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Research Article

The Framework of 21st Century Skills in the Educational Sciences Literature

Eğitim Bilimleri Alan Yazınında 21. Yüzyıl Becerilerinin Kapsamı

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ABSTRACT

This study derives its motivation from the 21st-century skills, often called the "skills of the era," which encompass goals inspired by contrasting philosophies. Educators are expected to nurture environmentally conscious, health-literate, and culturally sensitive individuals while fostering competitive, outcome-oriented, financially literate individuals. There's a quest to harmonize these attributes, driving specific investments. The need for an educational landscape overview becomes evident. discussions. Interpreting 21st-century skills, selecting focused skills, and understanding data collection sources initiate multidimensional discussions within educational sciences. Thus, the study's core objective is to map fundamental characteristics of literature emphasizing 21st-century skills. Analyzing 157 recent PhD theses in Turkey's educational sciences field, the study examines academic disciplines, emphasized skills, methodologies, data collection tools, participants, and outcomes. The literature review shows variations in emphasis on 21st-century skills, with some receiving attention while others are marginalized. Study participants mainly comprise students and educators. The conclusion highlights recommended tools like mobile apps, animation software, websites, instructional techniques, and devices, as advised by authors.

Keywords: 21st century skills, maps of skills, skills in education

ÖZ

Kamuoyunda “çağın becerileri” olarak ifade edilen, içerisinde karşıt felsefelerden beslenen amaçların da olduğu 21. yüzyıl becerileri bu çalışmanın güdülenme (motivasyon) kaynağıdır. Öğretmenlerden çevreye duyarlı, sağlık okuryazarı, kültürel farklılıklara duyarlı bireyler yetiştirmesi beklendiği kadar rekabetçi, fayda odaklı, finans okuryazarı bireyler de yetiştirmesi beklenmektedir. Dahası bunların hepsinin bir arada olduğu bir düzlem aranmakta ve bazı yatırımlar yapılmaktadır. Tam bu noktada eğitim alanındaki durumun bir fotoğrafına ihtiyaç duyulduğu düşünülmektedir. Eğitim bilimleri alanında 21. yüzyıl becerilerinden ne anlaşıldığı, hangi becerilerin odağa alındığı, hangilerinin alınmadığı, soruları birçok bakımdan üzerinde tartışılabilir bir düzlem sağlayacaktır. Bu doğrultuda çalışmanın temel amacı, alan yazında 21. yüzyıl becerilerini odağa alan çalışmaların temel özelliklerinin haritasını çıkarmaktır. Çalışma alanı olarak Türkiye’de son yıllarda eğitim bilimlerinde yapılan doktora tezleri seçilmiş (157 doktora tezi); bu tezler yürütüldükleri bilim dalı, odağa aldıkları 21. yüzyıl becerisi, yöntemi, veri toplama aracı, katılımcıları ve sonuçları bakımından analiz edilmiştir. Alan yazında bazı 21. yüzyıl becerilerinin çok yüksek oranda ağırlık teşkil ettiği, bazı becerilerinin de kendisine neredeyse yer bulamadığı; çalışmaların katılımcılarının çoğunun farklı kademelerden öğrenci ya da öğretmen olduğu vb. sonuçlara ulaşılmıştır. Yazarlarca kullanımının yaygınlaştırılması tavsiye edilen birçok mobil uygulama, animasyon geliştirme uygulaması, web sitesi, öğrenim tekniği ve cihaz olduğu sonucuna erişilmiştir.

Anahtar Kelimeler: 21. yüzyıl becerileri, becerilerin çerçevesi, kapsam taraması.

INTRODUCTION

In recent years, all developments observed through individual, society, and technology variables must be carefully monitored by educational components. To exemplify the implications of these changes, the robot named Sophia, developed by a Hong Kong-based partnership, was granted citizenship by Saudi Arabia (BBC, 2017). Moreover, within the next 20-30 years, millions of jobs performed by people are anticipated to be taken over by artificial intelligence (McKinsey Global Institute, 2017). Furthermore, the International Labour Organization (ILO) (2019) forecasts a significant increase in the current 200 million unemployed individuals soon. According to the Intergovernmental Panel on Climate Change (IPCC) (2018), polar ice melting will cause sea level variations across many regions for centuries, profoundly affecting various life forms. Another study by Ceylan (2019) suggests that with the world population projected to reach 9 billion by 2050, existing drinking water and irrigation resources could prove insufficient. Similar developments give rise to notable planetary needs. Hence, the conceptual framework referred to as 21st-century skills, discussed in many disciplines, including education, holds significance. According to Sackville (2020), skills are arranged as shown in Figure 1. As argued by Öğretir and Tuğluk (2019), the current era accentuates specific changes in areas such as innovation, sustainability, and social welfare, including ecological needs, economic challenges, and multicultural structures.

Figure 1. General Overview of 21st Century skills

(Sackville, 2020)

In education, preparing individuals for contemporary demands and addressing imminent threats are equally essential. Notably, 21st-century skills in education extend beyond welfare concerns like health, food, and ecology. Various disciplines, including educational sciences, are initiating transformative endeavors, focusing on 21st-century skills. In Turkey, curriculum revisions introduce new competencies, aiming to imbue individuals with these skills from an early age (MEB, 2019). Ministry of Education (MEB), (2018) emphasizes the primary importance of introducing 21st-century skills in early education for a sequential developmental process. The 2023 Education Vision by MEB (2018) underscores the significance of primary education for character development and as a solution to cultural change.

