

Primary School Students Perceptions about 21st Century Learning Practices

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This study was conducted to reveal primary school students' perceptions of 21st-century learning practices. A quantitative research design was adopted in this study. Research data were collected from appropriate sampling 622 4th-grade students attending public schools in a city center located in the central region of Turkey. "Students' Perception of 21st Century Learning Practices Scale" was administered as data collection tool. In the analysis of the obtained data, t test and regression analysis are used. It was concluded that students' perceptions towards thinking skills were above average in the sub-dimensions of critical thinking, creative thinking, and authentic problem solving and knowledge creation efficiency. As a result of t-tests it was concluded that the educational status of the father, having preschool education and having a computer differ significantly according to some sub-dimensions. As a result of the regression analysis, it was concluded that the variables based on Chai et al. (2015) that explain the knowledge creation efficacy are creative thinking, authentic problem solving, self-directed learning and critical thinking. The study results showed that providing rich learning practices related to teaching thinking skills to students creates positive learning outcomes. This research results also indicated that the students participating in the study had similar perceptions with the students who had rich learning practices.

Keywords: 21st century learning practices, Primary school student, 21st century skills, Knowledge creation efficacy, Student's perceptions

INTRODUCTION

21st century education aims to educate students, ensuring that they have a creative and entrepreneurial potential that will enable them to cope with changing world conditions. To date, there is no clear consensus on the 21st-century learning models to be implemented in schools (Voogt et al., 2013). However, researchers largely agree on "what the students will learn," "what kind of learning opportunities will be offered to them," and "how to create the best learning environments." In 21st-century learning environments, effective teachers and students work together to solve educational problems and achieve appropriate learning outcomes (Larson, Miller, & Ribble, 2010). Another issue on which consensus is reached on how 21st-century learning environments should be is that teaching should be based on various dimensions of 21st-century skills (Thang & Koh, 2017). Some researchers agree that twenty-first century learning experiences should help students to develop the different kinds of twenty-first century competencies (Koh, Chai, & Lim, 2016). Chai, Deng, Tsai, Koh, and Tsai (2015) suggest critical thinking, creative thinking, and authentic problem solving as key thinking processes of 21st-century learning. The environments in which students work collaboratively are important in teaching socio-cultural communication and conflict resolution, which are considered

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important 21st-century competencies. Learners who possess the features are desired in business life, and they are also individuals who use technology effectively for efficient work (Larson & Miller, 2011). From this perspective, carrying out learning practices using technology, which is a tool for solving real-life problems, or including technology, can be stated as necessary (Howland et al., 2013; Koh et al., 2016). At the same time, 21st-century learning practices allow students to develop their existing knowledge as "knowledge generators" that they use for solving problems and developing different competencies (Chai et al., 2015; Koh, Chai, & Lim, 2016).

Learning practices can be interpreted as activities that teachers perform during the teaching activity for their students. They are how students make sense of learning in the school environment and their teachers' classroom teaching experiences. Therefore, students' learning practices can be expressed as 21st-century learners' reflections resulting from their responsibilities and their teachers' teaching activities (Freeman and Johnson 2005). Having the competencies required by today's society is indispensable for personal success, and the importance of schooling increases accordingly (Chai et al., 2015). Therefore, it is very important to know and be aware of the skills that are intended to be acquired by students. Gaining these skills that learners should have to ensure the highest level of adaptation to their lives is only possible by providing learners with appropriate learning practices.

In order to organize the learning environments as listed above, there are some factors widely uphold in the literature. These are self-directed learning, cooperative learning, meaningful learning with technology, critical thinking, creative thinking, and authentic problem-solving. These six factors, which come to the fore in learning practices or practices, can also be grouped into two groups. The first group is about learning processes, and the second thinking processes. Moreover, these factors, which are emphasized to facilitate students' learning, build students' knowledge creation capacity (Scardamalia et al., 2012). In other words, it is aimed to provide or increase students' knowledge generation competencies by employing learning processes and high-order thinking skills (Chai et al., 2015). In this study, the classification of Chai et al. (2015) for the learning practices expected in the 21st-century primary school classrooms was adopted.

