above the average scores. Similarly, Topbaş Tat (2018) and Dinçer et al. (2016) found that pre-service teachers' mathematical literacy self-efficacy levels were above the medium level in their studies. The findings in the literature supported the study results. In addition, the mathematical literacy levels of the PsPST were examined according to the gender variability and grade level, and it was explained that the mathematical literacy self-efficacy of the PsPST differed significantly in terms of the gender variable. This significant difference was in favor of male pre-service teachers. In the literature, Özgen & Bindak (2008, 2011), Hackett & Betz (1989), and Ozyurek (2010) found similar results to the current findings. Mathematical literacy self-efficacy of primary school teacher candidates did not differ significantly in the grade level attended. Similar results were obtained in the study conducted by Topbaş Tat (2018) with pre-service mathematics teachers. However, some researchers highlighted that PsPST mathematical literacy self-efficacy differed significantly by grade level (Dinçer et al., 2016; Koyuncu & Haser, 2012).

As another result of the study, the PsPST perceptions of 21st-century skills efficiency levels were high. The literature states that the 21st-century skills of the participants were high (Cemaloğlu et al., 2019; Donmuş Kaya & Akpunar, 2018; Günüç et al., 2013; Kozikoglu & Altunova, 2018). In addition, PsPST perceptions of 21st-century skills efficiency do not differ significantly in accordance with gender. In the literature, Cemaloğlu et al. (2019) support the current findings of the study. When the 21st-century skill efficiency perceptions of the pre-service teachers were analyzed according to the grade level, the 2nd level of PsPST perceptions of 21st-century skills proficiency were higher than those attending the 3rd year. Similarly, Gülen (2013) found in his study that as the students' grade level increased, the level of use of 21st-century skills decreased. In addition, financial literacy emerges as a basic skill for the 21st-Century (OECD, 2014), and many countries see financial literacy as a skill of the 21st-century (Lusardi, 2015).

Moreover, it was determined that the PsPST financial literacy attitude and behavior levels were low. When the literature is examined, Biçer & Altan (2016) used the same scale as university students studying in different departments of a state university, financial literacy attitude and behavior levels of students receiving financial education were detected to be higher than students who did not receive financial education. As a result of the currents research, the financial literacy attitudes and behaviors of the PsPST did not differ significantly by gender and grade level. Similarly, Adeleke (2013), Biçer & Altan (2016), Jorgensen & Savla (2010), and Ünal et al. (2016) detected that the gender variable did not make a significant difference on financial literacy level. Biçer & Altan (2016) stated that the financial literacy attitudes and behaviors of the 2nd-year students were significantly higher than the other grade levels. It is thought that the discrepancy between the results in the literature and the results taken from this research is due to the fact that the PsPST participating in the research did not receive education on financial literacy. Individuals, especially future teachers, are thought to be financially literate to make effective decisions and evaluate financial decisions correctly, and accordingly, teachers are expected to have financial literacy skills to transfer their knowledge to students. The participants of this study have similar financial literacy levels, and it is low. This can be explained as the absence of a financial literacy course or content in graduate education. In general, financial literacy skills are taught by associating them with mathematics and social studies. In other words, although social studies and mathematics proficiency are important in terms of financial literacy.

There was a positive and significant relationship between the 'mathematical literacy self-efficacy' of PsPST and their perceptions of '21st-century skills efficiency'. With mathematics education, students should be prepared to apply mathematics in all kinds of work and daily life situations; in other words, 21-century skills and mathematical skills should support each other. 21st-century skills should be accepted as the aims of mathematics education and support mathematics-specific argumentation and communication skills (Gravemeijer et al., 2017). In

addition, a negative and significant correlation was found between the 'mathematical literacy self-efficacy' of the PsPST and their 'financial literacy attitudes and behaviors'. Although this result is similar to the study conducted by Seyhan (2020), it is due to the fact that financial literacy skills are given in social studies rather than mathematics lessons, and among the objectives of the social studies, the lesson is the aims of raising individuals who can be financially literate and conscious consumers. The importance of the mathematics curriculum in terms of financial literacy is limited to units and topics related to money and orientation to consumption. On the other hand, a negative and insignificant relationship was determined between the 21st-century skills efficiency perceptions of the participants and their financial literacy attitudes and behaviors.

CONCLUSION

21st-century skills include learning skills such as problem-solving skills, literacy skills such as information literacy, and life skills such as social skills (Szabo et al., 2020). To gain mathematical literacy, people need to have 21st-century skills and financial literacy skills. To develop the skills (mathematical literacy, 21st-century skills, financial literacy, etc.) that individuals should have in the age we live in, primarily education programs should be supported in this direction. Besides, the awareness of teachers and pre-service teachers who will apply for these programs in their classes should be increased and supported on these skills. Also, teachers and pre-service teachers can participate in in-service training courses in order to have the specified qualifications and skills. Besides, courses or activities for acquiring relevant skills can be added to the curriculum at the university for pre-services teachers. Mathematical literacy includes many basic skills such as thinking and reasoning in mathematically. Mathematical argumentation, mathematical modeling, problem posing and solving. For primary school students to have a positive perception of mathematics, the efficiencies of primary school teachers in this area are important. Future primary school teachers were expected that they will have high mathematical literacy self-efficacy.

This study has some limitations. The research group of this study is limited to 276 primary teacher candidates studying in Turkey. It is also limited to three scales (Mathematical Literacy Self-Efficacy Scale, 21st-Century Skills Efficacy Perceptions Scale, and Financial Literacy Attitude and Behavior Scale) used in the study.

REFERENCES

Adeleke, T. (2013). *The Effects of Gender and Gender Role on the Financial Literacy of College Students*. University of North Carolina Wilmington.

Allison, P. D. (1999). *Multiple Regression: A Primer*. SAGE Publications.

Anagün, Ş. S., Atalay, N., Kılıç, Z., & Yaşar, S. (2016). Öğretmen Adaylarına Yönelik 21. Yüzyıl Becerileri Yeterlilik Algıları Ölçeğinin Geliştirilmesi: Geçerlik ve Güvenirlik Çalışması [The Development of a 21st Century Skills and Competences Scale Directed at Teaching

Candidates: Validity and Reliability Stud. *Pamukkale University Journal of Education*, *2016*(40), 160–175. https://doi.org/10.9779/puje768

Atkinson, A., & Messy, F.-A. (2013). Promoting Financial Inclusion through Financial Education. *OECD Working Papers on Finance, Insurance and Private Pensions*, *34*. https://doi.org/10.1787/5k3xz6m88smp-en

Biçer, E. B., & Altan, F. (2016). Üniversite Öğrencilerinin Finansal Okuryazarlık ile İlgili Tutum ve Davranışlarının Değerlendirilmesi [Evaluation of University Student's Financial Literacy Related to Attitudes and Behavior]. *Atatürk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, *20*(4), 1519–1533.

California Department of Education. (2015). *Financial literacy and mathematics education. of the Mathematics Framework for California Public Schools: Kindergarten Through Grade Twelve*. California Department of Education.

Cemaloğlu, N., Arslangilay, A. S., Üstündağ, M. T., & Bilasa, P. (2019). Meslek Lisesi Öğretmenlerinin 21. Yüzyıl Becerileri Özyeterlik Algıları [21st Century Skills Self-efficacy Perceptions of Vocational High School Teachers]. *Ahi Evran Universitesi Kırşehir Eğitim Fakültesi Dergisi*, *20*(2), 845–874. https://doi.org/10.29299/kefad.2019.20.02.010

Delors, J. (1998). *The Treasure Within : Report to UNESCO of the International Commission on Education for the Twenty-first Century*. Renouf Publishing Company Limited.

Dinçer, B., Akarsu, E., & Yılmaz, S. (2016). İlköğretim Matematik ÖğretmeniAdaylarının Matematik Okuryazarlığı Özyeterlik Algıları İle Matematik Öğretimi Yeterlik İnanç Düzeylerinin İncelenmesi [The Investigation of Perceptions of Math Literacy Self-Efficacy and Mathematics Teaching Efficacy Belief . *Turkish Journal of Computer and Mathematics Education (TURCOMAT)*, *7*(1), 207. https://doi.org/10.16949/turcomat.99884

Donmuş Kaya, V., & Akpunar, B. (2018). An Investigation of Prospective Teachers' 21st Century Skills Effect About Digital Storytelling Events. *MANAS Journal of Social Studies*, *7*(4).

Gravemeijer, K., Stephan, M., Julie, C., Lin, F.-L., & Ohtani, M. (2017). What Mathematics Education May Prepare Students for the Society of the Future? *International Journal of Science and Mathematics Education*, *15*(1), 105–123. https://doi.org/10.1007/s10763-017-9814-6

Gülen, Ş. B. (2013). *Ortaokul Öğrencilerinin 21. Yüzyıl Öğrenme Becerileri ve Bilişim Teknolojileri ile Destekleme Düzeylerinin Cinsiyet ve Sınıf Seviyesine Göre İncelenmesi [21st Century Learner Skills and Level of Support from Information and Communication Technologies: An*. Gazi University.