MEB's (2022) In-Service Training Plan predominantly includes activities centered around 21st-century skills like coding, computing, data analysis, disaster preparedness, and cyber security. Additionally, under the Presidency, Turkey's Education and Teaching Policies Board emphasizes the need for increased interaction among stakeholders to develop integrated school models (2021). Critical pedagogy, too, highlights the evolving nature of contemporary needs and the necessity for change.

In summary, examining 21st-century skills reveals a complex landscape spanning teacher training, policy boards, and various philosophical foundations. However, delving deeper uncovers a challenge. Analyzing which skills to prioritize, when to impart them, and how, on a national scale, remains a gap. While research has identified a common set of skills within 21st-century skills, no comprehensive studies have evaluated the scope of educational science disciplines in this context. This research aims to provide an overview of the directions taken by these studies, the emphasized skills, problem areas, and data collection methods, to create a snapshot of educational scientists' perceptions of the 21st century. In this light, an exploratory map is sought, and the research question is formulated as follows: "What is the general overview of academic studies related to 21st-century skills in the field of educational sciences in Turkey?" The sub-problems are as follows:

In PhD theses conducted in the field of education sciences in Turkey in recent years;

1. What are the 21st-century skills focused on?
2. Is there a difference by years?
3. Which scientific disciplines were involved in the study?
4. Which patterns were used?
5. Which data collection tools were used?
6. Who are the participants from whom the data was obtained?
7. What are the results of these studies?

METHODOLOGY

This section provides information regarding the research design, study sample, data collection tool, validity and reliability of the study, and data analysis.

2.1. Research Model

In this study, a qualitative scoping review method was employed to determine the scope of studies related to 21st century skills in the field of education. The scoping review approach is a relatively new technique used to map structured information on a particular topic and create a discussable platform on a subject (Mai et al., 2014). Accordingly, 157 PhD theses were analyzed and categorized in a table by section. Parameters used during categorization included publication year, focused skill, discipline of study, data collection tool used, participants, methodology, sample size, and result. An example of the data collection tool is provided in Table 1. To determine the 21st century skill to be analyzed in the study, the P21 (2009) study was crucial due to its independent consideration of each skill from a theoretical perspective. The information obtained was analyzed and conclusions and recommendations were written.

2.1.1. Scale and Data Collection Process

In scoping review studies, it is not possible to speak of a structure with clearly defined boundaries (Mai et al., 2014). Based on the requirements of the information to be mapped, certain premises were determined, and a form, as exemplified in Table1, was developed.

Table 1

Sample Form (Data Processing Form)

Number	Title of the Study	Year of Publication	Academic Discipline of the Study	Method Used	Focused 21st Century Skill	Data Collection Tool	Data Source	Sample Size	Results

.	..	...	...	.. .	...	...	.. .	.. .	..
.	..	...	...	.. .	...	...	.. .	.. .	..

In the processing of data in the form, the expertise of one specialist was consulted for parameter selection and form organization. A total of 157 PhD theses, publicly available in the database of the Council of Higher Education (YÖK), were examined for each parameter, and the data was entered into the relevant boxes.

2.2. Data Analysis

After data collection, the study was divided into sections, with each parameter forming a section. For example, the data collection tools used in the studies were analyzed within their own section, while the 21st-century skill focused on was also analyzed within its own section. The data obtained in each section were re-tabulated for mapping. The data was further subjected to processing for the organization of certain information under a single name, with the aim of resolving differences resulting from the author's expressions or the use of different names for some scientific disciplines at universities. Detailed information regarding these processes is presented in Table 2.

Table 2

Details Regarding the Resolution of Name Variations in the Data.

Number	Before Editing	After Editing
1	Department of Education for Hearing Impaired	Special Education / Intellectual Disabilities Teaching / Hearing Impaired Teaching
2	Department of Education for Intellectual Disabilities	
3	Special Education Department	
4	Primary Education Department	Primary Education Department
5	Department of primary Education	
6	Primary Teaching Department	
7	Department of Elementary School Teaching	
8	Department of Educational Management	Education Management, Inspection, Planning, and Economics
9	Department of Educational Management and Inspection	
10	Department of Educational Management, Inspection, Planning and Economics	
11	Department of Science Education	The Elementary Mathematics / Mathematics / Science Education
12	Department of Mathematics Education	

13	Department of Mathematics and Science Education	Department
14	Department of Elementary School Mathematics Teaching	
15	Department of Social Studies Education	The Department of Social Studies and Turkish Education
16	Department of Social Studies Teaching	
17	Department of Social Studies and Turkish Language Education	
18	Department of Turkish Language Education	

After analyzing the data, findings and conclusions have been reached.

2.3. Limitations of the study

One of the sub-problems focuses on the frequency of studying the skills emphasized in the study in the recent past. Consequently, a timeframe (such as the last 5 years) has been selected to understand whether there is a trend within the skills over the years. Another limitation of the study is the inclusion of PhD theses conducted in the last 5 years.

FINDINGS

When considering the designs of the studies, mixed-methods design (86 studies, 54.8% of total studies) was ranked first. Additionally, there were 51 studies (32.5% of total studies) in quantitative design and 20 studies (12.7% of total studies) in qualitative design. Therefore, it was found that more than half of the PhD theses were created in mixed-methods design and qualitative design was more preferred than quantitative design as a secondary option. The findings obtained in this section of the study were expressed in sections.