Although 21. century skills can be acquired through education in all education levels starting from primary school to higher education, the skills acquired at earlier ages are more likely to be permanent, learners who are used in higher education levels to continue their education life in a more qualified way and have richer stages of development. Learners must have a high level of perception towards learning practices so that they can be equipped with the skills mentioned above in their primary school education and their subsequent life, adapt to social changes and transformations at the highest level, access the information required to continue their lives in a qualified way, and identify what is right and wrong and use them. Learners' perceptions of 21st-century learning practices are considered important as they will also affect their future learning lives (Yasar, Boyacı, & Anagun, 2022). Frost and Little (2014) aimed to identify the learning experiences organized for primary school children in Ethiopia; Louis (2012) aimed to identify how teachers could acquire the 21st century skills by using technology in primary school lessons; and in her study with 4th grade primary school students, Atalay (2015), on the other hand, aimed to identify the effect of slow transition animation applications on teaching the "learning and renewal" dimension of the 21st century skills (cited in Yaşar, Boyacı and Anagün, 2022). When the literature on the subject is reviewed, it is seen that the studies focused on the necessity of developing 21st century skills, but there is not studies on which learning experiences will be provided to the students for gaining these skills. This research aims to reveal learning practices' perception levels and fill the lack of information and research on this subject. This research is designed based on these needs. It is considered important to reveal primary school students' perceptions about their learning practices and reveal teachers' opinions about the learning practices they bring to students.

Purpose of the Study

This study was conducted to reveal primary school students' perceptions of 21st-century learning practices. For this purpose, the following questions addressed:

- What are primary school students' perceptions of 21st-century learning practices?
- Regarding primary school students' perceptions of 21st-century learning practices, are they related to the following variables?
 - a) Students' gender
 - b) Education of the mother
 - c) Education of the father
 - c) Receiving pre-school education
 - d) Computer ownership
- How primary school students' 21st-century learning practices for thinking and learning practices predict their knowledge creation efficacy?

METHOD

A quantitative research design was adopted in this study which was conducted to determine primary school students' perceptions of 21st-century learning practices according to different variables.

Participants

Research data were collected from appropriate sampling 622 students (300 female, 322 male) attending 5 different public schools from 18 public schools in a city center located in the central region of Turkey. There are approximately 4500 4th grade students continue their education (Uzunöz and Akgür, 2020). The research was carried out in a province in the Central Anatolian Region of Turkey, since it reflects the middle level of Turkey in terms of socioeconomic status. The reason why the research was conducted with 4th grade students is related to fact that the age 10-11 age is critical in acquiring thinking skills. It was also chosen in the context of revealing all learning practices related to 4th grade primary school education.

Instrument

In this study, the classification of Chai et al. (2015) for the learning practices expected in the 21st-century primary school classrooms was adopted. There are 32 items in the original scale. These items consist of three main dimensions (thinking processes, learning processes and knowledge creation efficacy). In this context, two different study groups were included in the study. Linguistic equivalence studies were carried out on the first group, and construct validity and internal consistency analyzes were performed on the second group. These two groups were excluded in the main study. Students in these two groups who have socio-economic characteristics similar to those included in the research, were excluded from the main study. A total of seven people including four linguists and three educational sciences experts' and twelve fourth grade students participated in the linguistic equivalence study. For construct validity and internal consistency "Confirmatory factor analysis" was conducted to ensure structural validity. In this context, the analysis was carried out on 310 students studying in the 4th grade of primary schools. In the final stage, the Cronbach alpha coefficients of the sub-dimensions were calculated for the reliability of the scale. CFA findings confirmed that the collected data conformed to the original factor structure of the scale. It was determined that the scale has appropriate psychometric features in Turkish context.

Data Analysis

One-sample t-test, independent groups t-test, one-way analysis of variance (ANOVA), and multivariate linear regression analysis were performed for independent groups. The significance level was taken as $\alpha = .05$ for all analyzes. One-sample t-test was used to determine students' perceptions of 21st-century learning practices, testing whether the mean score obtained in each dimension differed significantly from the mean value of the scale, 3.00. All variables' skewness and kurtosis values were in the range of [-1, 1]; thus, the normal distribution assumption was met, and one-sample t-test was used. As a result of this test, it became possible to interpret student perceptions differing from the average. Independent groups t-test was used to determine whether students' perceptions of 21st-century learning practices differed significantly according to gender, pre-school education, and having a computer at home. The scores obtained for all dimensions showed normal distribution in each category of the relevant variables; therefore, parametric tests were used.

