

The Role of the Academic Field in the Relationship between Self-Directed Learning and 21st Century Skills

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Abstract

In this study, the relationship between self-directed learning (SDL) skills and 21st century skills were investigated. In addition, the role of academic field in the relationship between SDL skills and 21st century skills have been investigated. The research data were collected from a total of 568 teacher candidates with various academic fields. The analysis of the data was carried out using structural equation modeling. In addition, the established model was tested separately for each academic field and the groups were compared. According to the findings, there is a positive and statistically significant relationship between SDL skills and 21st century skills. Moreover, SDL skills are a strong predictor of 21st century skills. According to the group comparisons, SDL skills of students in the special ability academic field do not predict 21st century skills. However, SDL skills of students in other academic fields strongly predict 21st century skills. As a result, it can be said that as the SDL skills increase on the basis of the academic field of individuals, 21st century skills will increase too.

Keywords: 21st century skills, self-directed learning skills, teacher education, regression, structural equation modeling

Introduction

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Individuals have different academic and affective skills due to hereditary and environmental characteristics. In this context, it is necessary for individuals to gain the competences of their age in line with their abilities. As a matter of fact, the information age offers opportunity for individuals to develop their talents and potentials with technology-supported information and thus lifelong learning. Therefore, individuals need to be prepared for the future not only with good academic achievements but also by acquiring some skills they will need in the future (EnGauge 21st Century Skills, 2003). The 21st century seems to be quite different from the 20th century in terms of knowledge and skills people need for work, citizenship and self-realization. In this sense, education systems are expected to transform students' learning processes inside and outside the school and to acquire 21st century skills for work, citizenship and a satisfying lifestyle (Dede, 2007). On the other hand, the development of science and technology in our age causes an increase in the amount of information, and this situation creates the need for individuals to update their knowledge continuously. In this sense, individuals need to improve their knowledge and skills not only with the knowledge and skills they have acquired in educational institutions, but also by continuing their learning processes outside the educational institutions. This situation requires individuals to have self-directed learning (SDL) skills. Because self-directed learners have the responsibility of planning, initiating and evaluating their own learning processes (Wilcox, 1996). Therefore, it is thought that individuals with SDL will gain the necessary knowledge and skills by being aware of their learning needs and have the potential to acquire 21st century skills.

The positive effects of the characteristics of SDL are emphasized by many researchers (Schunk, 1981; Brockett & Hiemstra, 1991; Morrow et al., 1993; Temple & Rodero, 1995; Agran et al., 2000; Azevedo & Cromley, 2004; Bolhuis & Voeten, 2004; Roberson & Merriam, 2005; Song & Hill, 2007; Barnark-Brak et al., 2010; Fox, 2011; Murray, 2015; Littlejohn et al., 2016; Karatas, 2017; Kizilcec, et al., 2017). They indicated that SDL is positively associated with many structures related to education. However, a limited number of studies have been found investigating the relationship between SDL and 21st century skills. The 21st century skills provide a strong organizational framework for leadership and professional development, motivating and engaging students, improving their trust as learners (Kay, 2009). Self-directed learners who are taught how to be active will be better prepared for the environment of the 21st century as employees who adapt their learning, anticipate their organization, create value for customers and create their own unique learning styles, organizations and employers (Artis & Harris, 2007; Cron et al., 2005). Based on all these, this study has been carried out to reveal the relationship between SDL skills and 21st century skills competence perceptions of individuals who are already in the teaching process as adult learners, who will also be future teachers.

Research Questions

- a. Is there a significant relationship between SDL and 21st century skills?
- b. To what extent SDL predict 21st century skills?
- c. Does the relationship between SDL and 21st century skills differ according to academic fields?

Literature Review

21st Century Skills

Partnership for 21st Century Skills (P21) (2009), a leading defense organization that encourages the inclusion of 21st century skills in education, has improved a framework for 21st century learning. According to this framework, student outcomes include basic issues and 21st century themes; information, media and technology skills; learning and innovation skills; life and career skills. In an increasingly digital world, the International Society for Technology in Education (ISTE) acknowledged that students need skills in the following areas; communication and collaboration, creativity and innovation, critical thinking, research and information fluency, digital citizenship, problem solving and decision making, technology operations and concepts (Williams, 2004). Another approach organizing 21st century skills is focused on personal skills, cognitive skills, technical skills and interpersonal skills (Ananiadou & Claro, 2009), and this approach is called the approach of OECD. "The Assessing and Teaching of 21st Century Skills (ATC21S)" organization proposed taxonomy to describe the 21st century skills: ways of working, ways of thinking, working tools, and living in the world (Binkley et al., 2010). While there are many ways to define 21st century skills and view their content, they all emphasize how students can realize what they can do with knowledge and apply what they have learned in real context. The essence of all is actually based on expertise in technology, communication and collaboration skills, innovative and problem solving skills and creative thinking skills (Larson & Miller, 2011).

According to Silva (2009), the 21st century skills are not new, but they have become important nowadays as employees have to find and explore information from multiple sources and use this information to make resolutions and produce new ideas. The skills students need in the 21st century are not new, but the new is the changes in the world that means individual and collective success be attached to having such skills (Rotherham & Willingham, 2009). Some of these skills have always been important, but have gained different meanings today. For example, we may need to cooperate with anyone we can no longer face in the world. It is important that teachers can guide students on how to move on to the next level of a particular skill, so that students can demonstrate skills such as teamwork, collaboration, and managing their own learning (Walser, 2008).

It is thought that these skills can be achieved through self-directed learning. Today's students should acquire to think deeply about their learning so they can recognize their place in a speedily changing and global society. Students need life-long learning skills, problem solving skills, information and communication skills, interpersonal and self-directed skills to create multiple perspectives on real-world problems and produce solutions to these problems (P21, 2009).

Self-Directed Learning

According to Fullan (2001), the main purpose of education is to make a difference in students' lives and to raise citizens who can live and work efficiently in increasingly complex societies. This aim raises several key questions: What is learning? How do our students learn? How can we help them learn? What is required to be ready for work when they graduate from school? These questions have led to the development of many learning paradigms for centuries. We need to review how we teach them to prepare students for the world they will encounter when they graduate the school system. There is a need for an approach that will enable students to manage their own learning in order to provide authentic learning demanded in the 21st century by actively adding students to the learning environment (McCain, 2007; Lombardi, 2007).

With the development of technology, accessing information is easier today, but it seems difficult to decide which information is relevant for the subject and the purpose. In addition, the obligation to learn this information in schools decreases day by day. In line with the needs and conditions of the current age, schools change their classical approach and create more student-centered conditions. Being a self-directed student is seen as a necessity for all humans in the 21st century society and the concept of SDL is rapidly gaining importance (Garrison, 1997). SDL has initially been the focus of attention due to the tendency to search adult learning, but has spread over a wide area of study over time (Roberson, 2005).

One of the challenges face today's teachers is to meet the individual needs of students in a classroom environment characterized by multiple skills, learning and achievement levels. Because regular classes consist of students who come from different socio-cultural backgrounds and have different levels of physical and social development, leading to increased demands in teachers' time and efforts. Woolfolk (2010), argued that lessons that focus on activities where students acquire facts, rules and action sequences, and that require outputs at the lower levels of cognition such as knowledge, understanding and practice, create individuals who cannot think severally of the teacher, and cannot go beyond the contents in the textbooks. Based on what is stated, it can be thought that the way most teaching takes place will not teach students to realize their own learning capacity, to think critically and to extract their own thought and meaning patterns from

the content presented. The cornerstone of effective independent learning is that students are responsible for their own learning and are mainly guided by their own learning processes (Vincent & Ley, 1999; Karatas & Basbay, 2014).

Self - directed learning promotes human not only to remain an observer, but also to play an “active role” in learning (Morrow et al., 1993). SDL improves the ability to transfer conceptual information to new situations. Humans can fill the gap between real-world problems and school knowledge more simply (Temple & Rodero, 1995). According to Kreber (1998), SDL involves taking the responsibility to decide what, when and how to learn.

According to the researchers (Brockett & Hiemstra, 1991), SDL takes place when a student takes the responsibility of planning, implementing and evaluating the learning process. The aim of SDL based on a humanistic philosophy is to improve the student's self-directed capacity (Brookfield, 1986; Mezirow, 1985). Knowles (1975, 1990) defined SDL as a process where people take initiative with or without the help of others, identify learning needs, set goals, identify human and material resources, select appropriate learning strategies, implement and evaluate learning outcomes. According to Knowles (1975), learning does not occur in isolation but it happens in relation to others, such as teachers, facilitators and peers. Lamdin and Fugate (1997) defined SDL as learners' control on what to learn when learning begins, where it goes, when it ends. Merriam and Caffarella (1999) defined it as planning, implementation, and evaluation of their own learning experiences as a process involving people's priority initiative. Candy (1991) defined it as both a goal and a process, and addresses SDL in four dimensions: self-management in learning, personal autonomy, learner control in teaching and the pursuit of independent learning. Self – directed learning is a naturally occurring process while the individual is learning. Learning here is a self-confidence process that is not only in the classroom, but also in daily life activities. SDL point up the importance of achieving purpose and continuity in the learning process; as it will motivate the learner to continue teach (Gibbons, 2002). It means providing students with opportunities to make decisions and solve problems themselves without being told what to do. In this way, students are provided help to believe that they have the ability to successfully process information and, most importantly, to reflect on thinking and learning processes (Long, 1989). In this study, it was aimed to contribute to the literature by examining the relationship between the self-directed learning skills of teacher candidates and their 21st century skills. It was also investigated whether the academic fields played a role in this relationship. Because determining the variables or structures that play a role in the relationship between self-directed learning and 21st century skills will increase the quality of its contribution to the literature. In addition, it will also affect the enrichment and deepening of future studies on these issues.

Methodology

Participants and Procedure

The research working group is composed of students from various academic fields at different universities in Turkey. Information about the working group is presented in Table 1.

Table 1

Characteristics of the respondents

	<i>f</i>	<i>%</i>
Gender		
Female	436	76,8
Male	132	23,2
Academic Area		
Turkish-Social	141	24,8
Turkish-Mathematics	225	39,6
Math-Science	136	23,9
Special ability	66	11,7

As seen in Table 1, the working group consists of 568 people with different genders and various academic fields.

Data Collection Tools

Self - Directed Learning Skills Scale: The scale developed by Tekkol and Demirel (2018), consists of four sub-dimensions and 21 items. The scale was developed by collecting data from 2600 university students. In the validity studies of the scale, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were performed. In the result of EFA 4 sub-dimensions are determined as; motivation (7 items), self-control (5 items), self-monitoring (5 items) and self-confidence (4 items). The total variance explained by the sub-dimensions regarding the scale was calculated as 52.90%. As a result of the CFA carried out to verify the structure of the scale fit indices; GFI: ,92; AGFI: ,89; CFI: ,96; NFI: ,96; NNFI: ,96; were obtained as good fit and between acceptable values. In the reliability studies of the scale, Cronbach Alpha internal consistency coefficient was calculated for *motivation* dimension .82; the *self-control* dimension .79; the *self-monitoring* dimension .76 and the *self-confidence* dimension .69; for the whole scale it was found to have a value of .89. Based on these results, it was concluded that the scale has sufficient psychometric properties in terms of measuring SDL skills.

21st Century Skills Scale: Developed by Anagün et al. (2016), the scale consists of three sub-dimensions and 42 items. The scale was developed by collecting data from 336 teacher candidates. In validity studies of the scale, EFA and CFA were performed. In the result of EFA, 3 sub-dimensions were determined as; Learning and Renewal Skills (18 items), Life and Career Skills (16 items), Information, Media and Technology Skills (8 items). The total variance explained by the sub-dimensions regarding the scale was calculated as 51.30%. As a result of the CFA carried out to verify the structure of the scale; GFI: ,82; AGFI: ,80; CFI: ,93; NFI: ,87; NNFI: ,93 fit indices were obtained between acceptable values. In the reliability studies of the scale, Cronbach Alpha internal consistency coefficient was calculated for *Learning and Renewal Skills* dimension ,84; *Life and Career Skills* ,82; *Information, Media and Technology Skills* were found to have a value of ,81. Based on these results, it was concluded that the scale has sufficient psychometric properties in measuring 21st century skills of teacher candidates based on their own perspectives.

The reason for using these scales (Self - Directed Learning Skills Scale and 21st Century Skills Scale) in this study is that both scales were developed by collecting data from pre-service teachers and their psychometric properties were high. Before the research data were collected, necessary permissions were obtained and data were collected from volunteer teacher candidates who wanted to participate in the research. At the beginning of the data collection process, the purpose of the research was explained to the students, instructions and explanations were made regarding the filling of the scales and they were asked to respond to the scale items internally and objectively. The internet access address was given to the students to answer the data collection tools previously transferred to the virtual environment and all the students in the study group filled the scale items completely. The collected data was transferred to the computer environment and analyzes were carried out.

Results

Preliminary Analysis

Firstly, the sub-dimensions of the measurement tools used in the research, the explained total variances, skewness, kurtosis, and reliability coefficients were examined. Findings obtained from the analysis are given in Table 2.

Table 2

Sub-dimensions, Kurtosis, Skewness and Reliability Coefficients

Scale	Subscales	KMO	Chi-Square	Sig.	Total Variance Explained	Skewness (SE=.103)	Kurtosis (SE=.205)	α
21 st century skills	Learning & Innovation	.935	3982.28	.000	52.55	-.084	-.505	.90
	Life & Career	.851	2784.41	.000	61.99	-.532	-.061	.79
	Information, Media & Technology	.868	1826.54	.000	50.56	-.661	-.089	.85
Self - directed learning skills	Motivation	.867	1202.07	.000	49.06	-.985	-.048	.77
	Self - control	.849	1041.06	.000	59.74	-.495	-.164	.82
	Self - monitoring	.829	848.58	.000	56.38	-.655	.056	.80
	Self - confidence	.712	396.89	.000	51.35	-.772	-.276	.70

As indicated in Table 2, Kaiser-Meyer-Olkin indices, which range from .71 to .93 indicated sampling adequacy for each subscale. Significance of the Bartlett test ($p < .001$) suggested that data set was appropriate for factorability. Explained total variance ranged from 49.06 to 61.99. Minimal skewness (range -.98 to -.08) and kurtosis (range -.50 to .05) confirmed the normality distribution. Finally, Cronbach's α coefficients, which ranged from .70 to .90 confirmed the reliability of scales (Nunnally & Bernstein, 1994). After these findings, the correlation coefficients between the Self - directed learning skills and the 21st century skills sub-dimensions were calculated and presented in Table 3.

Table 3
Correlation Coefficients Between Self-Directed Learning Skills and 21st Century Skills

	Learning & Innovation	Life & Career	Information, Media & Tech.	Motivation	Self-control	Self-monitoring
Life & Career	.58**					
Information, Media & Tech.	.36**	.41**				
Motivation	.44**	.44**	.24**			
Self-control	.59**	.43**	.33**	.52**		
Self-monitoring	.63**	.48**	.36**	.65**	.80**	
Self-confidence	.39**	.41**	.26**	.61**	.48**	.62**

** $p < .001$

When Table 3 is examined, there is a positive and significant relationship between *learning & innovation* dimension of 21st century skills and *motivation* ($r = .44$, $p < .001$), *self-control* ($r = -.59$, $p < .001$), *self-monitoring* ($r = -.63$, $p < .001$) and *self-confidence* ($r = .39$, $p < .001$) from sub-dimensions of SDL skills. Secondly, there is a positive and significant relationship between the *life & career* dimension of 21st century skills and *motivation* ($r = .44$, $p < .001$), *self-control* ($r = -.43$, $p < .001$), *self-monitoring*, ($r = -.48$, $p < .001$) and *self-confidence* ($r = .41$, $p < .001$). Thirdly, there is a positive and significant relationship between *information, media & technology* dimension of 21st century skills and *motivation* ($r = .24$, $p < .001$), *self-control* ($r = -.33$, $p < .001$), *self-monitoring* ($r = -.36$, $p < .001$) and *self-confidence* ($r = .26$, $p < .001$).

After calculating the correlation coefficients between individuals' SDL skills and 21st skills, it was determined whether the factor structures in the SDL skills scale and 21st skills scale were confirmed within the framework of this research. CFA results for these scales are given in Table 4. Then Structural Equation Modelling was used to determine the predictive relationship between SDL skills and 21st century skills. Likewise, values related to model fit are given in Table 4.

Table 4
Model Fit Indices

Fit Indices	Measurement Models		Structural Model	Reference Value(s)
	21st Skills	Self-directed		
χ^2	1681.58	629.924	30.122	
<i>p</i> value	< .01	< .01	< .01	
χ^2/df	2.15	3.50	3.34	< 5
GFI	.90	.91	.99	$\geq .90$
AGFI	.85	.88	.96	$\geq .80$
TLI	.90	.90	.97	$\geq .90$
CFI	.90	.90	.99	$\geq .90$
IFI	.90	.90	.99	$\geq .90$
RMSEA	.05	.07	.06	$\leq .08$
SRMR	.05	.05	.02	$\leq .08$

The structural equation model that constitutes the SDL skills predicting 21st skills is given in Figure 1. Given the thresholds for acceptable fit by Hair et al. (2017), results shown in Table 4 suggested a strong model fit: [$\chi^2 / df = 3.34$, GFI = .99, AGFI = .96, NFI = .98, CFI = .99, IFI = .99, RMSEA = .064, LO 90 = .040, HI 90 = .090, PCLOSE = .155]. The findings provided strong support for construct validity of the structural model and measurement model.

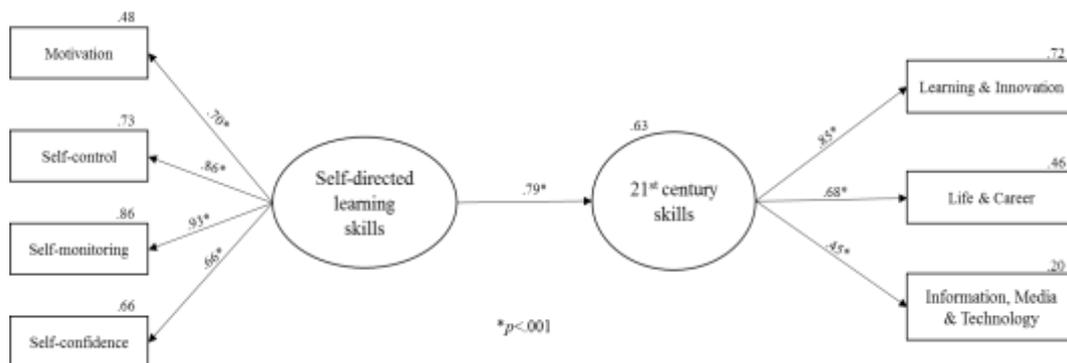


Figure 1. *Structural Model with Standardized Estimates*

As seen in the structural equation model in Figure 1, there is a strong and statistically significant relationship between SDL skills and 21st skills. Regression results related to the structural equation model that constitutes SDL skills predicting 21st skills are presented in Table 5.

Standardized Regression Weight Results for Self - Directed Learning Skills Predicting 21st Skills

Step	Estimate	Std. Estimate	Std. Error	Critical Ratio	p
Self - Directed → 21st skills	4.91	.79	.35	13.99	***

*** $p < .001$

According to Table 5, it was determined that SDL skills predicted 21st skills significantly and strongly ($\beta = .79, p < .001$). In addition, when direct and indirect effects of SDL skills are calculated, 21st skills explain 63% of the total variance. On the basis of the model, group comparison was made according to academic fields and the results of the analysis are presented in Table 6.

Table 6

Multiple Group Comparison Analysis Results According to Academic Fields

Relation	Turkish - Social					Turkish - Maths				
	Estimate	Std. Estimate	Std. Error	C.R	p	Estimate	Std. Estimate	Std. Error	C.R	p
Self - Directed → 21st skills	6.89	.80	1.26	5.46	***	5.25	.86	.50	10.61	***
	Maths - Science					Special Ability				
	Estimate	Std. Estimate	Std. Error	C.R	p	Estimate	Std. Estimate	Std. Error	C.R	p
	4.08	.85	.54	7.62	***	1.10	.20	1.35	.82	.411

*** $p < .001$

As stated in Table 6, the model was tested for Turkish-Social, Turkish-Mathematics, Mathematics-Science and Special Ability fields. After the test, the model was confirmed for the students in Turkish-Social academic field ($\beta = .80, p < .001$), for the students in Turkish-Mathematics academic field ($\beta = .86, p < .001$) and for the students in Mathematics-Science academic field ($\beta = .85; p < .001$). However, it has been observed that the model in the field of special ability academic field ($\beta = .20, p = .411$) could not be verified significantly. In other words, SDL skills of students in Turkish-Social, Turkish-Mathematics, Mathematics-Science and Special Ability academic fields predict their 21st skills; however, SDL skills of students in the field of special ability academic field do not predict 21st skills.

Discussion

When the research findings are examined, it is seen that there is a positive and significant relationship between 21st century skills scale's dimensions of *learning & innovation, life & career* and *information, media & technology* and SDL skills scale's dimensions of *motivation, self-control, self-monitoring* and *self-confidence*. Some studies show that SDL is associated with 21st skills (Beers, 2011; Collins, 2009; Kivunja, 2015; Mishra, Fahnoe

& Henriksen, 2013; Tan & Koh, 2014). Considering the correlation coefficients, 21st century skills were found to be higher related to *self-monitoring* dimension of SDL skills compared to other dimensions. Self-monitoring is when individuals examine their own behavior and record whether they are able to perform these behaviors according to pre-determined criteria (Agran et al., 2003). Individuals with this skill are expected to establish their own learning goals, determine various ways to achieve these goals, and review their level of achieving their goals as a result of their studies. It is of course inevitable that the self-monitoring dimension, which is a behavior management strategy frequently used in teaching academic behavior, is related to learning and career skills. Self-directed individuals are thought to be the those who can direct their own learning; consider learning as an opportunity and a need for every new problem encountered; know why they are learning, are excited about it, spend time and enjoy it, plan and manage the learning process, use various learning paths in this process, monitor and evaluate their own learning, take responsibility for their own learning, and make self-criticism related to this, open to life-long learning. It is known that most of the skills mentioned here are important skills for 21st century learner and employee. Similarly, the 21st century individual is expected of developing original ideas for the solution of problems encountered in life and trying different solutions, considering different perspectives, analyzing, criticizing and questioning, adapting to new situations quickly, communicating effectively in group works, cooperating and taking responsibility, being open to criticism and is self-development. Fahnoe and Mishra (2013) show that students in the 21st century learning environment, which was designed deliberately, reported higher self-management perception than those in the traditional learning environment.

When the structural equation model that constitutes SDL skills predicting 21st skills is examined, it is determined that SDL skills predict 21st skills significantly and strongly. In other words, as individuals' self-directed skills increase, 21st skills will increase too. The importance of SDL as an essential skill for working in the 21st century and preparing students for future life is emphasized in the literature (Alismail & McGuire, 2015). SDL is a concept that exists in most frameworks of 21st century learning and is often regarded significant for personal learning experiences.

In the 21st century, advances in education, remarkable advances in accessing technology and information require students to use initiative in their own learning (Teo et al., 2010). Laar et al. (2017) stated that as 21st skills individuals should have knowledge management, communication, collaboration, creativity, critical thinking, problem solving, ethical awareness, cultural awareness, flexibility, SDL and lifelong learning skills. SDL is an important tool for students to develop their metacognitive capacities, which is necessary for the 21st century employee who must constantly solve various problems (Karatas, 2017; Voogt & Roblin, 2012; Yasmin, Naseem & Masso, 2019). At the same

time, Nair (2020), emphasizes that individuals must have lifelong learning skills, critical and creative thinking and self-directed skills in order to succeed in a complex world full of rapid developments in information and technology. In this sense, opportunities should be provided for greater access to technological tools and individualized learning experiences. For this, the education given in schools should aim at developing students' SDL skills and gaining 21st skills (Chou & Chen, 2008). According to Fahnoe and Mishra (2013), self-management is the basic skills required for students to fully participate in their learning experiences. In general, 21st century students should acquire SDL skills, manage learning resources, demonstrate independence in learning, and think critically to solve problems. In this sense, teachers have great duties in the development of students' SDL skills.

Teachers, as self-directed learners, should constantly expand their professional knowledge and skills to follow up the constantly changing and updated information (Fox, 2011). In this sense, it is important that future teachers are trained in the pre-service period in order to gain 21st century skills as self-directed learners. Depending on this situation, teacher candidates should be actively the main actors of the learning process, not as passively recipients of information in the process of acquiring knowledge. In addition, by increasing their academic knowledge and keeping their motivation for learning, they are expected to make a critical assessment and come to a position that produces knowledge (Karatas& Başbay, 2014). For this, teacher training programs should be encouraging SDL and developing 21st skills. Thus, it is thought that future teachers will develop SDL skills and gain 21st skills. Teachers who have acquired SDL skills will prepare their students for the future in a more qualified and equipped way and develop their students' 21st skills.

In addition, another important finding obtained in this research is that the research model has been verified for students in Turkish-Social, Turkish-Mathematics and Mathematics-Science academic fields; however, it was observed that the model could not be verified significantly for students in the academic field of special ability. In other words, SDL skills of students in Turkish-Social, Turkish-Mathematics, Mathematics-Science and Special Ability academic fields predict 21st skills; however, SDL skills of students in the field of special ability academic field do not predict 21st skills. Within the scope of this research, students in special ability academic field are the students studying in a bachelor's degree program in fine arts or sports. This research finding contradicts with some researches in the related literature, and it seems that the students in the field of special ability academic field have improved SDL skills and thus 21st skills (Diker-Coskun & Demirel, 2010; Tekkol & Demirel, 2018; Yaman, 2014). McNabb (2003) stated that special ability in achieving high success and learning does not constitute a guarantee. Risemberg and Zimmerman (1992), often described gifted students as intelligent, curious

and self-confident individuals in their learning processes. However, it is emphasized that it should not be deduced that every talented individual will be successful in learning and use self-regulation skills (Çağlar, 2004; Karatas, 2020). In this sense, special talented students may not feel the need to update themselves in different areas in terms of knowledge and skills, as they are dealing with a fixed job due to their branches. If this need is not felt, it may affect SDL skills and 21st skills.

Conclusion and recommendations

As a result, there is a positive and statistically significant relationship between SDL skills and 21st century skills. Moreover, SDL skills are a strong predictor of 21st century skills. According to the group comparisons, SDL skills of students in the special ability academic field do not predict 21st century skills. However, SDL skills of students in other academic fields strongly predict 21st century skills. In line with this, it can be said that as the SDL skills increase on the basis of the academic field of individuals, 21st century skills will increase too.

New developments in the 21st century educational environment, such as changes in pedagogy, online learning opportunities and mobile devices, raise expectations for all learners to take use initiative in their own learning. Learning environments of the 21st century connect different pedagogy and technologies and offer a broad reason to re-examine self - directed learning opportunities. SDL is an important life skill for the 21st century, bringing innovations to learning environments, providing access to new technologies, differentiating learning, changing the role of the learner and teacher in the classroom requires updating the traditional school structure. In order to raise self-directed individuals, rich learning environments should be provided to support the 21st century learner, and students' interests and needs should be taken into account in order to benefit from different experiences. Relational research can be conducted in future research to reveal cognitive and affective structures associated with SDL and 21st skills. The model revealed as a result of the research can be tested in different cultures and adult groups. Detailed examinations can be made by taking the opinions of academicians and teachers about what applications should be done to develop the SDL and 21st skills of individuals.

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