3.1. The Findings on the Years of Studies Conducted

When the data was analyzed regarding the question "Are there any differences according to the years in which the studies were conducted?" it was found that between 28-34 studies were conducted each year. In 2017, 28 studies were conducted, in 2018, 33 studies, in 2019, 34 studies, and in 2020, 30 studies were conducted. Other findings indicate that the studies were largely evenly distributed over the years, and there was no continuous increase or decrease. In summary, it was concluded that there is not a significant difference in terms of the year of completion of PhD theses conducted in the 21st century.

3.2. The findings related to the scientific fields in which the studies were conducted

The findings related to the scientific disciplines in which the studies were conducted are presented in Table 3, which shows the distribution of 21st-century skills in PhD theses by scientific discipline.

Table 3

Distribution of 21st Century Skills in PhD Theses by Fields of Science

Number	Field of Study (Department)	Number of Studies (f)	Percentage (%)
1	Education Programs and Instruction	30	19.1
2	Primary School Mathematics / Mathematics / Science Education	26	16.6
3	Primary Teaching Science	19	12.1
4	Social Studies and Turkish Language Education	15	9.6
5	Preschool Education Science	14	8.9
6	Educational Administration and Inspection / Inspection Planning / Inspection Science	8	5.1
7	Computer Programs and Instruction / Computer and Instruction	8	5.1
8	Guidance and Psychological Counseling Science	6	3.8
9	Special Education / Intellectual Disability Teaching / Hearing	6	3.8
10	English Language Education Science	6	3.8
11	Gifted Education Science	3	1.9
12	Gifted Education Science	3	1.9
13	Measurement and Evaluation Science	2	1.3
14	Fine Arts Education Science	2	1.3
15	***** Other (Adult Education Science, Art Education Science, Music Teaching Science, French Language Education Science, Physics Education Science, Educational Technology Science, Educational Psychology Science, Religious Culture and Ethics Education Science, German Language Education Main Science)	9	5.4
	Total	**157**	**100**

**In each of the scientific fields listed in this section, only one study has been found within the last five years.*

According to Table 3, Education Programs and Instruction, Primary Education Mathematics/Mathematics/Science Education, Elementary Education, and Social Studies and

Turkish Language Education make up 66.2% of the PhD theses on 21st century skills in the field of educational sciences. Education Management and Inspection/Planning/Inspection, Computer Programs and Instruction/Computer and Instruction Technologies, Guidance and Psychological Counseling, Special Education/Intellectual Disabilities Teaching/Hearing Impaired Teaching, and English Language Education fields have carried out PhD theses on 21st century skills at a moderate level. However, very few PhD theses have been conducted on 21st century skills in the fields of Gifted Education, Physical Education and Sports, Measurement and Evaluation, Fine Arts Education, Adult Education, Drawing and Art Education, Music Teaching, French Language Teaching, Physics Education, Educational Technology, Educational Psychology, Religious Culture and Ethics Education, and German Language Education.

3.3. Findings regarding data collection tools used in studies

The findings regarding the question "What are the data collection tools used in PhD theses?" are presented in Table 4. The distribution of data collection tools used in PhD thesis provided in the Table 4.

Table 4

Distribution of Data Collection Tools Used in PhD Theses

Number	Data Collection Tools	Number of Studies (f)	Percentage (%)
1	Scale	120	29.1
2	Interview	104	25.2
3	Achievement Test	88	21.3
4	Observation	36	8.7
5	Diary	18	4.3
6	Document Analyze	12	2.9
7	Activity Reports	12	2.9
8	Evaluation Form	11	2.6
9	Self-Evaluation Form	5	1.2
10	Worksheets	3	0.7
11	E-Portfolio	1	0.2
12	Committee Reports	1	0.2
13	Picture	1	0.2
	Total	**412**	**100**

According to Table 4, a total of 412 data collection tools were used in 157 PhD theses, with only scales, interviews, and observations accounting for 76.4% of the total. Data collection tools such as observation, diary, document review, activity reports, and evaluation forms were used at a relatively moderate level, while self-assessment forms, work sheets, e-portfolios, committee reports, and pictures were rarely utilized.

3.4. Findings regarding the determination of participants in the studies.

When the data obtained from the participants are analyzed regarding the research problem of the study "who are the participants from whom the data are obtained?", it was found that there were 54 different data sources in a total of 157 studies. Among the data sources where

middle school students are the highest, various sources such as subject teachers, education managers, adults, and children were preferred. Additionally, in studies on 21st-century skills in education sciences, multiple data sources are predominantly evaluated together. It was found that a total of 195 data sources were used in the literature of the research field. To enable a more effective evaluation, Table 5 presents the general distribution of the participants, determined with more general parameters such as teachers and students.

Table 5

General Distribution of Participants

Number	Data Source	Number of Studies (f)	Percentage (%)
1	Elementary school students	60	30.8
2	Teacher candidates	32	16.3
3	Teachers	29	14.7
4	Undergraduate students	12	6.1
5	High school students	12	6.0
6	Preschool students	11	5.5
7	Primary school students	10	5.0
8	Parents	10	5.0
9	**Others (adults, school administrators, guidance and psychological counselors, individuals with special needs, some vocational school students)	19	9.4
	Total	**195**	**100**

Each data source in this section has been the focus of no more than 3 studies in the last five years.**

According to Table 5, middle school students, teacher candidates, and teachers constitute 61.8% of PhD theses on 21st-century skills in educational sciences. In studies where undergraduate students, high school students, preschool students, elementary school students, and parents found a moderate place, individuals with special needs and associate degree students were relatively less included in the studies.

3.5. Findings on the focused 21st century skills

The research identified 14 different 21st century skills in response to the question "what are the 21st century skills focused on?" The findings obtained were expressed in Table 6 in terms of the comparison of 21st century skills in PhD theses.

Table 6

Frequency of Usage of 21st Century Skills in PhD Theses

Number	The 21st century skill that is focused on in the studies	Total Number of Studies Focused on (f)	Percent (%)
1	Problem-solving	45	25.4
2	Creativity	36	20.3

3	Critical thinking	30	16.9
4	Communication	15	8.5
5	Entrepreneurship	9	5.1
6	Collaboration	9	5.1
7	Media literacy	8	4.5
8	Global awareness	6	3.4
9	Flexibility and adaptability	5	2.8
10	Technology literacy	5	2.8
11	Information and technology literacy	4	2.3
12	Environmental literacy	2	1.1
13	Self-management	2	1.1
14	Financial literacy	1	0.6
15	**Total**	**177**	**100**

When analyzing Table 6, it was found that skills such as problem-solving, creativity, and critical thinking constituted a significant portion of the studies, while skills such as environmental literacy, financial literacy, and self-management had limited representation. However, communication, entrepreneurship, collaboration, media literacy, global awareness, adaptability, technology literacy, and information and technology literacy were partially represented at a moderate level. Only problem-solving, creativity, and critical thinking skills accounted for 62.6% of the total usage of 21st-century skills in PhD dissertations.

3.6. Findings related to research results

The results of the studies in the literature were primarily written in Table 3, and secondarily divided into sections within itself for in-depth evaluation (through holistic reading). Accordingly, the results of the studies conducted in literature on 21st-century skills in the last five years are gathered under two different themes. These dimensions are expressed in Table 7 as an overview of the general findings of the studies on 21st-century skills in literature.

Table 7

General Overview of the Results of Studies on 21st Century Skills in the Literature

Number	Themes/findings that the results of studies in the literature focused on
1	Findings related to studies that focus on innovation such as web-based educational applications, mobile applications, technology-enhanced learning environments, and STEM activities.
2	Findings related to studies that examine the correlation between the developed instructional program, teaching techniques, or 21st century skills.

In this section of the study, the data obtained will be presented separately for the 2 themes indicated in Table 7.

3.6.1. Findings related to studies that are based on innovation such as web-based educational applications, mobile applications, technology-supported learning environments, and STEM activities.

The findings reveal that a significant number of studies based on 21st-century skills focus on online learning environments, mobile applications, and technology. Accordingly, it is stated that the mobile application or educational environment, which is the focus of almost all studies conducted in this direction, may have a positive effect on the educational components. For example, according to Aydemir (2019), design-oriented computer programs improve participants' technology and media literacy and creativity skills. Zengin (2018) shows that an online developed mobile course has a positive impact on English teachers' thoughts about technology usage. Merzifonluoğlu (2020) indicates that success increases with technology-supported applications, and individual, collaborative learning environments are created. Kalkan (2020) finds that individuals supported by virtual reality education improve their table tennis success in real life. Çelik (2018) shows that work done with 3D production tools positively affects students' entrepreneurship scores. Kelleci (2020) suggests that robotic applications have a positive impact on students' creative skill levels. Özen (2020) demonstrates that digital storytelling dimensions, such as active participation, willingness, and other factors, are effective on students' creativity levels. Bilici (2020) shows that digital storytelling activities have a positive effect on students' critical thinking skills. Gürsan (2021) indicates that digital storytelling activities have a positive impact on students' critical thinking skills. Gezer (2020) shows that mobile application-based activities have positive effects on students' critical thinking skills. Kaya (2018) reveals that Alice animation creation software has positive effects on students' problem-solving perception. Çam (2019) demonstrates that robotic-assisted programming education results in a positive increase in students' problem-solving skills. Yılmaz (2019) shows that violence-based action-adventure video games have negative effects on children's problem-solving skills, while movement-based activities have positive results on students' problem-solving skills. Pullu (2019) suggests that orienteering techniques have a positive impact on students' problem-solving skills. Şen (2021) shows that the "Solve" mobile application has positive effects on the problem-solving skills of individuals with special needs. Şılbır (2017) indicates that technology-supported materials and applications are effective on communication skills of hearing-impaired students. Bilmez (2020) shows that coaching applications that provide feedback via video have positive effects on children's communication skills. Koç (2020) suggests that cloud-based peer teaching methods positively affect students' communication skills. According to Gülboy (2021), it was found that the ADDIE model has positive effects on students' communication skills, while according to Gökdağ (2021), mobile applications that generate speech on tablets have positive effects on students' communication skills. However, information about the mentioned (open-source) applications and websites in the studies is expressed in some innovative learning environments and techniques in 21st-century literature, as presented in Table 8.

Table 8

Some Innovative Learning Environments and Techniques Mentioned in 21st Century Literature in the Field

Number	Website/ Mobil application/ Technique	Content/Description
1	Alice	Animation development application
2	www.abcya .com	Website offering activity and game-based exercises

3	www.brainpop.com	Website featuring STEM-based animations
4	Speech device	Speech device for individuals with speech impairment
5	www.pbskids.org	Website providing educational content through games and videos
6	www.storyonline.net	Website containing e-reading activities
7	ADDIE	Instructional design model
8	Cloud-based learning	E-learning environments for storing data
9	Arduino	Hardware and software design
10	Scenario-based scratch technique	Game/video development application (Coding)

As seen in Table 8, it has been concluded that the use of certain activities, websites, or applications has resulted in success. Additionally, it has been found in the literature that some mobile applications or programming tools are not accessible. Among the findings is the absence of Turkish language support on accessible websites. Furthermore, results of studies focusing on innovation, such as web-based educational applications, mobile applications, technology-enhanced learning environment and STEM activities indicate that similar sites and applications are included among results.

3.6.2. Findings related to studies that examine the correlation between the developed instructional program, teaching techniques, or 21st century skills.

When considering the 21st century skills in his/her article, it has been concluded that a significant portion of the studies is created in a relational structure. In these studies, skills are generally considered by establishing a relationship with another structure. These structures are sometimes determined as teaching technique, teaching program, and sometimes as teachers and other stakeholders. When the data sources are examined more closely, the skills that are related to are created by taking data from almost every field. Therefore, in literature, 21st century skills are considered as a conceptual framework that can be related to almost any structure. For example, according to Alıcı (2018), there has been an increase in the awareness of education for sustainable development and critical media literacy levels of pre-school teachers who receive professional development education. According to the Dolanbay (2018), the media literacy empowerment training received by the participants played an effective role in the process, and all knowledge/skills/perception processes developed through the experiences of the participants. According to the Kış (2017), some teaching models were effective in developing the digital literacy of teacher candidates and contributed to the solution of problems in foreign language teaching. According to Bayra (2020), while parameters such as income level and education status influence the usage level of these skills, they do not have an effect on technology usage preferences. According to Seçer (2020), students having high-level thinking skills influence their problem-solving and attitudes towards STEM. According to Hazar (2019), the strongest relationship between information and media literacy skills is between mathematics, Turkish language, and physics at different levels. According to Yüksel (2018), a relationship exists between professional experience, education level, school type, multicultural perception, cultural intelligence, and global citizenship parameters. In the Kimzan (2021), because of the study using children's literature and visual arts, it was found that the awareness levels of children regarding differences and global phenomena increased. According to Çelikten (2020), the

developed teaching program was more effective in achieving success than the social studies teaching program. According to Erbil (2021), social entrepreneurship activities have a positive effect on the social entrepreneurship skills and beliefs of the students. According to Özbilen (2019), entrepreneurship and social capital skills differ depending on the sector in which one wishes to work as well as their membership in civil society organizations. According to Yılık (2017), it has been concluded that situational hope, social support, cognitive flexibility, and less problem-focused thinking are related to each other. According to Özbağ (2019), ceramic and art work have positive effects on creativity; the Gülec (2017) suggests that improvisation exercises in violin playing have an impact on participants' musical creativity levels; Kaya (2018) shows that there is no relationship between high school graduation, gender, age, and music achievement, but there is a relationship between creativity levels and music achievement; Eedenebaata (2017) suggests that there is no relationship between reading strategies and awareness of reading strategies and critical thinking skills; Kurtuluş (2021) suggests that content integration has a positive effect on students' multicultural competencies and critical thinking skills; Özgenel (2017) found that decision-making styles and critical thinking tendencies of managers predict problem-solving skills; Fakhmirarhadi (2018) suggests a relationship between marital harmony, locus of control, and problem-solving skills; Temel (2018) shows that strategies such as simplification, systematic listing, and finding connections have a positive effect on students' problem-solving skills; Arıcı (2019) found that non-programmatic creative activities have a positive effect on students' collaborative problem-solving skills; Esentürk (2019) suggests that a customized physical activity program implemented by mothers has a positive effect on the communication skills of students with special needs; and Özdemir (2021) found that the expert mantle approach has a positive effect on students' collaboration skills. In the literature on 21st-century skills, various relationships have been attempted to be defined through several studies. When the data obtained are evaluated holistically, it is found that every sector of society and every method and approach is related to 21st-century skills. For example, Uçar (2018) found that problem-solving skills were higher in women who exercised before, during, and after menstruation compared to those who did not. When the data obtained are analyzed, it is found that many different concepts, techniques, and methods are related to 21st-century skills. Some of the different structures used in the literature are expressed in table 9.

Table 9

Some Factors With a Positive Relationship with 21st Century Skills.

Number	Some factors that are positively related to 21st century skills.
1	Orienteering
2	Cognitive flexibility skill
3	Adventure therapy
4	Gradual self-directed learning technique
5	Context-based storytelling technique
6	Spatial reasoning skill
7	Information processing skill
8	Bibliotherapy
9	Intercultural communicative competence education

It has been concluded that there is a relationship between the structures expressed in Table 9 and 21st century skills. However, it has been found that operational definitions of some

concepts were not included in the study. In addition, it was not possible to access the theoretical reasons for why some education and activities were included in the scope of 21st century skills in some studies. The most general finding is that there are many methods and elements in the acquisition of 21st century skills by individuals. However, it has been determined that the developed curriculum, teaching techniques, or 21st century skills are mostly treated correlatively, and the results of the studies are not integrated with each other.

CONCLUSION, DISCUSSION AND RECOMMENDATIONS

21st century skills are one of the most discussed concepts in both liberal and critical pedagogical approaches. In liberal discourses, the necessity of techno-pedagogical arrangements to increase individuals' well-being is emphasized, while in critical approaches, the need to engage collective consciousness in all areas of education against the commodification of labor is discussed. It is believed that the way 21st century skills are addressed in the literature in Turkey will shed light on the contradictions between these approaches. In addition, the problems addressed in this study regarding 21st century skills are to some extent the starting point of the problem. Therefore, the first result that needs to be expressed is that the dominant approach in the educational sciences literature in Turkey is liberalism (MEB 2018). According to Anthony Giddens (2020), situations considered liberal are direct consequences of modernism, and education in the public sphere should not be indexed to economic indicators (hence, some skills).

According to Senemoğlu (2018), the organism’s ability to survive is somewhat related to its ability to adapt to the environment. In this respect, it is thought that establishing some practices to meet the recent needs in education has become a necessity. However, regulating all investments in the public sphere by focusing on a few developments creates new research problems. Among the questions addressed in the analyzed studies are how necessary it is to investigate educational practices such as robotics/coding in early childhood education from a techno-pedagogical perspective, and how many of the studies conducted are influenced by populist discourses. In the literature on 21st century skills, generally, the impact of a lesson/unit/achievement on a few skills has been investigated, and 21st century skills have been evaluated as consisting of a few skills and effects. It is thought that this contradicts the multi-disciplinary basis that constitutes 21st century skills. The recommendation for a multidisciplinary perspective (structures in which different subjects and skills are worked together at different levels) is supported by the results of the studies in literature.

As seen in Table 6, the results of the study indicated that certain skills were not emphasized in the academic literature on the topic of 21st century skills. For example, environmental literacy, adaptability, and media literacy were respectively represented at a rate of only 1.1%, 2.8%, and 4.5% in the conducted studies. Given the increase in global warming and natural disasters, the scarcity of studies on environmental literacy generates new research problems. It was concluded that there was no significant difference in the number of studies focused on 21st century skills over the years. In other words, it is not possible to speak of an increase or decrease in the number of studies focused on 21st century skills in the last 5 years.

Another issue that needs to be emphasized when analyzing studies focused on 21st century skills in education is the difference between the fields of science in which the studies were conducted. Education program and teaching science, mathematics education science, primary education science, and other sciences are among the fields that frequently address 21st century skills. Another factor that needs to be considered is the number of students in these fields of science. Indeed, there is believed to be a difference between the number of students studying in the fields of fine arts education and science education. However, there are also significant differences between fields of science such as education programs and primary

education, which are thought to have a wide range of human resources. This situation suggests the presence of differences between fields of science in the selection of research problems in educational sciences.

In Turkey, education scientists who worked on 21st century skill studies in their PhD theses mostly preferred mixed method and multiple data collection tools. In addition, the data was mostly obtained from students and teachers, which could be interpreted as a lack of involvement of the individuals and institutions at the focus of the skill. It was observed that none of the 157 PhD theses focused on 21st century skills sought the opinion of an expert from the industry (stakeholders). While the skills were approached more concretely and relationally in the literature through data collection tools such as scales and questionnaires, it should not be forgotten that it is not only difficult but also impossible to explain the skills solely through relationships.

Based on the findings, it can be concluded that education researchers in Turkey who focus on 21st century skills only consider a few skills, generally focus on the relational dimensions of these skills, use new approaches and techniques, prefer mixed methods designs, do not obtain data from industry stakeholders, and achieve positive results from using new techniques. Therefore, the following recommendations can be made regarding the 21st century skills:

- New mobile or web-based applications regarding 21st century skills should be focused on by researchers.

- Structures should be researched in teacher training, curriculum development and instructional processes to incorporate new developments (applications/techniques) more quickly into educational components. Works such as bulletins, magazines, trips and documentaries should be supported and educators' access should be facilitated.

- Digital storytelling tools, free online learning spaces, and 3D production and animation development applications should be provided with Turkish language support.

- Direct data should be collected from sectors and stakeholders considered to have brought the 21st century into existence. In this way, the skills of the era will gain both national and data-based qualities.

- Instead of considering skills individually and in isolation from each other, structures in which many skills such as "life and career skills" are found together should be preferred.

- More emphasis should be placed on environmental, health, finance, art, and music studies within 21st-century skills.

- Different sports branches, such as Orienteering, where many skills are effectively used, should be focused.

- Early-age individuals should be protected against violence, action, and adventure games.

- Horizontal organizational structures such as coaching and mentoring, which are required by 21st-century skills, should be researched.

- Studies focusing on the sub-dimensions of 21st-century skills should be included. The theoretical foundations of studies and applications related to 21st-century skills should be strengthened.

- The 21st-century needs that focus on special needs or disadvantaged groups in society should be defined.

- A critical practice against populist rhetoric and the commodification of labor should be provided by all stakeholders in educational components.

- National and regional needs should be considered in addition to global needs in studies and investments.

- Causal studies beyond the relational model, multi-disciplinary research problems, and data collection tools such as e-portfolios should be given weight in the studies to be carried out.

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GENİŞLETİLMİŞ ÖZ

Giriş

Son yıllarda birey, toplum ve teknoloji değişkenleri üzerinden gözlemlenen tüm gelişmelerin eğitim bileşenleri tarafından dikkatle takip edilmesi gerekmektedir. Bu değişimlerin izdüşümlerini örneklemek gerekirse, yakın zamanda Hong Kong merkezli bir ortaklık tarafından geliştirilen Sophia isimli robota Suudi Arabistan tarafından ülke vatandaşlığı verilmiştir (BBC, 2017). Ayrıca gelecek 20-30 yıl içerisinde milyonlarca kişi tarafından yapılan işin artık yapay zekâ tarafından yapılması beklenmektedir. Bir diğer çalışmada, Ceylan (2019) dünya nüfusunun 2050 yılında 9 milyarı bulması durumunda mevcut içme suyu ve tarımsal sulama kaynaklarının yetersiz kalabileceği belirtmektedir. Benzer gelişmeler gezegenimizde belirgin birtakım ihtiyaçların meydana çıkmasına neden olmaktadır. Tam bu noktada 21'inci yüzyıl becerileri olarak ifade edilen kavramsal çerçeve aralarında eğitiminde olduğu birçok disiplinde tartışılmaktadır. Öğretir ve Tuğluk'a (2019) göre içerisinde bulunduğumuz zaman, inovasyon, sürdürülebilirlik, toplumsal refah gibi arayışlar spesifik olarak bazı alanlardaki değişime dikkat çekmekte; bu alanların başında da ekolojik gereksinimler, ekonomik sorunlar ve çok kültürlü yapılar yer almaktadır. Eğitimde bireyin çağın ihtiyaçlarıyla donatılması kadar gelecekte onları bekleyen birtakım tehdit unsurlarına karşı da adımlar atılması gerekmektedir. Nitekim eğitimde 21'inci yüzyıl becerileri sağlık, gıda ve ekolojik problemler gibi ilanihaye bir refah arayışından başka alanları da içermektedir. Birçok farklı gerekçeyle eğitim bilimlerinin de aralarında olduğu birçok disiplin 21'inci yüzyıl becerilerini odağa almak suretiyle çeşitli dönüştürücü girişimlerde bulunmaktadır. Türkiye'de öğretim programlarında da yeni yetkinliklere ve kazanımlara yer verilmiş, 21'inci yüzyıl becerileri erken dönemlerinden itibaren bireye kazandırılmak istenmektedir (MEB, 2019). Ayrıca MEB'e (2018) göre gelişimin belli bir sıra izlemesi bakımından eğitimin ilk yılları 21'inci yüzyıl becerilerinin bireye kazandırılmasında ayrı bir öneme sahip olarak tanımlanmıştır. MEB (2018) 2023 Eğitim Vizyonuna göre karakter gelişimi bakımından ilkokula ayrı bir önem atfedilmiş, 21'inci yüzyılın gerektirdiği kültürel değişimin çözümü olarak eğitimin erken yılları işaret edilmiştir.

Öğretmen yetiştirme sürecinden politika kurullarına varıncaya kadar geniş bir alanda farklı gerekçe ve felsefi temellerle kendisine yer bulan 21'inci yüzyıl becerilerine daha yakından bakmak istediğimizde bir sorunla karşılaşılmaktadır. Hangi becerinin hangi gerekçeyle, yaşamın hangi döneminde, hangi yöntemle bireye kazandırılmak istediği analiz edildiğinde ulusal ölçekte etkin bir çalışmaya ulaşılamamıştır. 21'inci yüzyıl becerilerinde alan yazında (bu becerilerin hangileri olduğu yönünde) araştırıldığında ortak bir dizi beceriye ulaşılmasına rağmen, eğitim bilimcilerin kendi içerisindeki durumlarının değerlendirilebileceği/kıyaslanabileceği çalışmalara erişilememiştir. Örneğin 21'inci yüzyıl becerilerinde üzerinde durulan araştırma problemlerinin hangi alanlarda yoğunlaştıkları, akademik çalışmalarda en dikkate alınan becerilerin ve çalışma gruplarının nelerden/kimlerden oluştuğu

cevap aranan sorular arasındadır. Tam bu noktada alan yazında yapılmış çalışmaların yöneldikleri alanların, üzerinde çalıştıkları becerilerin, odağa aldıkları problemlerin, veri topladıkları alanların üzerinden eğitim bilimcilerin 21'inci yüzyıla ilişkin algılarının bir fotoğrafı çekilmek istenmiştir. Bu bakımdan üzerinde tartışılabilecek bir harita çıkarmak istenilmiş ve çalışmanın problem cümlesi "Türkiye'de eğitim bilimleri alanında yapılan 21'inci yüzyıl becerileri konulu akademik çalışmaların genel görünümü nasıldır?" olarak belirlenmiştir. Çalışmanın alt problemleri şu şekildedir:

Türkiye'de eğitim bilimleri alanında son yıllarda yapılan doktora çalışmalarda;

- i. Odağa alınan 21'inci yüzyıl becerileri nelerdir?
- ii. Yıllara göre bir farklılık bulunmakta mıdır?
- iii. Çalışmanın yürütüldüğü bilim dalları hangileridir?
- iv. Hangi desenler kullanılmıştır?
- v. Hangi veri toplama araçları kullanılmıştır?
- vi. Verilerin elden edildiği katılımcılar kimlerdir?
- vii. Analiz edilen çalışmaların sonuçları nedir?

Yöntem

Eğitim bilimleri alanında 21'inci yüzyıl becerilerinin haritasının amaçlandığı bu çalışmada nitel desende kapsam taraması (scopping review) yöntemi kullanılmıştır. Alan yazında belli konudaki bilgilerin yapılandırılmış bir şekilde haritasının çıkarılmasında ve bir konu hakkında tartışılabilir bir zemin oluşturulmak istendiğinde başvurulan "kapsam taraması yaklaşımı" görece yeni bir tekniktir (Mai et al., 2014). Bu doğrultuda 157 doktora tezi kısımlara ayrılarak analiz edilmiş ve bir tablo üzerinde kısımlara ayrılmıştır. Ayrıştırma yapılırken kullanılan parametreler; yayım yılı, odağa alınan beceri, çalışmanın yapıldığı bilim dalı, kullanılan veri toplama aracı, katılımcılar, yöntemi, örneklem sayısı ve sonucudur. P21 (2009) çalışması her bir beceriyi bağımsız ele alması bakımdan (kuramsal açıdan) belirleyici olmuştur. Elde edilen bilgiler analiz edilerek sonuç ve öneriler yazılmıştır. Kapsam taraması çalışmalarında sınırları kesin olarak belirlenmiş bir yapıdan söz etmek mümkün değildir (Mai et al., 2014). Çalışmada elde edilen veriler gerektirdiklerine göre belli öncüller belirlenerek veri işleme formu geliştirilmiştir (Tablo 3). Verilerin işlendiği formda parametrelerin seçilmesinde ve formun düzenlenmesinde bir (1) alan uzmanına başvurulmuştur. Yüksek Öğretim Kurumu (YÖK) veri tabanında paylaşıma açık 157 doktora tezi her bir parametre bakımından incelenmiş ve veriler ilgili kutucuklara işlenmiştir. Veriler toplandıktan sonra her bir sutün bir bölüm olmak üzere çalışma kendi içerisinde kısımlara ayrılmıştır. Örneğin çalışmalarda kullanılan veri toplama araçları kendi içerisinde analiz edilmiş, söz konusu çalışmada odağa alınan 21'inci yüzyıl becerisi kendi içerisinde analiz edilmiştir. Her bir bölümde elde edilen veriler haritası çıkarılmak üzere yeniden tablolaştırılmıştır. Elde edilen veriler bazı bilgilerin düzenlenmesi (tek bir isim altında toplanması) bakımından bir işleme daha tabi tutulmuştur. Bu kısımda yazarın ifadesi bakımından ya da üniversitelerin bazı bilim dalları için farklı isimleri kullanması bakımından ortaya çıkan farklıklar giderilmiştir. Bu süreçte yapılan düzenlemelere ilişkin detaylı bilgi Tablo 4'te ifade edilmiştir.

Sonuç ve Tartışma

Eğitim bilimlerinde 21'inci yüzyıl becerilerini odağa alan çalışmalar analiz edildiğinde üzerinde durulması gereken bir durum da çalışmaların yürütüldüğü bilim dalları arasındaki farklılık. Eğitim programları ve öğretimi bilim dalı, matematik eğitimi bilim dalı, sınıf eğitimi vb. bilim dalı 21'inci yüzyıl becerilerinin sıkça gündemine alan bilim dalları arasındadır. Burada hesaba katılması gereken bilim dallarındaki öğrenci sayılarıdır. Nitekim güzel sanatlar eğitimi ile fen eğitimi bilim dallarında eğitim gören öğrenci sayıları arasında bir farklılık olduğu düşünülmektedir. Bununla birlikte geniş bir insan kaynağını sahip olduğu düşünülen eğitim programları, sınıf eğitimi gibi bilim dalları arasında da büyük farklar bulunmaktadır. Bu durum eğitim bilimlerinde araştırma problemi seçiminde muhafazakâr bir durumun varlığını düşündürmektedir. 21'inci yüzyıl becerisi çalışan eğitim bilimciler büyük oranda karma desen ve birden çok veri toplama aracı tercih etmişlerdir. İlave olarak veriler büyük oranda öğrencilerden ve öğretmenlerden elde edilmiştir. Bu durum becerin odağındaki kişi ve kurumların çalışmaya dahil edilmediği gibi yorumlanabilir. 21'inci yüzyıl becerilerini odağa alan 157 doktora tezinin içerisinde sektörden (paydaşlardan) bir uzmana başvurulmadığı görülmüştür. Başta ölçek, anket gibi veri

toplama araçlarının tercih edilmiş söz konusu becerilerin daha somut ve ilişkisel bir tabanda seyretmesini zaruri kılmıştır. Ancak ilişkisel çalışmaların ilişkinin nedenlerine ilişkin veri sağlamayacağı unutulmamalıdır. Türkiye'de 21'inci yüzyıl becerilerini odağa alan eğitim bilimcilerin problemi yalnızca birkaç beceri olarak dikkate aldıkları, becerilerin genelde ilişkisel boyutları üzerinde durdukları, yeni yaklaşım ve teknikleri kullandıkları, genelde karma deseni tercih ettikleri, beceriler ile ilgili sektörel paydaşlardan veri almadıkları ve yeni tekniklerin kullanılmasından olumlu sonuçlarını elde ettikleri sonuçlarına erişilmiştir.