On the other hand, in cases where the assumption of the equality of variances could not be met, the Welch t-test was used instead of Student's t-test, and the results of this test were interpreted. One-way analysis of variance (ANOVA) was used to determine whether students' perceptions of 21st-century learning practices differed significantly according to their parents' educational status. Fisher statistics were interpreted in cases where the homogeneity of variances assumption was met, and Welch statistics in cases where it was not. In addition, the Bonferroni test, one of the post hoc tests, was preferred in cases where there were significant differences. This test was preferred because the scores did not show high deviations from the normal distribution according to both mother's and father's education. Multiple linear regression analysis was used to predict students' knowledge creation efficacy scores from self-directed learning, meaningful learning with ICT (Information and Communication Technology), cooperative learning, critical thinking, creative thinking, and authentic problem-solving. For this analysis, the existence of multicollinearity was checked by calculating the correlations between the variables. Accordingly, no correlation coefficient was found to be above .90 among the variables. Besides, the Durbin-Watson statistic was calculated to test whether the data showed autocorrelation and was found to be 2.02. This value shows that there is no autocorrelation between the variables. The residual values were also tested for normal distribution, and they were found not to deviate from the normal distribution. The forward method was used in the multiple linear regression analysis. In other words, predictive variables were included in the model sequentially, and non-predictive variables were excluded from the model.

FINDINGS

Primary School Students' Perceptions of 21st-Century Learning Practices

The quantitative findings derived from the data obtained through the "21st-century learning practices perceptions scale" to determine primary school 4th-grade students' 21st-century learning experience perceptions, the first objective of the research, are given in Table 1.

Table 1

One-sample t-test results of the average scores received from the 21st-century learning practices perception scale for various dimensions.

<i>Dimension</i>	\bar{X}	<i>s</i>	<i>Sd</i>	<i>T</i>	<i>P</i>	<i>D</i>
Self-directed learning	3.83	.865	621	23.842	.000	.956
Meaningful learning with ICT	2.62	1.116	621	-8.391	.000	-.337
Cooperative learning	3.26	.981	621	6.575	.000	.264
<i>Learning-oriented</i>	3.24	.807	621	7.311	.000	.293
Critical thinking	3.64	.968	621	16.559	.000	.664
Creative thinking	3.92	.872	621	26.258	.000	1.053
Authentic problem-solving	3.68	.838	621	20.261	.000	.812
<i>Thinking-oriented</i>	3.75	.774	621	24.178	.000	.969
Knowledge creation efficacy	3.72	.911	621	19.767	.000	.793

Test value: 3.00

According to the results of the one-sample t-test, in all dimensions except Meaningful learning with ICT, students' mean response scores were significantly higher than 3.00, the median of the five-point Likert-type response scale ($p < .05$). In the meaningful learning with ICT dimension, students' mean score was significantly lower than the median of the scale ($p < .05$). Regarding Cohen *d* coefficients used to determine the effect size, meaningful learning with ICT and cooperative learning dimensions' effect sizes were small. On the other hand, critical thinking and knowledge creation efficacy dimensions have a medium effect size, and the other dimensions have a large effect size. In the light of all these findings, it can be concluded that students' perceptions of meaningful learning with ICT are below the average, while their perceptions in other dimensions are above the average.

Relationship between Primary School Students' 21st Century Learning Practices Perception and the Gender

Independent groups t-test was conducted to determine whether primary school students' perceptions of 21st-century learning practices differ significantly by gender. The student's t-test was used when the homogeneity of variances assumption was met, while the Welch t-test was used when the homogeneity of variances assumption was unmet. Accordingly, the findings are given in Table 2.

