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Analysis of secondary school mathematics textbooks in the context of digital competence

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Highlights

- One of the most important knowledge, skills, and competencies that should be gained by individuals in the 21st century is digital competence.
- This study shows that digital competence is not given enough in secondary school mathematics textbooks.
- The results of the study show that digital competence is more involved in MoNE Publishing textbooks.
- Digital competence should be included in textbooks in a more comprehensive and balanced way. In this context, all elements of DigComp or another framework should be taken into consideration.

Article Info: Research Article

Keywords: *Digital competence, Secondary school, Textbook, Mathematics education*

Abstract

In today's world, where digitalization is inevitable and necessary, it is extremely important to raise individuals with digital competence. For this reason, it is of great importance that textbooks, which are important instruments of the education environment, are prepared in a way that contributes to digital competence skills. The aim of the study carried out in this context is to determine to what extent digital competence is included in secondary school mathematics textbooks. Document analysis, one of the qualitative research methods, was used in the study. The documents of the study consist of eight secondary school mathematics textbooks belonging to different publishers and being taught in public schools in the 2022-2023 academic year. The documents determined within the scope of the research were analyzed with the content analysis technique using a technology-supported qualitative data analysis software. The analysis of the data was based on the content, learning areas, and DigComp 2.2 framework that included digital competence. The results obtained from the study show that textbooks generally do not pay much attention to DigComp dimensions, more digital competence is included in the textbooks of MoNE Publications compared to the textbooks of other publishers, but in general, the concept of digital competence, which has an important place in the curriculum, is not sufficiently included in secondary school mathematics textbooks. In line with the results obtained from the study, suggestions were made to textbook authors and researchers.

1. Introduction

The 21st century appears as a period in which the transition from the industrial society to the information society is experienced and the value given to information increases (Coşkunserçe & Aydoğdu, 2022). The developments in today's 21st century world, where technology touches every aspect of our lives, have an impact on many areas from education to art, from industry to economy. This improvement changes our basic routines, including learning and teaching habits (Erdin & Uzun, 2022). Societies are affected by these

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developments in information and technology. Individuals, who are seen as part of the global community, need to be equipped with certain knowledge, skills, and competencies as well as to develop the skills they already possess in order to achieve a sustainable life and future. In other words, in order for individuals to be able to keep up with the 21st century world and get a share of the global cake in terms of employment, it is vital for their lives to have a set of knowledge and skills called 21st century skills in addition to the basic knowledge and skills they receive in schools (Kayhan et al., 2019).

Some skills are needed to overcome complex problems, develop cooperation by communicating well with others, to acquire knowledge and skills on one's own, and keep up with the competitive environment in today's global economy by adapting to rapidly changing conditions (Tindowen et al., 2017). In other words, in order to be successful against existing social changes and uncertainties specific to the 21st century, 21st century skills such as digital competence, collaboration, communication, and responsibility are required (Aura et al., 2023). These skills are referred to as 21st century skills. In the 21st century, access to information has gained considerable importance and individuals need these skills to integrate into the workforce as participating citizens (Van Laar et al., 2017). 21st century skills is an umbrella concept that encompasses a set of skills and competencies that individuals will need to fully participate in this era as 21st century citizens and to be effective stakeholders and employees (Dede, 2010). Many models have emerged to define the skills and competencies that make up this concept.

The first project to define 21st century competencies is *the Definition and Selection of Competencies: Theoretical and Conceptual Foundations (DeSeCo)* project carried out by the OECD (Organisation for Economic Co-Operation and Development) between 1997 and 2022 (Miettinen, 2022). This project is followed by a report in which the issues related to the teaching and evaluation of 21st century skills and competencies are discussed in the study carried out in 2009 with the participation of some OECD member countries (Ananiadou & Claro, 2009). In 2018, within the scope of the Education 2030 project (OECD Learning Framework 2030), knowledge, skills, attitudes, and values were associated with competencies based on the DeSeCo project (OECD, 2018). The National Research Council [NRC] focused on determining the skills necessary to prepare individuals for life and business life within the framework of workshops and meetings held between 2005 and 2009 (Cansoy, 2018). Within the framework of the studies, NRC classified the skills needed by students in the 21st century (NRC, 2011). The European Reference Framework of Key Competences defined 8 key competencies for lifelong learning in 2006 (Gordon et al., 2009). In 2018, the European Union Council accepted the proposal for 8 basic competencies for lifelong learning (European Commission, 2019). Partnership for 21st Century Learning (P21) reveals the skills required to be successful in business and life in the 21st Century as Frameworks for 21st Century Learning (P21, 2019). The context of "key competencies" put forward by P21 and the OECD and the European Union can be considered as more general frameworks that enable the conceptualization of 21st century skills compared to the contexts in which other frameworks are created (Voogt & Roblin, 2010).

Many countries are reviewing their education and training policies in the context of 21st century skills and digital competence in order to provide individuals with the knowledge, skills, and competencies required in the 21st century. In studies conducted for many Scandinavian countries such as Denmark, Sweden, Norway, and Finland (Olofsson et al., 2021; Undheim & Ploog, 2023) and England and Walles (Goodman-Deane, 2020), national and international reports and policy documents (European Commission, 2020, OECD, 2021) it is stated that digital competence is a basic competence for 21st century skills. In this context, in 2006, the Norwegian Ministry of Education and Research included five basic competencies, including the development of digital skills, in the new education curriculum within the framework of the Knowledge Promotion reform, from primary education to high school (Tømte, 2015). In 2010, the Ministry of Education of Singapore aimed to increase students' 21st century competencies by introducing a new framework for curriculum (Uğur & Sungur, 2021). In Finland, these competencies have been included in

the national education curriculum as seven broad-based or transversal competencies (Ranta et al., 2022). In this context, emphasis is placed on transversal competencies in Finland's new core curriculum teaching (Finnish National Board of Education (FNBE), 2014). The Finnish National Board of Education (2011) has identified the development of digital competence as one of the goals for the future (as cited in Ilomäki et al., 2016). In Türkiye, as in many countries, changes were made in the curriculum by taking 21st century skills into account, and the curriculum in 51 areas was renewed within the framework of the skills and competencies that students should have (Kayhan et al., 2019). Based on the basic perspectives of the renewed curriculum, we see that the main purpose of Türkiye's educational system is to develop children with knowledge, skills, and behaviors (MoNE, 2018). Accordingly, eight basic competencies are defined in the curricula based on the Turkish Qualifications Database. With this innovation movement, the curriculum is aligned with 21st century skills, and the aim of the programs is to gain 21st century skills in the context of values and competencies and to raise individuals who succeed in applying these skills in daily life (Kayhan et al., 2019). Among these competencies included in the curricula, the concept of "digital competence", which is one of the important competencies in gaining 21st century skills and supports the development of these skills and is an important key to lifelong learning (Vuorikari et al., 2022), comes to the fore.

Digital competence is required today in business life, participation in social activities, and education (Batz et al., 2022). In all dimensions of life, digital competence means being able to use relevant digital technologies confidently and critically for information, communication, and problem solving (Guillén-Gámez et al., 2021). Council Recommendation on Key Competences for Life-long Learning (European Commission, 2019) emphasizes that digital competence is a combination of knowledge, skills, and attitudes, and defines it as the confident, critical, and responsible use and involvement of digital technologies for participation in business life and society. From these definitions, it can be seen that digital competence is related to many aspects of life, such as work, social activity, leisure, communication, and at the same time, it is beyond basic knowledge and skills (Janssen et al., 2013). It can be said that digital competence is a multifaceted concept that is rapidly advancing with new technologies covering many fields and literacy (Ferrari, 2012). After the European Commission defined digital competence as eight basic life skills for lifelong learning, it sought to explain what digital competence means. It developed the European Digital Competence Framework (DigComp) (Zhao et al., 2021). In order to operationalize digital competence, the first DigComp framework was introduced in 2013, where 21 competences were grouped into five main areas. Later, the DigComp framework was updated in 2016 (DigComp 2.0) and 2017 (DigComp 2.1) and finally the framework in Figure 1 (DigComp 2.2) was created (Vuorikari et al., 2022).

According to the DigComp 2.2 framework presented in Figure 1, digital competence consists of five dimensions: information and data literacy, communication and collaboration, digital content creation, security, and problem solving. When the explanations for these five dimensions are examined (Vuorikari et al., 2022, p.7); *Information and data literacy* includes expressing requirements for information, finding and retrieving data to judge the suitability of the source and content, and management, storage, and organization of digital content, data, and information. *Communication and collaboration* require interacting and collaborating through digital technologies while being aware of cultural diversity, participating in society through public and private digital services, and managing one's digital presence, identity, and reputation. *Digital content creation* involves creating and editing digital content, integrating and developing information and content into existing knowledge by understanding how copyrights and licenses apply, and knowing how to give understandable instructions to a computer system. *Safety* content requires protecting personal data and privacy, protecting physical and psychological health, being aware of digital technologies for social well-being and social inclusion, and being aware of the environmental impacts of digital technologies and their use. *Problem solving* refers to making conscious decisions based on need or purpose,

solving conceptual problems with digital tools, using technologies productively, and the ability to solve technical problems.

Fig. 1. *The DigComp 2.2 framework (Vuorikari et al., 2022, p.67)*

According to the DigComp 2.2 framework presented in Figure 1, digital competence consists of five dimensions: information and data literacy, communication and collaboration, digital content creation, security, and problem solving. When the explanations for these five dimensions are examined (Vuorikari et al., 2022, p.7); *Information and data literacy* includes expressing requirements for information, finding and retrieving data to judge the suitability of the source and content, and management, storage, and organization of digital content, data, and information. *Communication and collaboration* require interacting and collaborating through digital technologies while being aware of cultural diversity, participating in society through public and private digital services, and managing one's digital presence, identity, and reputation. *Digital content creation* involves creating and editing digital content, integrating and developing information and content into existing knowledge by understanding how copyrights and licenses apply, and knowing how to give understandable instructions to a computer system. *Safety* content requires protecting personal data and privacy, protecting physical and psychological health, being aware of digital technologies for social well-being and social inclusion, and being aware of the environmental impacts of digital technologies and their use. *Problem solving* refers to making conscious decisions based on need or purpose, solving conceptual problems with digital tools, using technologies productively, and the ability to solve technical problems.

The structure of DigComp, determined by the European Commission, provides a basic structure taken into account for the development of digital skills competencies by creating a common source of understanding of what digital competencies are (Cabezas-González et al., 2023). Definitions and the determined framework lead to efforts to improve knowledge, skills, and attitudes by establishing connections between the digital world and real life. In this context, a review of the 2018 Mathematics curriculum in Turkey (grades 1, 2, 3, 4, 5, 6, 7, and 8 in primary and secondary schools) shows that the Turkish Qualifications Framework is based on the European Qualifications Framework and examines eight core principles, including digital competence. In the curriculum, digital competence is defined as follows: "It covers the safe and critical use of information and communication technologies for work, daily life, and communication. This competence is underpinned by core skills such as using computers to access and

evaluate, store, produce, present and exchange information, as well as participating in and communicating with public networks via the Internet." (MoNE, 2018, p.6).

The knowledge, skills, and competencies that students need to acquire are included in the curriculum (Ekmen & Bakar, 2018). The reflection of the content of the curriculum is evident in the textbooks. Textbooks are one of the basic materials that provide a source of students' learning experiences in order to realize the goals and content of the curriculum (Halis, 2022). Therefore, textbooks need to be analyzed well in order to determine whether the skills and competencies that students want to acquire are effectively taught and to support the development of students' mental abilities (Üredi & Ulum, 2020).

Determining the extent to which digital competence is included in textbooks, which is an important tool for students to acquire digital competence, is valuable in terms of providing a framework for the current situation. In addition, while teaching toward the learning outcomes in the mathematics curriculum, the development of students' digital competence also depends on the adequate and balanced inclusion of digital competence practices in the textbooks. Because associating each text, visual, application, problem, or exercise in the textbooks with digital competence within the framework of the objectives will enable students to develop their digital competence. Considering these situations, this study aimed to determine the level of digital competence in middle school mathematics textbooks. In this context, the research sought an answer to the problem "At what level is digital competence in middle school mathematics textbooks?". In the study, the level of digital competence in middle school mathematics textbooks was examined by taking into account the sections, learning areas and DigComp 2.2 framework created by the European Commission.

2. Methodology

2.1. Research Model/Design

In this study, which aims to examine middle school mathematics textbooks in the context of digital competence, a qualitative research approach was adopted due to the nature of the research. Qualitative research can be defined as an approach that consists of a series of material and interpretive practices that make the world visible, examining events in their natural environment and trying to make sense of and interpret events in terms of the meanings people attribute to them (Mertens, 2010). In studies designed with a qualitative research approach, there is an effort to reach a deep understanding of the subject being studied (Karataş, 2017).

The document analysis method was used in this study in which qualitative research approach was adopted. The document analysis method appears as a scientific method that can be used by all researchers who require strict adherence to research procedures in studies in social sciences (Mogalakwe, 2006). According to Bowen (2009), document analysis is also seen as a special form of qualitative research based on the analysis of documents by using it as a stand-alone method. As with other methods of qualitative research, document analysis requires examination and interpretation in order to make sense, gain understanding, and develop information based on observation and experimentation (Corbin & Strauss, 2008). In this direction, the level of digital competence in mathematics textbooks at the secondary school level was examined and interpreted in the context of document analysis.

2.2. Documents Analyzed

In educational research, documents such as textbooks, lesson plans, curricula, and teacher handbooks can be sources of data (Bogdan & Biklen, 2007). Documents can provide guidance in understanding the social realities in the theoretical framework (Flick, 2009) and at the same time, they can make visible the processes of situations and the background and insights of how these processes take place (Patton, 2022). In addition,

documents can provide a rich source of data for the researcher to construct meaning for the situations (Bogdan & Biklen, 2007). In this study, a total of eight mathematics textbooks, two textbooks for each grade level at the secondary school level, one from a private publishing house and one from MoNE publications, which were officially taught in the 2022-2023 academic year, were used as the main data source.

Table 1.

List of secondary school mathematics textbooks analyzed according to grade levels

Grade	Textbook
5 Grade	Middle school and imam hatip (religious) middle school 5th grade mathematics textbook. Özgün Publishing.
5 Grade	Middle school and imam hatip (religious) middle school 5th grade mathematics textbook. MoNE Publishing.
6 Grade	Middle school and imam hatip (religious) middle school 6th grade mathematics textbook. Koza Publishing.
6 Grade	Middle school and imam hatip (religious) middle school 6th grade mathematics textbook. MoNE Publishing
7 Grade	Middle school and imam hatip (religious) middle school 7th grade mathematics textbook. Berkay Publishing.
7 Grade	Middle school and imam hatip (religious) middle school 7th grade mathematics textbook. MoNE Publishing.
8 Grade	Middle school and imam hatip (religious) middle school 5th grade mathematics textbook. Koza Publishing.
8 Grade	Middle school and imam hatip (religious) middle school 5th grade mathematics textbook. MoNE Publishing.

2.3. Data Collection

It is seen that techniques such as observation, interview or document analysis are predominant in obtaining data in qualitative research (Merriam, 2009; Mertens, 2010; Yıldırım & Şimşek, 2018). In line with the aim of the study to examine middle school mathematics textbooks within the framework of digital competence, the data of the study were obtained by examining the textbooks given in Table 1. There are certain stages while analyzing the documents. These stages consist of five steps: "accessing documents, checking authenticity, understanding documents, analyzing data, and using data" (Forster, 1995; as cited in Yıldırım & Şimşek, 2018 p.194). The relevant steps were followed in the research.

In the first step, middle school level mathematics textbooks were accessed from the official web pages of MoNE. In the second step, the authenticity of the textbooks accessed electronically was checked. The authenticity of the textbooks was checked by paying attention to issues such as being textbooks approved by the MoNE, being accessed from primary sources, and the fact that the textbooks were being taught in the 2022-2023 academic year.

In the next stage, textbooks were examined and analyzed within the framework of digital competence. If the research is based on documents, the documents obtained should be analyzed comparatively with each other within a certain system (Yıldırım & Şimşek, 2018). In this direction, the digital competence in secondary school mathematics textbooks was analyzed by comparatively analyzing the chapters, learning areas, and DigComp 2.2 framework in which digital competence is included, and analyzing the data comparatively for MoNE publications and books for private publishers.

2.4. Data Analysis

Content analysis was used to analyze the data obtained in the study. Content analysis provides objective inferences on written, visual, or verbal data in order to provide information and understanding about the phenomenon being studied (Downe-Wamboldt, 1992).

The identified documents were analyzed using Nvivo 14, a technology-supported qualitative data analysis software, based on the content, learning areas, and DigComp 2.2. framework. The code list based on the analysis of the data is given in Tables 2 and 3:

Table 2.

Code List Related to Book Content and Learning Areas

Code	Code Name
BC 1	Research
BC 2	Activity
BC 3	Introduction
BC 3	Problem
BC 4	Project
BC 5	Image
BC 6	Datamatrix
BC 7	Lecturing
BC 8	Subject Preparation
BC 9	Dictionary
LA 1	Numbers and Operations
LA 2	Algebra
LA 3	Geometry and Measurement
LA 4	Data Processing
LA 5	Probability

Table 3.

DigComp 2.2 Related Code List

Theme	Code	Code Name
Information and Data Literacy	1.1	Browsing, searching and filtering data, information and digital content
	1.2	Evaluating data, information and digital content
	1.3	Managing data, information and digital content
Communication and Collaboration	2.1	Interacting through digital technologies
	2.2	Sharing through digital technologies
	2.3	Engaging citizenship through digital technologies
	2.4	Collaborating through digital technologies
	2.5	Netiquette
	2.6	Managing digital identity
Digital Content Creation	3.1	Developing digital content
	3.2	Integrating and re-elaborating digital content
	3.3	Copyright and licences
	3.4	Programming
Safety	4.1	Protecting devices
	4.2	Protecting personal data and privacy
	4.3	Protecting health and well-being
	4.4	Protecting the environment
Problem Solving	5.1	Solving technical problems
	5.2	Identifying needs and technological responses
	5.3	Creatively using digital technology
	5.4	Identifying digital competence gaps

2.5. Validity and Reliability

The criterion of validity and reliability in qualitative research can be achieved by presenting evaluations related to concepts in the context of trustworthiness such as credibility, accuracy of results, and competence of researchers (Krefting, 1991). In order to ensure internal validity within the framework of credibility, the triangulation strategy, one of the most commonly used methods, was used (Arslan, 2022). In this context, coding for the analysis of middle school mathematics textbooks was carried out by two independent researchers. The researchers came together for the coding they performed independently and evaluated the

consistency of the coding. Consistency between coders is also considered among the situations that increase internal reliability (Arslan, 2022). A consensus was reached on the codings by negotiating different codings. Examples of the codings performed to support the reliability of the study are given in the findings. Presenting the data obtained for this research directly in the findings, involving more than one researcher in the research, ensuring that the coding between different coders is consistent, and conducting the analysis based on a conceptual framework such as Digcomp 2.2 are efforts to increase the reliability of the research. One of the criteria for ensuring validity in qualitative research is detailed description (Creswell, 2013). In order to increase the validity of the research, the research model, data collection process, data analysis process, coding, and how the findings were generated were given in detail.

3. Findings

In this part of the study, in which digital competency indicators in middle school mathematics textbooks are examined, the findings obtained are given according to the grade level in accordance with the sub-problem statements of the research.

3.1. Digital Competence in 5th Grade Mathematics Textbooks

The distribution of digital competence in the 5th grade middle school textbook of a private publishing house according to learning areas is given in Table 4:

Table 4.

Investigation of DigComp and Digital Competency Indicators in the 5th Grade Textbook According to Learning Areas (Özgün)

	Algebra	**Geometry and Measurement**	**Probability**	**Numbers and Operations**	**Data Processing**
Activity	-	-	-	-	1
Datamatrix	-	2	-	3	1
1.1 Browsing, searching, and filtering data, information, and digital content	-	2	-	3	1
3.1. Developing digital content	-	-	-	-	1

As can be seen in Table 4, digital competence is predominantly included in the learning domain of numbers and operations in the 5th grade textbook of a private publishing house. However, it was observed that the digital competence was mostly through QR codes. Through QR codes, videos, lectures, questions with solutions, etc. of the units and topics can be accessed through the EBA platform (Figure 2). In addition, when the DigComp framework is taken into consideration, it is seen that the situation related to expressing students' information needs, searching for data, information, and content in digital environments, accessing digital content, and navigating between these digital environments is more involved (Vuorikari et al., 2022). On the other hand, when Table 2 is examined, it is seen that this situation is actually tried to be realized by using QR codes. In addition, in an activity in the data processing learning domain, students were asked to create a column graph based on the given frequency table and then make a comparison (Göksülük, 2022, p. 197), and the DigComp competency, which includes creating content in different formats, editing and developing content created by oneself or others, and expressing oneself creatively using digital media and technologies (Vuorikari et al., 2022), was included.

Fig. 2. 5th Grade Textbook QR Code Examples (Göksülük, 2022, p. 11, 109, 223)

Table 5.

Comparison of DigComp and Digital Competency Indicators in the 5th Grade Textbook (Özgün)

	Activity	Datamatrix
1.1 Browsing, searching, and filtering data, information, and digital content	-	6
3.1. Developing digital content	1	-

The distribution of digital competence in the 5th grade middle school textbook of the MoNE publishing house according to learning areas is given in Table 6:

Table 6.

Investigation of DigComp and Digital Competency Indicators in 5th Grade Textbooks According to Learning Areas (MoNE)

	Algebra	Geometry and Measurement	Probability	Numbers and Operations	Data Processing
Research	-	1	-	-	-
Activity	-	5	-	-	4
Problem	-	-	-	2	-
Image	-	7	-	2	13
Datamatrix	-	2	-	3	2
1.1 Browsing, searching, and filtering data, information, and digital content	-	4	-	3	2
1.2 Evaluating data, information, and digital content	-	1	-	-	-
1.3. Managing data, information, and digital content	-	-	-	4	2
3.1. Developing digital content	-	8	-	-	12
3.4. Programming	-	1	-	-	3

As can be seen from Table 6, digital competence in the 5th grade textbook of the MoNE publishing house is predominantly included in the data processing learning domain. However, it was determined that the digital competence was mostly based on visuals and these visuals were mostly used in the data processing learning domain (Figure 3). On the other hand, when the DigComp framework is taken into consideration, it is seen that the 5th grade textbook of the MoNE publishing house frequently emphasizes digital content development using visuals in the field of data processing learning (Cırıtcı et al., 2018).

Table 7.

Comparison of DigComp and Digital Competency Indicators in the 5th Grade Textbook (MoNE)

	Research	Activity	Problem	Image	Datamatrix	Dictionary
1.1 Browsing, searching and filtering data, information and digital content	-	1	-	2	6	-
1.2 Evaluating data, information and digital content	1	-	-	-	-	-
1.3. Managing data, information and digital content	-	-	2	3	1	1
3.1. Developing digital content	-	6	-	15	-	-
3.4. Programming	-	2	-	2	-	-

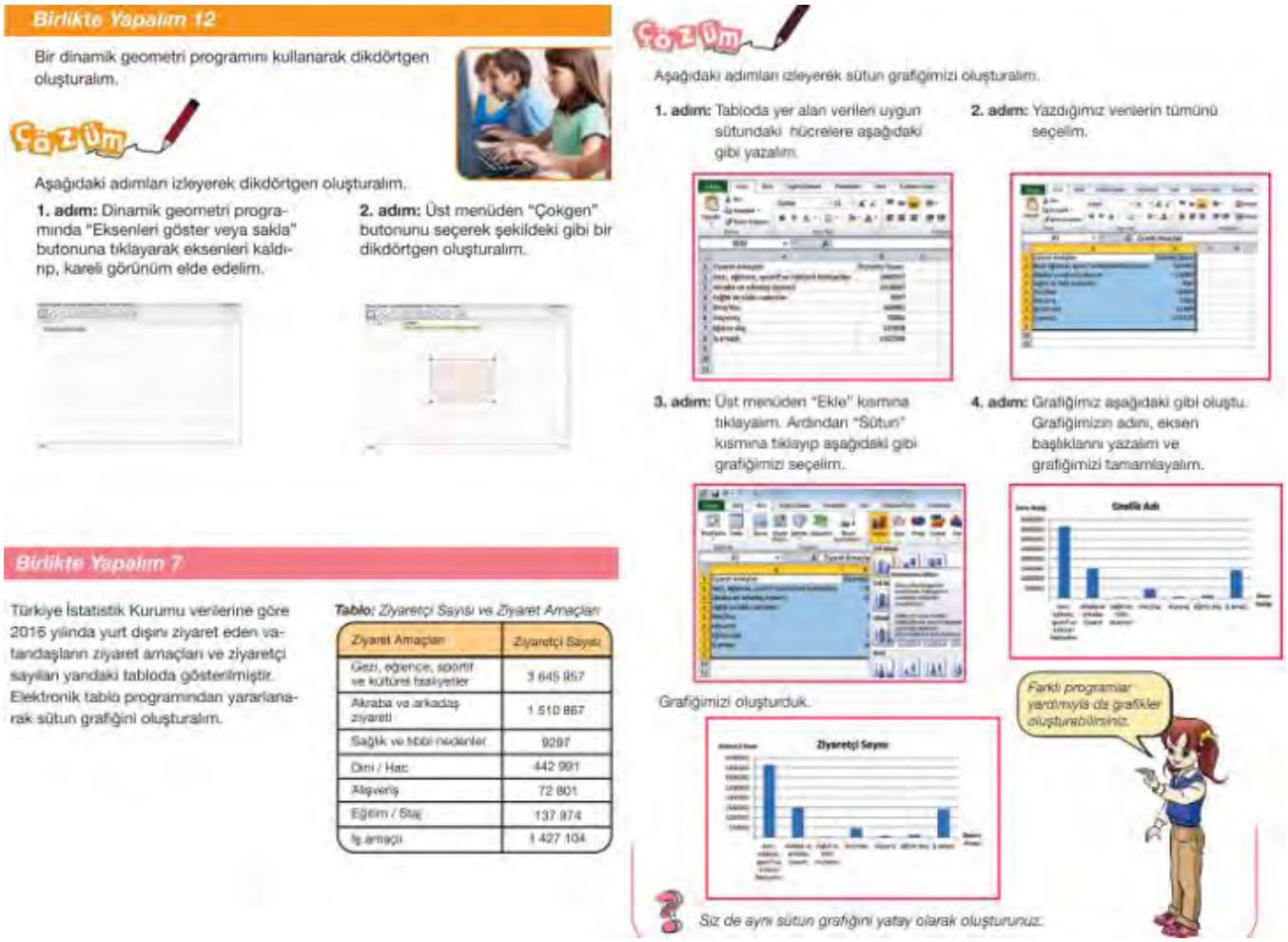


Fig. 3. 5th Grade Textbook Examples of Activities and Visuals Containing Digital Competence (Cırıtcı et al., 2018, p. 238, 260).

As can be seen in Figure 3, digital competence was included in the cases of producing digital content by using dynamic mathematics software and spreadsheet programs by using various visuals in different learning areas, performing various process steps, and considering alternative programs for these processes.

3.2. Digital Competence in 6th Grade Mathematics Textbooks

The distribution of digital competence in the 6th grade middle school textbook of a private publishing house according to learning areas is given in Table 8:

Table 8.

Investigation of 6th Grade Textbook's DigComp and Digital Competency Indicators According to Learning Areas (Koza)

	Algebra	**Geometry and Measurement**	**Probability**	**Numbers and Operations**	**Data Processing**
Research	-	-	-	-	1
Datamatrix	1	2	-	3	1
1.1 Browsing, searching and, filtering data, information, and digital content	1	2	-	3	2

As can be seen in Table 8, digital competence is predominantly included in the learning domain of numbers and operations in the 6th grade textbook of a private publishing house. It was observed that the digital competency was mostly based on QR codes. On the other hand, in the 6th grade textbook, it was determined that the situation of "scanning, searching and filtering data, information and digital content" in the Information and Data Literacy dimension of the DigComp framework was included more. When Table 9 is examined, it can be seen that this situation is addressed through research and often using QR codes.

Table 9.

Comparison of DigComp and Digital Competency Indicators in 6th Grade Textbook (Koza)

	Research	**Datamatrix**
1.1 Browsing, searching, and filtering data, information, and digital content	1	6

In the examples given in Unit 4 related to the data processing learning area, data tables about blood groups, school trips, and the number of students per classroom were given. After these examples, it was stated that students can search for the current versions of the data they examined by entering the internet addresses given in the book (Aydın & Erenkuş, 2019, p. 145).

The distribution of digital competence in the 6th grade middle school textbook of the MoNE publishing house according to learning areas is given in Table 10:

Table 10.

Investigation of DigComp and Digital Competency Indicators in 6th Grade Textbooks According to Learning Areas (MoNE)

	Algebra	**Geometry and Measurement**	**Probability**	**Numbers and Operations**	**Data Processing**
Research	-	2	-	1	-
Activity	-	-	-	-	1
Problem	-	-	-	3	-
Image	-	2	-	-	-
Datamatrix	2	3	-	6	1

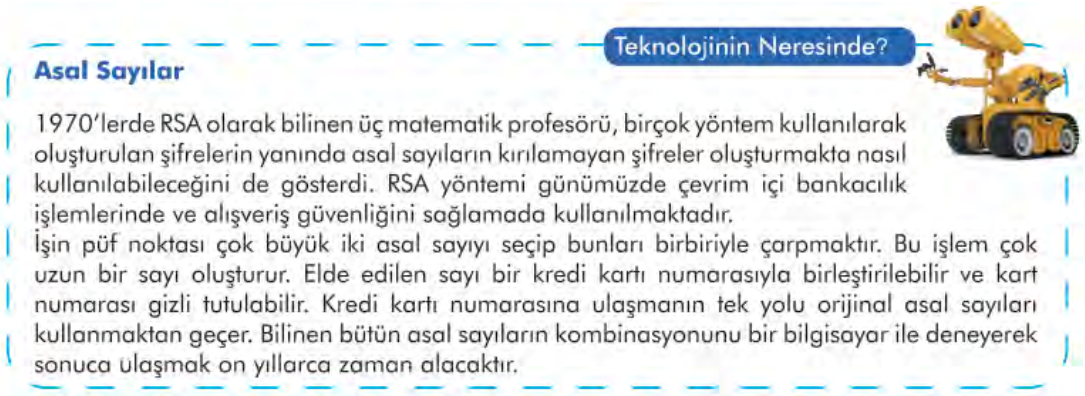
	Algebra	Geometry and Measurement	Probability	Numbers and Operations	Data Processing
1.1 Browsing, searching, and filtering data, information, and digital content	2	3	-	7	2
1.3. Managing data, information, and digital content	-	-	-	2	-
3.1. Developing digital content	-	2	-	-	-
3.4. Programming	-	2	-	-	-
4.2 Protecting personal data and privacy	-	-	-	1	-

In the 6th grade mathematics textbook (MoNE), digital competence is frequently included in the learning domain of numbers and operations by using QR codes. The inclusion of accessing various digital contents related to the units and subjects through the EBA platform via QR codes are the indicator of DigComp sub-dimension related to scanning, searching, and examining information, data, and digital contents in the textbook (Table 11).

Table 11.

Comparison of DigComp and Digital Competency Indicators in the 6th Grade Textbook (MoNE)

	Research	Activity	Introduction	Problem	Image	Datamatrix	Dictionary
1.1 Browsing, searching and filtering data, information, and digital content	-	1	1	1	-	11	-
1.2 Evaluating data, information, and digital content	-	-	-	-	-	-	-
1.3. Managing data, information, and digital content	-	-	-	2	-	-	1
3.1. Developing digital content	1	-	-	-	1	-	-
3.4. Programming	1	-	-	-	1	-	-
4.2 Protecting personal data, and privacy	1	-	-	-	-	-	1


Teknolojinin Neresinde?

Asal Sayılar

1970'lerde RSA olarak bilinen üç matematik profesörü, birçok yöntem kullanılarak oluşturulan şifrelerin yanında asal sayıların kırılamayan şifreler oluşturmakta nasıl kullanılabileceğini de gösterdi. RSA yöntemi günümüzde çevrim içi bankacılık işlemlerinde ve alışveriş güvenliğini sağlamada kullanılmaktadır.

İşin püf noktası çok büyük iki asal sayıyı seçip bunları birbiriyle çarpmaktır. Bu işlem çok uzun bir sayı oluşturur. Elde edilen sayı bir kredi kartı numarasıyla birleştirilebilir ve kart numarası gizli tutulabilir. Kredi kartı numarasına ulaşmanın tek yolu orijinal asal sayıları kullanmaktan geçer. Bilinen bütün asal sayıların kombinasyonunu bir bilgisayar ile deneyerek sonuca ulaşmak on yıllarca zaman alacaktır.

Fig. 4. 6th Grade Textbook on Protection of Personal Data (Çağlayan, Dağıstan, Korkmaz, 2021, p. 37)

In the information box above in Unit 1 related to the learning area of numbers and operations, the importance of prime numbers in the security of digital banking and shopping transactions was emphasized and security from DigComp dimensions was included.

3.3. Digital Competence in 7th Grade Mathematics Textbooks

The distribution of digital competence in the 7th grade middle school textbook of a private publishing house according to learning areas is given in Table 12:

Table 12.

Investigation of 7th Grade Textbook DigComp and Digital Competency Indicators According to Learning Areas (Berkay)

	Algebra	Geometry and Measurement	Probability	Numbers and Operations	Data Processing
Activity	-	2	-	-	2
Problem	1	-	-	-	-
Project	-	-	-	1	1
Image	-	2	-	-	5
Datamatrix	1	2	-	3	1
Subject Preparation	1	-	-	2	-
1.1 Browsing, searching, and filtering data, information, and digital content	3	2	-	6	2
3.1. Developing digital content	-	4	-	-	-
3.4. Programming	-	2	-	-	7

As can be seen in Table 12, digital competence in the 7th grade textbook of a private publishing house is mainly included in the data processing learning area. However, it was determined that the digital competence included was mostly through visuals, QR codes, and subject preparation sections. Examples of visuals used in the data processing learning area are given in Figure 5:

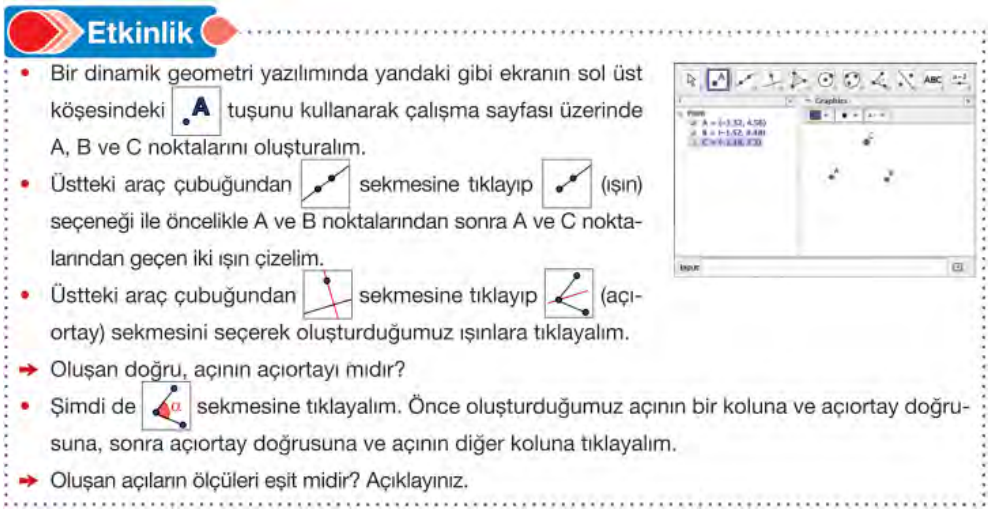


Fig. 5. 7th Grade Textbook Activity and Visual Example of Digital Competence (Akbulut, 2018, p. 144)

As can be seen in Figure 5, the activity of constructing geometry concepts using dynamic geometry software and digital competence in the visualization of this activity was addressed.

Table 13.

Comparison of 7th Grade Textbook DigComp and Digital Competency Indicators (Berkay)

	Activity	Problem	Project	Image	Datamatrix	Subject Preparation
1.1 Browsing, searching, and filtering data, information, and digital content	-	1	2	1	6	4
3.1. Developing digital content	2	-	-	2	-	-
3.4. Programming	3	-	-	6	-	-

On the other hand, when Table 13 is examined, it is seen that in the context of the DigComp framework, situations related to expressing information needs, searching for data, information, and content in digital environments, accessing digital content, and navigating between these digital environments are mainly included through QR codes and subject preparation sections (Vuorikari et al., 2022).

Fig. 6. 7th Grade Textbook Information and Data Literacy in the Context of DigComp (Akbulut, 2018, p. 77)

As seen in Figure 6, in the context of preparation for Unit 3, which is related to the algebra learning area, the life of a famous mathematician was mentioned and students were directed to an internet address related to the text. In addition, a QR code was also used on the relevant page to access the EBA platform (Akbulut, 2018).

The distribution of digital competence in the 7th grade middle school textbook of the MoNE publishing house according to learning areas is given in Table 14:

Table 14.

Investigation of 7th Grade Textbook's DigComp and Digital Competency Indicators According to Learning Areas (MoNE)

	Algebra	Geometry and Measurement	Probability	Numbers and Operations	Data Processing
Activity	-	4	-	-	-
Problem	-	-	-	-	2
Image	-	5	-	-	2
Datamatrix	1	1	-	3	1
Subject Preparation	-	-	-	-	1
1.1 Browsing, searching, and filtering data, information, and digital content	1	2	-	3	1
3.1. Developing digital content	-	8	-	-	4
3.4. Programming	-	2	-	-	2
2.3 Engaging citizenship through digital technologies	-	-	-	-	1

In the 7th grade textbook of the MoNE publishing house, indicators related to digital competence were mostly included in the learning areas of geometry and measurement, and data processing. It is seen that activities and visuals for developing digital content using various software are frequently included in the subjects related to geometry and measurement and data processing learning areas (Figure 7).

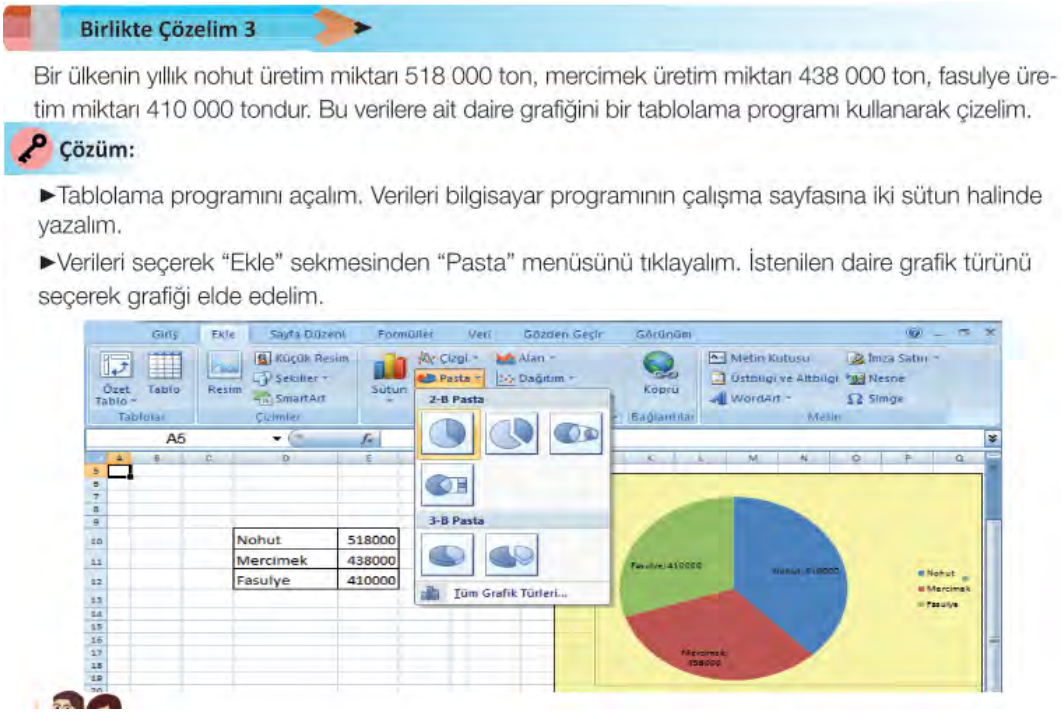


Fig. 7. 7th Grade Textbook Examples of Activities and Visuals with Digital Competencies (Keskin Oğan & Öztürk, 2021, p. 271)

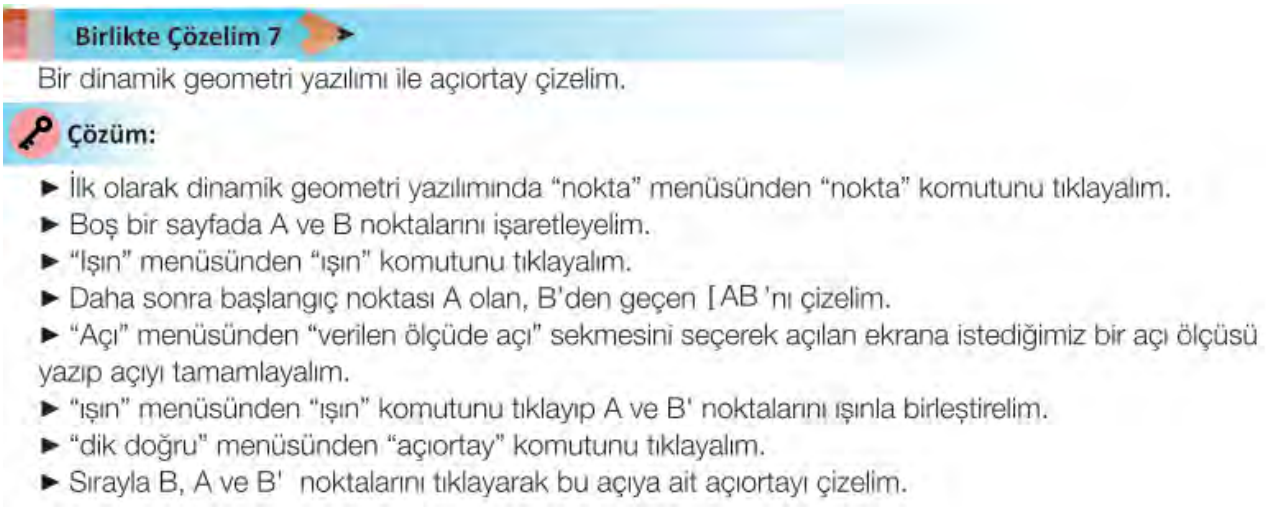
In the visual above, digital competence is emphasized through the creation of a circle graph on annual pulse production using a spreadsheet program.

Table 15.

Comparison of 7th Grade Textbook DigComp and Digital Competency Indicators (MoNE)

	Activity	Problem	Image	Datamatrix	Subject Preparation
1.1 Browsing, searching, and filtering data, information and digital content	1	-	-	6	-
3.1. Developing digital content	3	2	7	-	-
3.4. Programming	2	1	1	-	-
2.3 Engaging citizenship through digital technologies	-	-	-	-	1

When the DigComp framework is examined, "Programming", which refers to a sub-dimension of "Digital Content Creation", involves planning and developing a comprehensible set of instructions for a computer system to solve a specific problem or perform a specific task, to create the programs, applications, software needed, selecting tools and devices, making changes to program settings, making modifications to programs and code according to their own needs, knowing the principles of programming, and having an understanding of what happens in the background during the operation of a program (Vuorikari et al., 2022). Therefore, it can be said that activities involving the development of digital content on the planning and implementation of a set of instructions in both geometry and measurement and data processing learning domains are related to programming competence.



Birlikte Çözelim 7

Bir dinamik geometri yazılımı ile açıortay çizelim.

Çözüm:

- İlk olarak dinamik geometri yazılımında "nokta" menüsünden "nokta" komutunu tıklayalım.
- Boş bir sayfada A ve B noktalarını işaretleyelim.
- "Işın" menüsünden "ışın" komutunu tıklayalım.
- Daha sonra başlangıç noktası A olan, B'den geçen [AB 'nı çizelim.
- "Açı" menüsünden "verilen ölçüde açı" sekmesini seçerek açılan ekrana istediğimiz bir açı ölçüsü yazıp açıyı tamamlayalım.
- "ışın" menüsünden "ışın" komutunu tıklayıp A ve B' noktalarını ışınla birleştirelim.
- "dik doğru" menüsünden "açıortay" komutunu tıklayalım.
- Sırayla B, A ve B' noktalarını tıklayarak bu açıya ait açıortayı çizelim.

Fig. 8. Creating 7th Grade Textbook Content with Dynamic Geometry Software (Keskin Oğan & Öztürk, 2021, p. 192)

In the activity above, the student is asked to draw bisectors using dynamic geometry software. In this direction, the student is expected to first select the appropriate software to complete the bisector drawing task, and then plan and implement which instructions to apply in this software.

3.4. Digital Competence in 8th Grade Mathematics Textbooks

The distribution of digital competence in the 8th grade middle school textbook of a private publishing house according to learning areas is given in Table 16:

Table 16.

Investigation of 8th Grade Textbook DigComp and Digital Competency Indicators According to Learning Areas (Koza)

	Algebra	Geometry and Measurement	Probability	Numbers and Operations	Data Processing
Datamatrix	1	2	1	2	-
1.1 Browsing, searching, and filtering data, information, and digital content	1	2	-	2	-

In the 8th grade textbook belonging to a private publishing house, digital competence was mostly included in the learning areas of geometry and measurement and numbers and operations. When the inclusion of digital competence is examined, it is seen that only QR codes are used throughout the book, and the use of QR codes emphasizes data, content and information search, research, and filtering from the dimensions of "Information and data literacy" in the context of DigComp framework (Erenkuş & Eren Savaşkan, 2019).

Table 17.

Comparison of 8th Grade Textbook DigComp and Digital Competency Indicators (Koza)

	Datamatrix
1.1 Browsing, searching, and filtering data, information, and digital content	5

The distribution of digital competence in the 8th grade middle school textbook of the MoNE publishing house according to learning areas is given in Table 18:

Table 18.

Investigation of 8th Grade Textbook's DigComp and Digital Competency Indicators According to Learning Areas (MoNE)

	Algebra	Geometry and Measurement	Probability	Numbers and Operations	Data Processing
Research	-	-	-	-	1
Activity	-	35	-	-	-
Problem	1	-	-	2	-
Project	1	6	-	1	-
Image	-	54	-	1	-
Datamatrix	6	18	2	5	1
Subject Preparation	2	-	-	-	-
1.1 Browsing, searching, and filtering data, information, and digital content	7	18	2	5	2
1.3. Managing data, information, and digital content	-	-	-	1	-
2.2 Sharing through digital technologies	1	6	-	1	-
3.1. Developing digital content	1	95	-	1	1
3.4. Programming	-	35	-	-	-
4.2 Protecting personal data and privacy	-	-	-	2	-
5.2. Identifying needs and technological responses	2	-	-	-	-

In the 8th grade textbook of the MoNE publishing house, digital competence is frequently included in the learning areas of geometry and measurement. Considering the content types, it was determined that visuals, activities, and QR codes were used the most, and the DigComp component related to digital content

development was frequently included in the geometry and measurement learning area. On the other hand, the textbook emphasizes digital competence through research and projects. In addition, in this book, QR codes are frequently used not only in unit introductions but also in lecture pages.

Fig. 9. 8th Grade Textbook Activity, Visual and QR Code Example (Böge & Akıllı, 2021, p. 169)

As seen in Figure 9, the student was asked to create matching pictures with the help of a word processing program. A QR code was also used to access digital content related to the topic of congruence and similarity.

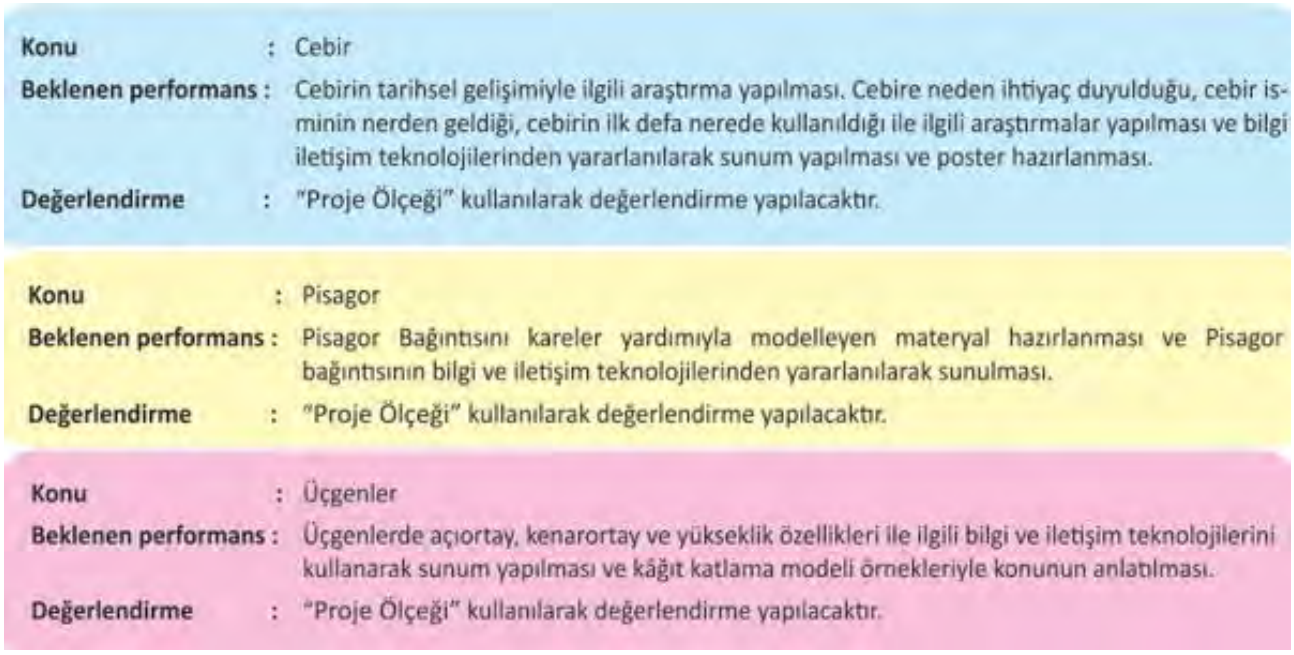


Fig. 10. 8th Grade Textbook Digital Competence in Project Task (Böge & Akıllı, 2021, p. 232)

In the 8th grade textbook project examples, students are asked to conduct research using information and communication technologies, create a digital content and share it. When analyzed within the DigComp

framework, it is clear that digital content development, a sub-dimension of the "digital content creation" dimension, and sharing skills through digital technologies, a sub-dimension of the "communication and collaboration" dimension, are emphasized.

Table 19.

Comparison of 8th Grade Textbook DigComp and Digital Competency Indicators (MoNE)

	Research	**Activity**	**Intro.**	**Problem**	**Project**	**Image**	**Datamatrix**	**Subject Prep.**
1.1 Browsing, searching, and filtering data, information, and digital content	1	-	1	1	-	-	31	-
1.3. Managing data, information, and digital content	-	-	-	1	-	-	-	-
2.2 Sharing through digital technologies	-	-	-	-	8	-	-	-
3.1. Developing digital content	1	35	-	-	8	54	-	-
3.4. Programming	-	17	-	-	-	18	-	-
4.2 Protecting personal data and privacy	-	-	-	1	-	1	-	-
5.2. Identifying needs and technological responses	-	-	-	-	-	-	-	2

As can be seen in Table 19, the sub-dimension of digital content development, which is frequently included in the 8th grade textbook of the MoNE publishing house, is included through visuals and activities. Similarly, it is seen that programming skills are emphasized with similar elements.

4. Conclusion, Discussion and Suggestions

In the knowledge context, individuals should know how digital technologies can support communication, productivity, and innovation and be aware of their opportunities, risks, and limitations. In terms of skills, individuals should be able to use digital technologies to support their development towards personal, social, or commercial goals in communication and collaboration with others within the framework of social participation as participatory citizens. Individuals are expected to take an approach to digital technologies as responsible citizens, taking into account issues such as ethics and security, and to be curious, open-minded, and have a positive attitude towards the future within the framework of a reflective and critical perspective.

Within the scope of this study, it was tried to make an inference about the extent to which important teaching materials such as textbooks, which are a part of education, have the potential to contribute to students' digital competencies. In this context, the digital competency indicators included in middle school mathematics textbooks were examined by taking into account the chapters, learning domains, and DigComp framework in which these indicators are included. In the examinations, the fact that the book belongs to private and MoNE publishing house and the grade levels were taken into consideration. As a result of the findings, it can be said that in general, middle school mathematics textbooks do not include digital competence at a sufficient level.

The results of the 5th grade mathematics textbooks were obtained by examining the books of Özgün Publishing and MoNE Publishing. Considering the learning areas; it was determined that the 5th grade textbook of the private publishing house mainly included digital competence in the learning area of numbers and operations, while the MoNE Publishing textbook included it in the learning area of data processing. Since both textbooks frequently use QR codes and emphasize the digital content on the EBA platform through these QR codes, the sub-dimension of "Information and Data Literacy", which is a dimension of the DigComp framework, related to scanning, searching and filtering data, information and digital content stands out. In addition, it was determined that activities for the development of digital content were frequently used in the textbook of MoNE Publishing. In order for students to gain digital competence, digital competencies should be included in the texts, activity examples, preparation questions, and visuals in the textbooks (Şimşek, 2022). In this context, it can be stated that both books are not at an appropriate level. In addition, it was concluded that the content development activities in the MoNE textbook were mainly related to the use of dynamic geometry software. However, when the two books are compared in terms of the level of inclusion of digital competency indicators, it is seen that the textbook of the MoNE publishing both emphasizes more digital content in terms of quantity and emphasizes digital competency in more book chapters and in the context of the DigComp indicator. On the other hand, considering the DigComp framework in general, it can be said that both textbooks include very few competency areas. Both textbooks do not include the "Communication and Collaboration", "Problem Solving" and "Safety" dimensions and their sub-dimensions, which are the other DigComp components other than "Information and Data Literacy" and "Digital Content Creation" dimensions.

The results related to 6th grade mathematics textbooks were obtained by examining the books belonging to Koza Publications and MoNE Publications. Considering the learning domains, it was determined that both publishers' 6th grade textbooks predominantly include digital competence in the learning domain of numbers and operations. Considering the sections where digital competence is included, it is seen that QR codes are frequently used in both textbooks. Since students are expected to access the digital material given within the scope of the relevant subject through the EBA platform as a result of the use of QR codes, the use of QR codes has enabled the DigComp indicator related to expressing information needs, searching for data, information, and content in digital environments, accessing digital content and navigating between these digital environments to be included more in both books than other indicators (Vuorikari et al., 2022). However, while the textbook of the private publishing house included one research related to the data processing learning domain and digital competence in QR codes, it was determined that the MoNE Publishing textbook included digital competence in the context of research, activity, problem, visual, and QR code. In addition, considering the DigComp framework, it was concluded that the private publishing house textbook only included data, information, and digital content browsing and research, which is a sub-dimension of the "Information and Data Literacy" dimension. It was concluded that the MoNE textbook emphasized more competency areas than the DigComp framework. These include indicators related to digital content development, programming, and protection of personal data. On the other hand, considering the DigComp framework in general, it can be said that both textbooks' coverage of these indicators in terms of quantity is quite low. While the private publishing house textbook includes only the dimensions related to information and data literacy, the MoNE publishing textbook includes the dimensions of information and data literacy, digital content creation, and security. However, these are not at an appropriate level in terms of addressing enough sub-dimensions.

The results related to 7th grade mathematics textbooks were obtained by examining the books belonging to Berkay Publications and MoNE Publications. Considering the learning areas; it was determined that the 7th grade textbook of the private publishing house mainly included digital competence in the data processing learning area, while the MoNE Publishing textbook included it in the geometry and measurement learning

area. It is seen that the use of visuals and QR codes is preferred more in the context of digital competence in both textbooks. Apart from this, it was concluded that activities and problems were used in the context of digital competence in the textbooks, albeit in small numbers. However, unlike the 5th and 6th grade textbooks, DigComp dimensions were included not only with the emphasis on information and data literacy through QR codes but also by using visuals and subject preparation sections in the private publishing house textbook and visuals in the MoNE textbook. In the Berkay Publications textbook, the competency of scanning and researching data, information, and digital content in the context of the problem, project, visual, QR code, and topic preparation was emphasized, and DigComp elements such as digital content development and programming were emphasized in activities related to dynamic geometry software. However, in the MoNE textbook, it is seen that information and data literacy are mostly provided through QR codes, and activities, problems, and visuals are used for content development and programming dimensions. In this context, it can be said that importance is given to creating digital content with the help of dynamic geometry software and spreadsheet programs. In addition, when the two books are compared in terms of the level of including digital competency indicators, it can be said that they are at similar levels in terms of quantity. On the other hand, when the DigComp framework is examined holistically, it is seen that the 7th grade textbook of the private publishing house includes the dimensions of "Information and Data Literacy" and "Creating Digital Content"; the MoNE textbook also includes the dimension of "Communication and Collaboration" along with these dimensions. Nevertheless, when all dimensions and sub-dimensions of digital competence are taken into consideration, it is concluded that both textbooks are not at a sufficient level in terms of both quantity and importance of more diverse elements.

The results of 8th grade mathematics textbooks were obtained by examining the books of Koza Publishing and MoNE Publishing. Considering the learning areas, it was determined that the 8th grade textbook of the private publishing house mainly included digital competence in the data processing learning area, while the textbook of MoNE Publishing included it in the geometry and measurement learning area. When the chapters of the 8th grade textbook of the private publishing house were examined according to the inclusion of digital competence, it was concluded that this skill was included only through QR codes in this book, and due to the QR codes, only the competence of searching and scanning data, information, and content from DigComp elements was emphasized. In terms of quantity, it can be stated that this situation is not sufficient. On the other hand, when the 8th grade textbook of the MoNE publishing was examined, it was found that this book included more digital competence in terms of quantity and more elements than the 5th, 6th, and 7th grade private and MoNE publishing books. In the related book, digital competence skills were frequently included through activities, visuals, and QR codes. In particular, the activities involving various software such as dynamic geometry software and word processing software related to many mathematical concepts in the geometry and measurement learning area, the visualization of these activities, and the construction of these activities on process steps resulted in the importance of DigComp elements. Digital content development, programming, information, and data literacy are among these elements. In addition, the MoNE textbook includes various project tasks that involve students conducting research, creating, and sharing content using information and communication technologies. In this context, considering the sections that include digital competence and the DigComp framework, it was concluded that the MoNE textbook includes more elements in terms of quantity than the private publishing house book. While the MoNE textbook included research, activities, problems, projects, visuals, preparation for the topic, and QR codes, the other textbook emphasized digital competence only through QR codes. In addition, only one sub-dimension of Information and Data Literacy, data, information and digital content research, scanning, and filtering, was included in the private publishing house textbook, whereas all DigComp dimensions were included in the MoNE textbook. Nevertheless, when all DigComp dimensions and their sub-dimensions are taken into consideration and considering that the MoNE textbook includes only one sub-dimension from

the Security and Communication and Collaboration dimension, it can be stated that both books are not at a sufficient level in terms of quantity.

In line with the examinations, it was determined that the contents related to digital competence were mostly included in the learning areas of "numbers and operations", "geometry and measurement" and "data processing" in all textbooks. This finding supports Mersin and Karabörk's (2021) view that the use of technology tools in Turkey is mostly in the learning areas of "numbers and operations" and "geometry and measurement". Kurudayıoğlu and Soysal (2018) examined the compliance of the learning outcomes in the Turkish curriculum with digital competence. DigComp created by the European Parliament was taken into consideration within the framework of the examination of digital competence. As a result of the study, it was determined that digital competence was included in the objectives of the curriculum, but not at a sufficient level and that no balance was observed in terms of skill areas and grade levels in the distribution of objectives within the framework of digital competence. Şimşek (2022) aimed to determine the level of digital competence in the Turkish curriculum in Turkish textbooks at the secondary school level. In the study, it was concluded that although digital competence is included in the curriculum, it is not sufficiently included in the textbooks, and the situations related to a small number of digital competencies are related to digital literacy and digital security, and other sub-competencies are not sufficiently addressed. In this context, it can be stated that the results obtained about the textbooks are consistent with the results of the current study.

In the knowledge society, as young people move from school life to working life, they need to have not only the skills to use knowledge but also a wide range of skills and competencies, from social skills to innovation, from digital competence to lifelong learning (Ranta et al., 2022). In this context, it is necessary to adapt 21st century skills to curricula, consider instructional approaches in teaching such skills, and to develop teaching materials that will cover 21st century skills (Geisinger, 2016). Because, as stated in the OECD's Learning Compass 2030 report, it is emphasized that the basic knowledge, skills, values, and attitudes in future education will include not only literacy and numeracy but also digital, physical, cognitive, social, and affective skills within the framework of data and digital literacy (OECD, 2018). It is becoming increasingly important that all these skills are necessary to be successful in the 21st century. In order to overcome the challenges in this context, learning environments, teachers, and curricula should be revised to enable students to think creatively, critically, and innovatively, and to facilitate them as problem solvers to have the communication and collaboration skills necessary in their fields of study and in real life (Shidiq & Yamtinah, 2019). Therefore, in line with the results of the study, middle school mathematics textbooks need to be revised to a great extent in terms of digital competence skills. In addition, in line with the results of the study, it can be suggested to the textbook authors that digital competence should be balanced throughout the book and more digital competence elements should be emphasized by considering DigComp or a similar comprehensive framework. In addition, examining textbooks and curricula in the context of other comprehensive frameworks such as the DigComp 2.2 framework, which is based on this study, is among the suggestions that can be given for future studies. In addition, the fact that programs and textbooks are not left aside as printed texts depends on the teachers' ability to teach the lesson effectively and efficiently (Ekmen & Bakar, 2018). In this context, it can also be suggested to conduct studies on the trainers' consideration of the digital competency elements in the textbooks and their application in their lessons.

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References

Akbulut, B. (2018). *Ortaokul ve imam hatip ortaokulu 7. sınıf matematik ders kitabı*. Berkay Yayınları.

Ananiadou, K., & Claro, M. (2009). *21st century skills and competencies for new millennium learners in OECD countries*. OECD Education Working Papers No. 41. OECD. http://dx.doi.org/10.1787/218525261154

Arslan, E. (2022). Nitel araştırmalarda geçerlilik ve güvenilirlik. *Pamukkale Üniversitesi Sosyal Bilimler Enstitüsü Dergisi,* 51, 395-407. https://doi.org/10.30794/pausbed.1116878

Aura, I., Järvelä, S., Hassan, L., & Hamari, J. (2023). Role-play experience's effect on students' 21st century skills propensity. *The Journal of Educational Research*, *116*(3), 159-170. https://doi.org/10.1080/00220671.2023.2227596

Aydın, E. & Erenkuş, M. A. (2019). *Ortaokul ve imam hatip ortaokulu 6. sınıf matematik ders kitabı*. Koza Yayınları.

Batz, V., Lipowski, I., Klaba, F., Engel, N., Weiß, V., Hansen, C., & Herzog, M. A. (2021, November). The digital competence of vocational education teachers and of learners with and without cognitive disabilities. *In International Symposium on Emerging Technologies for Education* (pp. 190-206). Springer International Publishing.

Bogdan, R. C., & Biklen, S. K. (2007). *Qualitative research for education : An introduction to theories and methods* (5th ed.). Pearson.

Bowen, G. A. (2009). Document analysis as a qualitative research method. *Qualitative Research Journal, 9*(2), 27-40.

Böge, H., Akıllı, R. (2021). *Ortaokul ve imam hatip ortaokulu 8. sınıf matematik ders kitabı*. MEB Yayınları.

Cabezas-González, M., Casillas-Martín, S., & García-Valcárcel Muñoz-Repiso, A. (2023). Theoretical models explaining the level of digital competence in students. *Computers*, *12*(5), 100. https://doi.org/10.3390/computers12050100

Cansoy, R. (2018). Uluslararası çerçevelere göre 21. yüzyıl becerileri ve eğitim sisteminde kazandırılması. *İnsan ve Toplum Bilimleri Araştırmaları Dergisi*, *7*(4), 3112-3134. https://doi.org/10.15869/itobiad.494286

Cırıtcı, H., Gönen, İ, Araç, D., Özarslan, M., Pekcan, N., & Şahin, M. (2018). *Ortaokul ve imam hatip ortaokulu 5. sınıf matematik ders kitabı*. MEB Yayınları.

Corbin, J. & Strauss, A. (2008). *Basics of qualitative research: Techniques and procedures for developing grounded theory* (3rd ed.). Sage.

Creswell, J. W. (2013). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage.

Coşkunserçe, O., & Aydoğdu, Ş. (2022). Investigating the digital skills of undergraduate students in terms of various variables. *Journal of Educational Technology and Online Learning*, *5*(4), 1219-1237. https://doi.org/10.31681/jetol.1151461

Çağlayan, N., Dağıstan, A., & Korkmaz, B. (2021). *Ortaokul ve imam hatip ortaokulu 6. sınıf matematik ders kitabı.* MEB Yayınları

Downe-Wamboldt, B. (1992). Content analysis: Method, applications, and issues. *Health Care for Women International,* 13, 313-321. https://doi.org/10.1080/07399339209516006

Ekmen, C., & Bakar, E. (2018). Digital competencies in the curriculum and textbooks of primary education. *National Education*, 221, 5-35.

Erdin, Y. & Uzun, L. (2022). An in-depth look into perceived technology proficiency of Turkish teachers of English and their technology practices. *Journal of Educational Technology and Online Learning*, *5*(1), 169-189. https://doi.org/10.31681/jetol.990908

Erenkuş, M.A., & Eren Savaşkan, D. (2019). *Ortaokul ve imam hatip ortaokulu 8. sınıf matematik ders kitabı.* Koza Yayınları.

European Commission, Directorate-General for Education, Youth, Sport and Culture, (2019). Key competences for lifelong learning, *Publications Office*. https://data.europa.eu/doi/10.2766/569540

European Commission. (2020). Digital education action plan 2021-2027: Resetting education and training for the digital age. https://education.ec.europa.eu/sites/default/files/document-library-docs/deap-communication-sept2020_en.pdf

Flick, U. (2009). *An introduction to qualitative research* (4th ed.). Sage.

Finnish National Board of Education [FNBE] (2014). Finnish national core curriculum for basic education. https://www.oph.fi/en/education-and-qualifications/national-core-curriculum-basic-education

Geisinger, K. F. (2016). 21st-century Skills: What Are They and How Do We Assess Them? *Applied Measurement in Education, 29*(4). 245-249. https://doi.org/10.1080/08957347.2016.1209207

Goodman-Deane, J., Bradley, M., & Clarkson, P. J. (2020). Digital technology competence and experience in the UK population: Who can do what. Published Online, *Contemporary Ergonomics & Human Factors*, 9 April 2020. Retrieved from https://publications.ergonomics.org.uk/uploads/Digital-technology-competence-and-experience-in-the-UK-population-who-can-do-what.pdf (accessed on 26 June 2023).

Gordon, J., Halász, G., Krawczyk, M., Leney, T., Michel, A., Pepper, D., ... & Wiśniewski, J. (2009). Key competences in Europe: Opening doors for lifelong learners across the school curriculum and teacher education. *CASE Network Reports*, (87).

Göksülük, G. (2022). *Ortaokul ve imam hatip ortaokulu 5. sınıf matematik ders kitabı*. Özgün Yayınları.

Guillén-Gámez, F. D., Mayorga-Fernández, M. J., & Contreras-Rosado, J. A. (2021). