Examining the 21st Century Skills of Secondary School Students: A Mixed Method Study

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Abstract

21st century skills are a collection of abilities, competencies that students need to develop in order to succeed in work, and lifein the 21st century.The aim of this study is to investigate the 21st century skills of secondary school students. The study was designed as a mixed method research. The quantitative data of the research collected from 222 secondary school students and the participants of qualitative section consisted of 20 students selected purposefully from these students.The quantitative results revealed that 21stcentury skills of the students are at high levels, and the skills of female studentsare more highly developed than those of male students. Among the secondary school classes, in general, the 21stcentury skill levels of 5th grade students are better than those of students in other classes. In parallel with the quantitative results, the group who said the school environment has the least effects on the development of 21st century skills was 8th grade in the interviews.

*Keywords:*21st century, 21stcentury skills, secondary school students, mixed method research.

1. Introduction

The21stcentury skills have become especially significantin the 21stcentury, thanks to the rapid development oftechnology. The rapid development oftechnology leads to the rapid disseminationofinformation.This makes it more important for students to produce the information rather than memorizeit, and use the information in solvingnew problems(Wagner, 2008).Use ofdigital technologies in the 21stcentury is increasing throughout the world in every region,and this use has becomean indispensable part ofdaily life. Therefore,a new generationof students has emerged, those who were born into the digital technology age, and grew up with the effect of these technologies (Şahin, 2009).

The rapid change and development in the 21stcenturymake it necessary for individuals to equip themselves with certaincompetencies and skills. These skills,calledthe 21stcentury skills, are the combination of the knowledge, skill, literacy, and expertise that are necessary forindividuals to be successful inwork and in daily life(Partnership for 21st Century Skills, 2009). Basic school issues and 21st century themes are in the center of 21stcentury skills. Life and career skills, learning and innovation skills, and information technologies skills are also part of the list (P21, 2009). There are also different categorizations in this field.The National Research Council categorizes the21st century skills under three headings: Cognitive skills (critical thinking, nonroutine problem-solving, and systems thinking),interpersonal skills (complex communication, social skills, teamwork, cultural awareness, and appreciation for diversity),intrapersonal skills (self-management, time management, personal development, self-regulation,adaptation, and management process).Wagner (2008) identified seven survival skillsin which students need to specialize, in order to obtain a good job.These survival skills were determined as a result ofinterviews with many leaders from the business world. Wagner identifiesthem as; critical thinking and problem-solving, collaboration and leadership, agility and adaptability, initiative and entrepreneurialism, effective oral and written communication, accessingand analyzinginformation, and curiosity and imagination.As we have seen,21st century skills have been categorized differently; however, it is noteworthy that the particular skills related toinnovation and production appear in all categorizations.

Recently,21st century skills have increasingly become the subject of various education studies. For example, Kang, Kim, Kim, and You(2012) developed a scale in order to measure the 21st century skills ofprimary school students, and categorized these skills under three fields:1)cognitive field (information management, information construction, information use, and problem-solving), 2)affective field (self-identity, self-value, self-management, and self-responsibility), and 3)sociocultural field (social membership, socialsensitiveness, socialization skills, and social accomplishments).Günüç, Odabaşı, and Kuzu (2013) determined howstudentteachers identifycharacteristics of21st century students, and categorized the characteristics under 4 themes and 10 subthemes (according to the identifications of the studentteachers). These themes are:1)personal skills(thinking freely and originally, acting in a solution-oriented manner, able to performmultiple tasks at once, determininggoals according to their personaldesires and skills, and being models), 2)investigativeand knowledge acquisition skills(acquiring the knowledge,research, problem-solving, love oflearning, curiosity about learning, effective in learning, and lifelong learner), 3)creative, innovative, and career skills(productive, creative and imaginative,handing down knowledge and lighting the way forthe next generations, and adapting to the needs of the age), and 4)technological skills(usingtechnology effectively as well as understandingthe concepts that are used to learn the technology). Although all of these skills are in different forms, in different categoriesand appear to be very different from each other, they are proven to be connected in a complicated way when the results of related studies are connected(Lai & Viering, 2012).