Table 2
Student perceptions independent groups t-test results by gender

Gender	N	\bar{X}	s	Sd	t	P
Self-directed learning						
Female	300	3.87	.882	620.00	1.076	.282
Male	322	3.79	.848			
Meaningful learning with ICT						
Female	300	2.58	1.057	619.48	-1.048	.295
Male	322	2.67	1.168			
Cooperative learning						
Female	300	3.26	.958	620.00	.036	.971
Male	322	3.26	1.003			
Learning						
Female	300	3.23	.804	620.00	-.083	.934
Male	322	3.24	.811			
Critical thinking						
Female	300	3.61	1.031	596.52	-.818	.413
Male	322	3.67	.907			
Creative thinking						
Female	300	3.90	.892	620.00	-.440	.660
Male	322	3.93	.853			
Authentic problem-solving						
Female	300	3.64	.840	620.00	-1.296	.196
Male	322	3.72	.834			
High-order thinking						
Female	300	3.72	.800	620.00	-1.007	.315
Male	322	3.78	.748			
Knowledge creation efficacy						
Female	300	3.68	.966	597.95	-1.234	.218
Male	322	3.77	.855			

According to the findings in Table 2, students' perceptions of 21st-century learning practices did not differ by gender for all dimensions ($p>.05$). In other words, both genders perceive 21st-century learning practices similarly.

Relationship between Primary School Students' 21st-Century Learning Practices Perception and the Mothers' and Fathers' Education Level

One-way analysis of variance (ANOVA) was conducted to determine whether primary school 4th-grade students' perceptions of 21st-century learning practices differ significantly according to their parents' education; the results of the mothers are given in Table 3, and fathers in Table 4.

Table 3
Student perceptions One-Way ANOVA for independent groups by mother education

	SS	MS	Sd	F	P
Self-directed learning					
Between groups	3.077	.769	4	1.029	.392
Within groups	461.320	.748	617		
Meaningful learning with ICT					
Between groups	2.013	.503	4	.402	.807
Within groups	771.695	1.251	617		
Cooperative learning					
Between groups	1.065	.266	4	.276	.894
Within groups	596.005	.966	617		
Learning					
Between groups	1.149	.287	4	.440	.780
Within groups	403.180	.653	617		
Critical thinking					
Between groups	2.185	.546	4	.581	.677
Within groups	580.358	.941	617		
Creative thinking					
Between groups	4.585	1.146	4	1.514	.196
Within groups	467.130	.757	617		
Authentic problem-solving					
Between groups	5.136	1.284	4	1.840	.119
Within groups	430.445	.698	617		
High-order thinking					
Between groups	3.701	.925	4	1.551	.186
Within groups	368.111	.597	617		
Knowledge creation efficacy					
Between groups	3.266	.816	4	.984	.416
Within groups	511.867	.830	617		

Note. SS= Sum of Squares; MS= Mean Square

According to the findings in Table 3, 4th-grade students' perceptions of 21st-century learning practices did not differ by mother's education for all dimensions ($p > .05$). In other words, regardless of the mother's education, all primary school students perceive 21st-century learning practices at a similar level.

Table 4 shows the results of the one-way analysis of variance (ANOVA), which was conducted to determine whether primary school 4th-grade students' perceptions of 21st-century learning practices differ significantly according to their father's education.

Table 4
Student perceptions one-Way ANOVA for independent groups by father education

	SS	MS	Sd	F	P	Difference
Self-directed learning						
Between groups	3.159	.790	4	1.057	.377	
Within groups	461.238	.748	617			
Meaningful learning with ICT						
Between groups	12.281	3.070	4	2.488	.042	SS – High School
Within groups	761.428	1.234	617			
Cooperative learning						
Between groups	1.718	.430	4	.445	.776	
Within groups	595.352	.965	617			
Learning						
Between groups	3.364	.841	4	1.294	.271	
Within groups	400.965	.650	617			
Critical thinking						
Between groups	5.415	1.354	4	1.447	.217	
Within groups	577.128	.935	617			
Creative thinking						
Between groups	2.890	.722	4	.951	.434	
Within groups	468.825	.760	617			
Authentic problem-solving						
Between groups	6.662	1.666	4	2.259	.064	
Within groups	428.918	.695	234.05			
High-order thinking						
Between groups	4.330	1.083	4	1.818	.124	
Within groups	367.482	.596	617			
Knowledge creation efficacy						
Between groups	3.877	.969	4	1.170	.323	
Within groups	511.255	.829	617			

Note. SS= Sum of Squares; MS= Mean Square; SS= Secondary School

The variances of the authentic problem-solving dimension scores were not distributed homogeneously according to the father's education ($p < .05$), so Welch's F test was used instead of Fisher's F test. Only the answers given to the meaningful learning with ICT dimension were found to differ significantly according to the father's education ($F[4, 617] = 2.488$; $p < .05$). Bonferroni test, a post-hoc test, was used to determine the source of the difference between groups. There was a .36 points difference between the mean scores of the students whose fathers were high school graduates and those whose fathers were secondary school graduates in favor of the students whose fathers were high school graduates ($p < .05$). On the other hand, the partial eta-squared calculated for one-way ANOVA was .016, and the Cohen d coefficient of the post-hoc test result was .002; therefore, the difference corresponded to a very small effect size even though the hypothesis test showed a significant difference. In other words, the significant difference found in the "Meaningful learning with ICT" dimension of the students whose fathers are high school and secondary school graduates is not meaningful in practice.

Relationship between Primary School Students' 21st-Century Learning Practices Perception and Preschool Education (as a Kindergarten) Status

Independent groups t-test was conducted to determine whether students' perceptions of 21st-century learning practices differ significantly by receiving pre-school education, and the findings are outlined in Table 5.

Table 5

Student perceptions independent groups t-test results by having preschool education

Pre-school education	N	\bar{X}	s	Sd	t	P
Self-directed learning						
Received	479	3.87	.85	620	2.302	.022
Not Received	143	3.68	.90			
Meaningful learning with ICT						
Received	479	2.65	1.10	620	1.204	.229
Not Received	143	2.53	1.17			
Cooperative learning						
Received	479	3.25	.99	620	-.236	.813
Not Received	143	3.26	.95			
Learning						
Received	479	3.26	.81	620	1.279	.201
Not Received	143	3.16	.80			
Critical thinking						
Received	479	3.68	.98	620	1.935	.053
Not Received	143	3.51	.91			
Creative thinking						
Received	479	3.95	.87	620	1.886	.060
Not Received	143	3.80	.86			
Authentic problem-solving						
Received	479	3.73	.82	620	2.710	.007
Not Received	143	3.51	.88			
High-order thinking						
Received	479	3.79	.77	620	2.538	.011
Not Received	143	3.61	.78			
Knowledge creation efficacy						
Received	479	3.74	.91	620	1.123	.262
Not Received	143	3.65	.91			

Table 5 shows a significant difference in students' perceptions of 21st-century learning practices according to receiving pre-school education for self-directed learning and authentic problem-solving dimensions ($p < .05$). The Cohen d coefficients indicating the effect sizes were found to be .22 and .26, respectively, which shows that receiving pre-school education in the two related dimensions has a small effect size.

Relationship between Primary School Students' 21st-Century Learning Practices Perception and Computer Ownership

Independent groups t-test was conducted to determine whether students' perceptions of 21st-century learning practices differ significantly by computer ownership, and the findings are outlined in Table 6.

Table 6
Student perceptions independent groups t-test results by computer ownership

Computer	N	\bar{X}	s	sd	t	P	D
Self-directed learning							
Have	550	3.82	.84	84.071	1.717	.090	.250
Does not have	72	3.64	1.02				
Meaningful learning with ICT							
Have	550	2.71	1.11	99.390	6.055	.000	.664
Does not have	72	1.98	.93				
Cooperative learning							
Have	550	3.26	.97	620	.053	.958	.007
Does not have	72	3.25	1.07				
Learning Practices							
Have	550	3.27	.80	620	3.144	.002	.394
Does not have	72	2.96	.79				
Critical thinking							
Have	550	3.66	.96	620	1.204	.229	.151
Does not have	72	3.51	1.01				
Creative thinking							
Have	550	3.94	.85	84.500	1.578	.250	.227
Does not have	72	3.74	1.02				
Authentic problem-solving							
Have	550	3.71	.81	83.344	2.077	.041	.309
Does not have	72	3.45	1.01				
High-order thinking							
Have	550	3.77	.75	83.879	1.857	.067	.272
Does not have	72	3.56	.92				
Knowledge creation efficacy							
Have	550	3.73	.89	85.053	.727	.469	.103
Does not have	72	3.64	1.05				