Günüç, S., Odabaşı, H. F., & Kuzu, A. (2013). 21. Yüzyıl Öğrenci Özelliklerinin Öğretmen Adayları Tarafından Tanımlanması: Bir Twitter Uygulaması [The Defining Characterıstıcs of Students of The 21st Century By Student Teachers: A Twitter Activity]. *Eğitimde Kuram ve Uygulama*, *9*(4), 436–455. http://eku.comu.edu.tr/article/view/1044000195

Gut, D. M. (2011). Integrating 21st Century Skills into the Curriculum BT - Bringing Schools into the 21st Century. In G. Wan & D. M. Gut (Eds.), *Bringing Schools into the 21st Century (Explorations of Educational Purpose, 13)* (pp. 137–157). Springer Netherlands. https://doi.org/10.1007/978-94-007-0268-4_7

Güvenç, H. (2017). Öğretim Programlarımızda Finansal Okuryazarlık [Financial Literacy in Turkish Formal Education Curriculum]. *Elementary Education Online*, *16*(3), 935–948. https://doi.org/10.17051/ilkonline.2017.330233

Hackett, G., & Betz, N. E. (1989). An Exploration of the Mathematics Self-Efficacy/Mathematics Performance Correspondence. *Journal for Research in Mathematics Education*, *20*(3), 261–273. https://doi.org/10.2307/749515

Hair, J. F., Bush, R. P., & Ortinau, D. J. (2002). *Market Research: With Data Disk Package*. McGraw-Hill/Irwin.

Henderson, G. E., Beach, P., & Coombs, A. (2021). Financial Literacy Education in Ontario: An Exploratory Study of Elementary Teachers' Perceptions, Attitudes, and Practices. *Canadian Journal of Education/Revue Canadienne de l'éducation*, *44*(2), 308–336. https://doi.org/10.53967/cje-rce.v44i2.4249

Jorgensen, B. L., & Savla, J. (2010). Financial Literacy of Young Adults: The Importance of Parental Socialization. *Family Relations*, *59*(4), 465–478. https://doi.org/10.1111/j.1741-3729.2010.00616.x

Karasar, N. (2020). *Bilimsel Arastirma Yöntemi [Scientific Research Method]*. Nobel Akademik Yayincilik.

Kayış, A. (2009). Güvenirlik Analizi [Reliability Analysis]. In Ş. Kalaycı (Ed.), *SPSS Uygulamalı Çok Değişkenli Istatistik Teknikleri [SPSS Applied Multivariate Statistical Techniques]* (pp. 403–419). Asil Yayın Dağıtım. https://books.google.co.id/books?id=TzWGPgAACAAJ

Koyuncu, İ., & Haser, Ç. (2012). Sınıf öğretmeni adaylarının matematik okuryazarlığı öz-yeterlik düzeyleri ile akademik başarıları arasındaki ilişkinin incelenmesi. 10 []. *Ulusal Fen Bilimleri ve Matematik Eğitimi Kongresinde Sunulan Bildiri, Niğde Üniversitesi, Niğde*.

Kozikoglu, I., & Altunova, N. (2018). Öğretmen Adaylarının 21. Yüzyıl Becerilerine İlişkin Öz-yeterlik Algılarının Yaşam Boyu Öğrenme Eğilimlerini Yordama Gücü [The Predictive Power of Prospective Teachers' Self-efficacy Perceptions of 21st Century Skills for Their Lifelong Learning Tendencie. *Journal of Higher Education and Science*, *8*(3), 522. https://doi.org/10.5961/jhes.2018.293

Lichtenberg, J., Woock, C., & Wright, M. (2008). Ready to innovate: Are educators and executives aligned on the creative readiness of the US workforce? *Conference Board New York*.

Lusardi, A. (2015). Financial Literacy Skills for the 21st Century: Evidence from PISA. *Journal of Consumer Affairs*, *49*(3), 639–659. https://doi.org/10.1111/joca.12099

Lusardi, A., & Mitchell, O. S. (2014). The Economic Importance of Financial Literacy: Theory and Evidence. *Journal of Economic Literature*, *52*(1), 5–44. https://doi.org/10.1257/jel.52.1.5

OECD. (2006). *Assessing Scientific, Reading and Mathematical Literacy A Framework for PISA 2006*. OECD Publishing.

OECD. (2011). *G20 High-level Principles on Financial Consumer Protection*. OECD Publishing.

OECD. (2013). *PISA 2012 Assessment and Analytical Framework: Mathematics, Reading, Science, Problem Solving and Financial Literacy: Mathematics, Reading, Science, Problem Solving and Financial Literacy*. OECD Publishing.