Preparing individuals forlife and equipping them withage-appropriate knowledge and skillsare among the responsibilities ofeducation. An education system is successful to the extent that it can equip its students with the knowledge and skills that are required inthe 21st century. Cho (2012) examinedthe teaching methods used in a primary schoolin order to equip its students with the necessary knowledge and skills for 21st century. The four main themes that were revealed in this research were 1)cultural support forimplementation and cooperation, 2)effective leadership for realizing the school's vision and goals, 3) the strong nexus between the school's vision and goals and the program and its applications, and 4) the integration of technologyinto the classroom.A primary education program that highly emphasizes technology was proposed in the research, and it was determined thatproject based learning activities helpstudentswork cooperatively by improvingthe students' communication, problem-solving, and creativity skills. In this context, studies were carried out in different areas, such as the identification of the school, classroom, and student factors that are necessary for the development of 21st century skills, how21st century skills are integratedintothe lessons, the development of a new literacy model which includes21st century skills, anddevelopment of a scale(Geiselhofer, 2010; Kang et al.2012; Laughlin, 2014; Ongardwanich, Kanjanawasee&Tuipae 2015; Osman, Soh&Arsad, 2010; Siddiq, Gochyyev&Wilson, 2017).Eguchi (2014) stated the importance of robotics for the development of 21st century skills. There are also studies about the importance of 21st century skills in job environment (Murphy, Greiff &Niepel, 2017), examining the development of 21st century skills in STEM and engineering education (Bell, Morrison-Love, Wooff & McLain, 2017; Stawiski, Germuth, Yarborough, Alford & Parrish, 2017), using different methods for the development of 21stcentury skills (Bell, 2010; O'Sullivan & Dallas, 2017; Yildiz, Petela&Mahoney, 2017) and measuring skills for 21st century learning (Silva, 2009) and detecting the21st century skills of the secondary school students (Gülen, 2013; Karakaş, 2015).The relationships between 21stcentury skills and digital skills were also examined and it was found that 21st century skills are broader than digital skills. In addition, in contrast to digital skills, 21st centuryskills are not necessarily underpinned by information and communication technologies (Laar, Deursen, Dijk & Haan, 2017). In this study, the 21st century skills of secondary school students was investigated. In this respect, the subproblems of the study can be listed as follows:

1. At which level are the 21st century skills of students?
2. How do these skilllevelsdiffer according to gender?
3. How do these skill levelsdiffer according to the grade level?
4. How do these skill levelsdiffer according to computer usage time?
5. What are the opinions of students about their 21st century skills?

2. Method

This study is a mixed method research thatis formally defined as the class of research where researchers mix or combine quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study (Johnson & Onwuegbuzie, 2004).

Integrating both quantitativeand qualitative data at some stage of the research process within a singlestudy providesa better understanding of the researchproblem (Creswell, 2005; Creswell & Plano Clark, 2011).In this study, explanatory sequential mixed method design, consists of collecting and analysing the quantitative data in the first phase, then collecting qualitative data to help explain or elaborate on the quantitative results was used(Creswell, 2015). This study aims to investigate the 21st century skill levels of secondary school students. Making general inferences about students' skills with quantitative data and examining in-depth results of their thoughts about the skills in a holistic approach were aimedat the study.

2.1. Sample

The study was conducted in a secondary school in Turkey during the 2015-2016 academic year. The school was selected throughrandom sampling.Students at the school are froma middle-class socioeconomic background and results of national central exams show a medium-level of success.It was assumed that aschool with these characteristicswas sufficient enough to reflect the universe.All of students at school (a total of 222 persons)participated in the quantitative study. The participants of qualitative study was selected through maximum variety sampling methodpurposefully from different successful levels. Semi structured interviews were conducted with 20 students from these students, 14 female and 6 male students,consisting of every 5 students from different grade levels.

2.2. Data Collection Tools

The quantitative data was collected via scale and qualitative data was collected via semi-structured interviews in this study. 21st Century Skills Scale developed by Kang, et al. (2012) and adapted into Turkish by Karakaş (2015) was used. The scale consisted of 32 5-point Likert-type items that range from strongly disagree to strongly agree.These items consisted of three subscales(first 13 items are cognitive, the itemsfrom 14-23 are affective, and the itemsfrom 24-32 are sociocultural). Cronbach alpha coefficients of thesubscales were found to be .77, .70, and .67 by Karakaş (2015) respectively. In this study, cronbach alpha coefficients of the subscales werecalculated to be .81, .79, and .71 respectively and the coefficient of whole scale was also found to be .93.

The interview form was including open ended questions asking the students which 21st century skills they have and the effects ofthe technology and school environments to the development of their 21st century skills.21st century skills identified by Wagner (2008) were used in the interview form. The questions in the form was corrected after expert opinions. Then applied to students.

2.3. Data Analysis

Firstly, in the data analysis, the normal distribution of the data was checked.According to the results, it was determined that while the scores of the whole scale were normally distributed (p=.200 in Kolmogorov-Smirnov test and kurtosis and skewness values were at normal values),the scores of the subscales were not distributed normally. The Kolmogorov-Smirnov test results of the subscales were p=.012 for cognitive subscale, p=.000 foraffective subscale and p=.002 for sociocultural subscale.Therefore, the appropriate parametric and nonparametric testswere used in the data analysis. The data was analysed by SPSS 17.0 software. .05 significance level criterion was considered in the data analysis. The qualitative data were analyzed by descriptive analysis. After transcripting the interviews, all data was read and encoded. Then similar statements brought together and the codes were determined. The frequencies of the students answers according to the research problems were counted and presented in the tables. Direct quotations from students' opinions were also presented in the results.

3. Results

The 21st century skill levels of the secondary school students were interpreted according to their average scores on the scale and subscales, and the descriptive statisticswere presented in Table 1.

Table1.The descriptive statistics about 21st century skill scores of students

		N	$\bar{X}$	SD	Min	Max
21st century skills		222	4.09	.48	2.44	5.00
Subscales	**Cognitive**	222	3.97	.54	1.54	5.00
	Affective	222	4.26	.53	2.20	5.00
	Sociocultural	222	4.05	.55	2.44	5.00

As seen in Table 1, the students' 21st century skill levels areseen to be high when their average scores ($\bar{X}$=4.09) aretaken into account. Similarly, the students' cognitive ($\bar{X}$=3.97), affective ($\bar{X}$=4.26), and sociocultural ($\bar{X}$=4.05) skill levelsareseen to be high according to their scores in the subscales.

Table 2.t-test results for the 21st century skill scoresaccording to gender

		N	$\bar{X}$	SD	t	df	p
21st century skills	Female	115	4.17	.44	2.95	220	.003*
	Male	107	3.98	.51			

*p< .05

In Table 2, whether the 21st century skill scores of the secondary school students differ according to gender was investigated through the independent samples t-test, and it was foundthat the scores differed significantly according to gender (*p*<.05). The 21st century skills of female students($\bar{X}$=4.17)were determined to be higher than those of male students($\bar{X}$=3.98).

Table 3.Mann-Whitney U test results forthe 21st century skill scores on the subscales according to gender

Subdimension	Gender	N	Mean Rank	Sum of ranks	U	Z	p
Cognitive	Female	115	121.63	13987.00	4988.000	-2.437	.015*
	Male	107	100.62	10766.00			
Affective	Female	115	123.89	14247.00	4728.000	-2.985	.003*
	Male	107	98.19	10506.00			
Sociocultural	Female	115	118.11	13583.00	5392.000	-1.593	.111
	Male	107	104.39	11170.00			

*p< .05

The secondary school students' scores in the subdimensions of the 21stcentury skills scale were investigated according to gender using Mann-Whitney U test, and the results were presented in Table 3.The students' cognitive and affective skills differed significantly according to gender (*p*<.05).The female students' cognitive (mean rank=121.63) and affective (mean rank=123.89) skill scores were found to be higher than the male students' skill scores (cognitive: mean rank=100.62and affective: mean rank =98.19). No significant difference was found between female and male students in the sociocultural dimension scores.

Table 4.ANOVA results for the 21st century skill scores according tograde level

		Sum of Squares	df	Mean Square	F	p	Significant Difference
21st century skills	Among groups	4.109	3	1.370	6.372	.000*	5th grade-6th grade*
	Within groups	46.855	218	.215			5th grade-8th grade*
	Total	50.964	221				

*p< .05

Whether the students' 21st century skills differ significantly according to the grade level was analysed by one-way ANOVA. As seen in Table 4 , the results indicated that the students' 21st century skills were determined to differ significantly according to the grade level (**p*<.05). The Scheffe Test that is donein order to find out which pairs of means are significant indicated that there was significant difference between grades 5 - 6,andgrades 5 - 8.

Table 5.The descriptive statistics about the 21st century skill scores according to the grade level

21st century skills	N	$\bar{X}$	SD	Min	Max
5th grade	42	4.34	.49	3.13	5.00
6th grade	88	3.97	.47	2.44	4.81
7th grade	36	4.14	.48	2.98	4.78
8th grade	56	4.04	.41	3.01	5.00

The students' scores on the scale according to the grade levels can be seen in Table 5. According to these results, the 21st century skill levels of the 5th grade students ($\bar{X}$=4.34) are higher than those of 6th grade students ($\bar{X}$=3.97), 7th grade students ($\bar{X}$=4.14) and alsosignificantly higher than 8th grade students' level ($\bar{X}$=4.04).

Table 6.Kruskal-Wallis test result for the 21st century skill scores on the subscales according to the grade level

	Grade level	N	Mean rank	χ^2	df	p	Significant difference
Cognitive	**5ᵗʰ grade**	42	141.25	11.828	3	.008*	5ᵗʰgrade–6ᵗʰ grade*
	6ᵗʰ grade	88	102.03				5ᵗʰ grade-7ᵗʰ grade*
	7ᵗʰ grade	36	112.43				5ᵗʰ grade-8ᵗʰgrade*
	8ᵗʰ grade	56	103.46				
Affective	**5ᵗʰ grade**	42	143.63	18.064	3	.000*	5ᵗʰgrade–6ᵗʰgrade *
	6ᵗʰ grade	88	99.23				5ᵗʰgrade- 8ᵗʰgrade*
	7ᵗʰ grade	36	125.44				6ᵗʰ grade-7ᵗʰgrade*
	8ᵗʰ grade	56	97.72				7ᵗʰ grad -8ᵗʰ grade*
Sociocultural	**5ᵗʰ grade**	42	139.43	17.541	3	.001*	5ᵗʰgrade–6ᵗʰgrade*
	6ᵗʰ grade	88	93.06				5ᵗʰ grade-8ᵗʰ grade*
	7ᵗʰ grade	36	127.44				6ᵗʰgrade-7ᵗʰ grade*
	8ᵗʰ grade	56	109.29				

***p< .05**

Whether the students' scores on the subdimensions of the 21stcentury skills scale differ according to the grade level was investigated through the use of Kruskal-Wallis Testand the results were presented in Table 6. The results revealed that the students' cognitive, affective, and sociocultural skills scores differ significantly according to the grade level ($p<.05$).When the paired comparisons were performedin order to identify the source of the differentlevels amongthe groups, the results indicated that there are significant differences between the 5ᵗʰ-6ᵗʰ, 5ᵗʰ-7ᵗʰ, and 5ᵗʰ-8ᵗʰ grades regardingthe students' cognitive skills scores; between the 5ᵗʰ-6ᵗʰ, 5ᵗʰ-8ᵗʰ, 6ᵗʰ-7ᵗʰ, and 7ᵗʰ-8ᵗʰ grades regardingthe students' affective skills scores; and between 5ᵗʰ-6ᵗʰ, 5ᵗʰ-8ᵗʰ, and 6ᵗʰ-7ᵗʰ grades regardingthe students' sociocultural skills scores ($p<.05$).The 5ᵗʰ grade students' cognitive scores (Mean rank=141.25)are significantly higher than the scores of all other grade levels. The 5ᵗʰ grade students' affective scores (Mean rank=143.63)are also higher than that ofstudents in the 6ᵗʰ and 8ᵗʰ grades; however, the difference inthe 7ᵗʰ grade students' scores was not statistically significant. 7ᵗʰ grade students have higher scores (Mean rank=125.44) than those of the students in the 6ᵗʰ and 8ᵗʰ gradesregarding theaffective skills. In addition, students in the 5ᵗʰ gradehave the highest scores considering the sociocultural skills (Mean rank=139.43).However, the differencebetweenthe scores of the students in 5ᵗʰand7ᵗʰ gradeis not statistically significant. It is seen that the 7ᵗʰ grade students' affective scores (Mean rank=125.44) arehigher than the 6ᵗʰ grade students' scores(Mean rank=99.23).

Table 7.ANOVA results for the 21st century skills according to the computer usage time

		Sum of Squares	df	Mean Squares	F	p
21st century skills	**Among groups**	.868	3	.289	1.258	.290
	Within groups	50.096	218	.230		
	Total	50.964	221			

As seen in Table 7, whether the 21st century skills of the secondary school students differ according to the computer usage timewas investigatedusing the ANOVA test.However, the results were not found to be significant ($p>.05$),that is,the daily computer usage time of the students does not lead to a significant change in their 21st century skills.

Table 8.The descriptive statistics of the 21st century skill scores according to their computer usage time

Daily computer usage time	N	$\overline{X}$	SD	Min	Max
Never	55	4.15	.45	3.06	5.00
Between 0-1 hour	86	4.09	.46	2.98	5.00
Between 2-3 hours	66	3.99	.50	2.44	5.00
4 or more hours	15	4.14	.55	3.01	4.77

As seen in Table 8, the computer usage time ofsecondary school students differed from each other. However, the differences between 21st century skill levels ($\overline{X}$)according to computer usage timeare not statistically significant, based on the ANOVA test results presented in Table 7.

Table 9.Kruskal-Wallis test results for the 21st century skill scores on the subscales according to computer usage time

	Grade level	N	Mean rank	χ^2	df	p	Significant difference
Cognitive	**Never**	55	118.58	3.108	3	.375	-
	Between 0-1 hour	86	112.91				
	Between 2-3 hours	66	100.80				
	4 or more hours	15	124.53				
Affective	**Never**	55	118.58	3.614	3	.306	-
	Between 0-1 hour	86	112.91				
	Between 2-3 hours	66	100.80				
	4 or more hours	15	124.53				
Sociocultural	**Never**	55	118.58	2.825	3	.419	-
	Between 0-1 hour	86	112.91				
	Between 2-3 hours	66	100.80				
	4 or more hours	15	124.53				

As in the total scores of the scale, it is seen that there is no significant difference between the subscales' scores according to computer usage time in Table 9.

Table 10.The frequencies of 21st century skills that students think they have according to the interviews

	21st century skills	f	%
1	**Critical thinking and problem-solving**	7	35
2	**Collaboration and leadership**	13	65
3	**Agility and adaptability**	9	45
4	**Initiative and entrepreneurialism**	7	35
5	**Effective oral and written communication**	9	45
6	**Accessingand analyzing information**	4	20
7	**Curiosity and imagination**	19	95

When the opinions of students about which 21st century skills they have, were analysed; the results in Table 10 was attained. As seen in the table, the skills most emphasised they havein the interviews was "curiosity and imagination"(f=19), and the second skill was "collaboration and leadership" (f=13). The skill that students think they have at least level was "accessing and analyzing information" (f=4).

When students were asked about the effects of the school environment on the development of 21st century skills, the majority of them emphasized that there are activities in the school improving these skills. When student opinions were examined according to class levels, all 5th grade students (f=5) think that the school environment has a positive effect on the development of 21st century skills. Students particularly emphasizedthe skills of curiosity and imagination, critical thinking, effective oral and written communication, thought flexibility, leadership, and problem solving in the school environments. They also said that especiallylanguagelessons and mathematics lessons' positive effects on the development of these skills.For example, the opinion of a fifth grade student in this regard is as follows; *"I gain critical thinking and problem solving skills in mathematics courses.Our teacher applies activities to improve these skills"*. In the interviews, sixth-grade students (f = 5) stated that training in the school emphasizes the development of 21st century skills. They said especially after the school activities are effective on social skills, project homeworks are effective on cooperating and leadership, painting and languagecourses are developing the curiosity and imagination skills. They also stated that activities were carried out in the school for the development of thought flexibility, adaptation, effective oral and written communication skills. This is also the view of a sixth-grader: *"for example reading and explaining our feelings in Turkish courses improve our effective oral and written communication abilities"*. Some students at the seventh grade level (f = 2) stated that 21st century skills were positive in school, while most students (f = 3) were adversely affected. A student in this regard said, *"No, I do not think that my 21st century skills have improved in school, I do not find enough activities for this"*. They said that the most developed skills by the school are problem solving, communication and cooperation, curiosity and imagination.On the eighth grade, most students (f = 4) stated that the school environment did not positively affect the development of 21st century skills.

Those expressions were explained about this, *"I do not think that the school has positively affected the development of these skills. We can not express ourselves fully because we remain firmly committed to the curriculum. I think that our skills will not develop unless we express ourselves by studying according to our own abilities"*.

The students were asked about their use of technology and its effect on the development 21st century skills. The majority of students stated that they generally use computers between 2-3 hours (f = 6) and 0-1 hours (f = 10) a day. Students expressed that they use the computers mostly for studying (f = 10), playing games, watching videos and movies (f = 10). About the technology's effects on the development of 21st century skills, their opinions were differed, positive effects (f = 8), negative effects (f = 6) and both positive and negative effects (f = 6) were expressed. They stated the technology's positive effects on that skills such as imagination, communication, strategic thinking but they have reached a consensus about that social skills will decline when the technology was used mostly. In this regard, a student stated his thoughts like; *"I think the technology effects the development of 21st century skills both positively and negatively. We can reach the knowledges we do not understand in the courses from the internet, we can talk to people. But when it was used too much, people connect their lives to the internet, so they do not engage with anyone and become antisocial"*.

4. Discussion

This study investigated the 21st century skills ofsecondary school students, and the quantitativeresults revealed that their 21st century skills are at a high level. Furthermore, their subscales' scores that are the cognitive, affective, and sociocultural, were also found to be at high levels. It was determined that the results are in line with the literature. Similarly, Karakaş (2015) asserted that 8th grade students were found to have21st century skills at a high level.Also, Gülen (2013) ascertained thatthe21st century learning skills of students are atan adequate level. In the interviews, the students stated which 21st century skills they have and it was determined that most of their 21st century skills are imagination and curiosity, cooperation and leadership skills, and at least the skill they possess is accessing and analyzing information. These results indicate that the 21st century skills of the students at the secondary school level have improved and the students have the skills requiredin this age.

Another research question is whether the students' 21st century skills differed according to gender.The results revealedthat the 21st century skills of female students are significantly higher than those of male students. Moreover, the scores of female students were higher than those of male students in the cognitive and affective subscales, while no significant difference was found in the sociocultural subscale. In this regard, in the literature there are similar results as well as different results. Karakaş (2005) stated that the 21st century skills differ significantly according to gender, and female students have higher averages than male students in the cognitive, affective, and sociocultural dimensions.On the other hand, Abdullah and Osman (2010) stated that among the subscales of the 21st century skills, female students aremore advanced regarding curiosity and risk-taking, male students are better in problem-management and adjustment, butno significant differencewasfoundregarding self-management and creativity.

When the scores of secondary school students according to the grade level were compared, it was seen that the 5th grade students' 21st century skills and their cognitive, affective, and sociocultural scores aresignificantly higher than the scores of other grade levels. However, the analysis results prevent deriving a general conclusion about how the scores would differ as the grade level increases.5th grade students are generally ahead of other grade levels in21st century skills, butthe skill level does not decrease regularly as the class level increases. As a result, it is seen that secondary school education decreases their skill levels when 5thand 8thgrade 21st century skill scores of the students are examined. This result is also supported by student expressions.

While all 5th grade students stated that activities were held in the school to support the development of 21st century skills, 7th and 8th grade students stated that they did not take place enough in such activities. They even stated that the courses should not be firmly committed to the curriculum, and that additional activities should be organized to highlight individual differences for development of 21st century skills. This study also showed that 21st century skills of the secondary school students do not differ according to their daily computer usage time.Thus it can be said that the computer usage time is not effective in the development of the students' 21st century skills.Royal (2012) highlighted the importance of the educational technologies in the development of21st century skills. Gülen (2013) found that there is a positive significant relationship between21st century learning skills ofsecondary school students and the level of support for these learning skills,regardinginformation technology.

This indicates that the quality of the time, not the duration of the time that thestudentsare exposed to information technologyaffects the development of their 21st century skills. In the interviews, the students also point out that computers can have positive and negative effects on the development of 21st century skills.They said daily computer usage has positive effects on ability such as accessing and analysing the data, communication, strategic thinking, and adversely affecting skills such as socialization. As a result, it can be said that the use of computers that are not overly prolonged is not a negative influence on the development of 21st century skills of students.

5. Recommendations

The 21st century skill levels of the secondary students were found to be high; however,21st century skill levels of students training at other school levelsremainunclear. This study can be improved by considering variedparticipant groups, grade levels, and variables. It is noteworthy that there is a need forstudies about the effects ofinformation technologies on the development of 21st century skills.Moreover, it is recommendedthat further studies be conducted to investigate what kind of activitiesstudents engage in computer,in addition to their computer usage times,and the effect of these activities on the development of 21st century skills. It will also be beneficial to make additional activities for the development of the 21st century skills of students.

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