As shown in Table 6, perceptions of primary school students with and without a computer towards 21st-century learning practices show significant differences in meaningful learning with ICT and authentic problem-solving dimensions ($p < .05$). Regarding Cohen d coefficients, these dimensions' effect sizes were .664 and .309, respectively. The effect size of meaningful learning with ICT dimension was medium, and authentic problem-solving was small. In this context, students who own a computer perceived meaningful learning with ICT quite differently.

Relationship between Self-Directed Learning, Cooperative Learning, Meaningful Learning with ICT, Critical thinking, Creative thinking and Authentic problem-solving of Primary School Students' 21st-Century Learning Practices

Multivariate linear regression analysis was conducted to determine the predictability of knowledge creation efficacy scores by self-directed learning, meaningful learning with ICT, cooperative learning, critical thinking, creative thinking, and authentic problem-solving variables. Analysis results are given in Table 7.

Table 7
Multiple linear regression analysis results for predicting knowledge generating efficacy

Variable	B	SH _B	B	t	P
Constant	.171	.121		1.422	.155
Creative thinking	.418	.041	.400	10.255	.000
Authentic problem-solving	.256	.041	.236	6.236	.000
Self-directed learning	.188	.038	.178	4.898	.000
Critical thinking	.069	.035	.074	1.989	.047

$R^2 = .598$; $F(3, 617) = 229.452$; $p < .05$

Regarding Table 7, the variables that explain knowledge creation efficacy are creative thinking, authentic problem-solving, self-directed learning, and critical thinking. The established model explains approximately 60% of the variation in knowledge-generating efficacy. 40% of the change is explained by the other variables not included in the research and, therefore, the model. Accordingly, it is possible to set up the regression equation as follows;

$$KGSE = 0.418 \times CT + 0.256 \times APS + 0.188 \times SDL + 0.069 \times CT + \text{error}$$

KGSE: Knowledge-generating self-efficacy; CT: Creative thinking; APS: Authentic problem-solving; SDL: Self-directed learning; CT: Critical thinking

Accordingly, a one-point increase in the relevant variable corresponds to the following increases in knowledge generation efficacy: creative thinking - 0.418, authentic problem-solving - 0.256, self-directed learning - 0.188, and critical thinking - 0.069.

CONCLUSION AND DISCUSSION

The findings obtained from the research data showed that students' learning-oriented perceptions are above average in self-directed learning and cooperative learning sub-dimensions; their thinking-oriented perceptions are above the average in critical thinking, creative thinking, authentic problem-solving, and knowledge creation efficacy sub-dimensions. The results of other studies are in line with these results. Atalay (2015), in her study with primary school students, found that primary school students presented with experiences towards 21st-century skills have been developed in terms of creativity and renewal, critical thinking and problem solving, cooperation, and communication skills. Similarly, Önür and Kozikoğlu (2019) concluded in their study that secondary school students' 21st-century skills perception was high. The results of Bernhardt's (2015) study, in which he examined school-based teacher training programs with different aspects, revealed that the acquisition of 21st-century skills occurs more positively in the classes of the teachers who work on creative, innovative, and collaborative thinking. Based on the results of this study, the high perceptions of students' learning experience can be associated with teachers.

The perceptions of primary school students in the dimension of meaningful learning with ICT were below the average. Louis' (2012) study, involving how teachers can give 21st-century skills by using technology in their lessons practically, has concluded that they do not use technology much in the classroom environment in providing students with 21st-century skills. The situation is similar in Turkey. Şengür (2020) reported that classroom teachers do not have enough conceptual knowledge about Web 2.0 applications. Tinggen, Philbeck, and Holcomb (2012) examined how students' 21st-century skills were developed by teachers' application of web classroom sites. The study's findings revealed that the teachers' web classroom sites did not meet the needs of 21st-century learners, and they reported a decrease in students' perceptions of skills. It is expected that teachers who have problems in meeting student expectations related to the use of technological tools cannot offer their students meaningful learning practices with technology. It can be said that the digital culture difference

between teachers and students is the basis of this problem and that new generation learners are more competent than their teachers in using information and communication technologies. In one of the studies to solve such problems, Donovan, Green and Mason (2014) developed a model to describe an effective learning environment of the 21st-century. The research concluded that 21st-century skills could be exhibited in a learning environment with content-based and project-based approaches. Besides, the same study revealed that the school climate is equally important while gaining 21st-century skills, concluding that it is important that teachers, school administrators, and academicians who train teachers are involved in the process.

Another result reached in the research is as follows; Primary school students' perceptions of 21st-century learning practices did not differ significantly according to gender for knowledge creation efficacy and all learning- and thinking-oriented sub-dimensions (self-directed learning, cooperative learning, meaningful learning with ICT). In other words, both genders perceive 21st-century learning practices similarly. Gender is taken as a variable in international exams, such as PISA (Programme for International Student Assessment) and TIMSS (Trends in International Mathematics and Science Study). In the TIMSS 2019 exam report, significant increases were observed in the performances of fourth and 8th-grade students in Science and Mathematics compared to previous exams (TIMSS, 2019). This increase occurred in both gender groups. In line with this result, it can be said that learning takes place at the same level in both genders no matter what kind of practices are experienced. However, some studies do not support these results. Kaya (2017) reported that secondary school students' 21st-century skills were high, and female students' 21st-century skills were higher than males. Primary school students' 21st-century learning experience perceptions did not show any significant difference according to the mothers' educational status. Primary school students' 21st-century learning experience perceptions did not differ significantly in the following dimensions according to the father's educational status: self-directed learning and cooperative learning (learning-oriented subdimensions), critical thinking, creative thinking, and authentic problem-solving (thinking-oriented subdimensions), and knowledge-generating self-efficacy. In other words, regardless of father's education, all primary school students perceive their 21st-century learning practices as similar, except for meaningful learning with ICT. In the study, the students whose fathers are high school graduates had higher perceptions of meaningful learning with ICT than students whose fathers are secondary school graduates. The study carried out by Kaya (2017) revealed that parents' education was significantly related to 21st-century skills. However, this study has been carried out with secondary school students. Similarly, international exams take into account the education of mother and father as a variable. The TIMSS 2011 exam data analysis showed how factors related to the family's economic level affect student achievement. Similarly, a higher father education also resulted in higher student achievement; thus, the achievement was also related to the father's education. However, the correlation between the achievement of female students and the mother's education was higher than the father's education. Based on these results, it has been hypothesized that the mother's education has a more important socio-cultural link with students' achievement than the father's education. In a similar study, Atalmuş, Avgın, Demir, and Yıldırım (2016) examined the demographic characteristics of Turkey's students in the TIMSS science and technology and TEOG (Transition from Primary Education to Secondary Education) science and technology exams and the effects of these variables on their achievements. The results obtained from the research indicated that gender and parents' education were among the variables predicting achievement in both exams. IMSS results revealed that parents' education had a positive effect on 8th-grade student achievement.

Attending pre-school education made a significant difference in the self-directed learning and authentic problem-solving dimensions of primary school 4th-grade students' perceptions of 21st-century learning practices. On the other hand, it did not affect the other sub-dimensions of the scale, namely cooperative learning, meaningful learning with ICT, critical thinking, creative thinking, and

knowledge-generating self-efficacy. Koçin and Tuğluk (2020) reviewed the MoNE 2013 Preschool Education Program achievements in terms of 21st-century skills. They found that the achievements covered by the pre-school curriculum are related to critical thinking, creativity, problem-solving, communication, responsibility, and awareness of different cultural characteristics. However, the achievements involving technology and media literacy are not sufficiently covered by the curriculum. This result does not agree with the research results. The students who receive pre-school education do not have a positive perception about all the skills included in the pre-school programs; this can be interpreted as failing to reflect the curricula into practice sufficiently.

Regarding computer ownership, primary school 4th-grade students' perceptions of 21st-century learning practices significantly differ in meaningful learning with ICT and authentic problem-solving dimensions. In other words, computer ownership affects 4th-grade primary school students' perceptions of meaningful learning with ICTs and authentic problem-solving. In her study, Louis (2012) investigated how teachers can provide 21st-century skills in primary education by using technology in lessons in a functional way. They reported that teachers use technology in situations such as self-learning and distance education while working in collaboration. However, they do not use it much in the classroom environment to provide students with 21st-century skills. The research conducted by Atalay and Anagün (2014) showed that the use of information and communication technologies by classroom teachers working in rural areas contributed to the success, facilitation, motivation, interest and attention, and meaningful learning, and effective use of time dimensions of learning. The study also concluded that classroom teachers who see themselves as adequate or inadequate in using information and communication technologies effectively are open to following innovations and professional development and have positive attitudes. Regarding the research results, the teachers believed in the positive effects of technology use even though they did not use technology enough in their lessons.

In the research on primary school 4th-grade students' 21st-century learning experience perceptions, an analysis was carried out to predict knowledge creation efficacy scores using self-directed learning, meaningful learning with ICT, cooperative learning, critical thinking, creative thinking, and authentic problem-solving variables. The variables explaining knowledge creation efficacy were creative thinking, authentic problem-solving, self-directed learning, and critical thinking. However, 40% of the change was explained by the variables not included in the research. Martin, Nacu, & Pinkard (2016) reported in their research that despite the increasing interest in the importance of 21st-century skills, it is not easy to measure such competencies effectively. This result can be associated with the unexplained variables of the study.

Regarding the fourth objective of the research, the learning practices that classroom teachers provide to their students are in the following areas: learning-oriented-self-directed learning, cooperative learning, meaningful learning with ICT; thinking-oriented-critical thinking, creative thinking, authentic problem-solving, and knowledge creation efficacy. In their study, Frost and Little (2014) examined whether Ethiopia's primary school curriculum fits the learning practices in practice and these experiences at the school, classroom, and teacher levels. According to the study, the student-centered learning experience was 10.7% in primary schools, teacher-centered experience 74.5%, and out-of-school experience 14.7%. However, it was also concluded that in-school learning practices and student-centered learning practices increased with the teachers' degrees. In Akınoğlu's (2001) research examining the effect of critical thinking skills-based science teaching on learning products, primary school groups taught based on critical thinking skills had higher access levels, critical thinking skills, and better attitudes towards science courses. Tarım and Tünç (2014) examined primary school mathematics and classroom teachers' views on using collaborative group work in mathematics lessons. The research revealed that teachers were aware that cooperative learning supports students' cognitive and affective development; on the other hand, they stated that it takes too much time and does not

contribute enough. Studies have shown that providing rich learning practices related to teaching thinking skills to students creates positive learning outcomes (Atalay, 2015; Atalay, Anagun, and Genc Kumtepe, 2016; Kara, Anagun, Boyaci and Yasar, 2022). This research also showed that the students participating in the study had similar perceptions with the students who had rich learning practices. However, Martin, Nacu, Pinkard (2016) concluded that it is not easy to measure such competencies effectively. In this context, it can be said that this research's results are limited to the opinions of the students who responded to the scale items.

LIMITATIONS

This study is limited to determining primary school fourth grade students' perceptions of what opportunities are offered to them in learning environments. This study can be replicated with different K-12 levels students. In this way, more comprehensive understanding of students' perceptions about twenty-first century learning could be achieved. Research, can also be carried out in different environments and classes with different socioeconomic levels by using different data collection tools and methods. In future research, it would be appropriate to carry out studies that deal with what kind of opportunities are offered to students in terms of classroom practices. Studies comparing students' preferred and actual perceptions will also contribute to the literature.

ETHICAL CONSIDERATIONS

Necessary permissions were obtained for the research. In the article, journal writing rules, publication principles, research and publication ethics rules, journal ethics rules were followed. Responsibility for any violations that may arise regarding the article belongs to the authors. This study was carried out with the Ethics Committee Approval of the Institute of Educational Sciences of Anadolu University, dated 15.02.2018 and numbered 20015.

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