OECD. (2014). *PISA 2012 Results: Students and Money (Volume VI) Financial Literacy Skills for the 21st Century: Financial Literacy Skills for the 21st Century*. OECD Publishing.

OECD. (2016). *New Vision for Education: Fostering Social and Emotional Learning Through Technology*. World Economic Forum.

Ontario. Ministry of Education. (2010). *A Sound Investment (Financial Literacy Education for Ontario Students : Report of the Working Group on Financial Literacy)*.

Özgen, K., & Bindak, R. (2008). Matematik Okuryazarlığı Öz-Yeterlik Ölçeğinin Geliştirilmesi [The Development of Self-Efficiacy Scale for Mathematics Literacy]. *Kastamonu Eğitim Dergisi*, *16*(2), 517–528.

Özgen, K., & Bindak, R. (2011). Lise Öğrencilerinin Matematik Okuryazarliğina Yönelik Öz-Yeterlik Inançlarinin Belirlenmesi [Determination of Self-Efficacy Belief of Mathematics Literacy for

High School Students]. *Kuram ve Uygulamada Eğitim Bilimleri [Educational Sciences: Theory and Practice]*, *11*(2), 1073–1089.

Ozyurek, R. (2010). The Reliability and Validity of the Mathematics Self-Efficacy Informative Sources Scale. *Educational Sciences: Theory and Practice*, *10*(1), 439–447.

Perdanasari, A., Sudiyanto, S., & Octoria, D. (2019). The Importance of Financial Literacy Knowledge For Elementary School Students In 21st Century. *Efektor*, *6*(1), 26–31. https://doi.org/10.29407/e.v6i1.12591

PISA. (2012). *Financial Literacy Assessment Framework*. OECD Publishing.

Sarıgül, H. (2015). Finansal okuryazarlik tutum ve davraniş ölçeği: geliştirme, geçerlik ve güvenirlik [Fınancial literacy behavior and attitude scale: Development, reliability and validity]. *Journal of Management and Economics Research*, *13*(1), 200–218. https://doi.org/10.11611/jmer408

Seyhan, A. (2020). Sosyal Bilgiler Dersinde Finansal Okuryazarlık Becerisinin Kazandırılmasına Yönelik Öğretmen Görüşleri [Teachers' Views on Gaining Financial Literacy Skills in Social Studies Course]. *Recep Tayyip Erdoğan Üniversitesi Sosyal Bilimler Dergisi*, *6*(11), 88–113. https://doi.org/10.34086/rteusbe.726511

Szabo, Z. K., Körtesi, P., Guncaga, J., Szabo, D., & Neag, R. (2020). Examples of Problem-Solving Strategies in Mathematics Education Supporting the Sustainability of 21st-Century Skills. *Sustainability*, *12*(23). https://doi.org/10.3390/su122310113

Tabachnick, B. G., & Fidell, L. S. (2013). *Using Multivariate Statistics*. Pearson.

Talim Terbiye Kurulu Başkanlığı [Board of Education and Discipline]. (2017). *Matematik Dersi Öğretim Programı* [Mathematics Curriculum]. Ankara.

The World Economic Forum. (2016). *New Vision for Education : Fostering Social and Emotional Learning through Technology*. World Economic Forum. http://www3.weforum.org/docs/WEF_New_Vision_for_Education.pdf

Topbaş Tat, E. (2018). Matematik Öğretmen Adaylarının Matematik Okuryazarlığı Öz-Yeterlik Algıları [Prospective Mathematics Teachers' Perceived Self-Efficacy in Mathematical Literacy]. *Elementary Education Online*, *17*(2), 489–499. https://doi.org/10.17051/ilkonline.2018.418887

Tuğluk, M. N., & Özkan, B. (2019). MEB 2013 Okul Öncesi Eğitim Programının 21. Yüzyıl Becerileri Açısından Analizi [Analysis of MoNE 2013 Preschool Education Program in terms of 21st Century Skills]. *Temel Eğitim Dergisi / Journal of Primary Education*, *2019*(4), 29–38. https://dergipark.org.tr/tr/pub/temelegitim/634024

Umbara, U., & Suryadi, D. (2019). Re-interpretation of mathematical literacy based on the teacher's perspective. *International Journal of Instruction*, *12*(4), 789–806. https://doi.org/10.29333/iji.2019.12450a

Ünal, O., Torun, S., Yavuz, E., & Ediş, S. (2016). İlköğretim Bölümü Öğretmen Adaylarının Finansal Okuryazarlık Düzeylerinin Açısından İncelenmesi. *Electronic Turkish Studies*, *11*(9), 931–946. https://doi.org/10.7827/TurkishStudies.9644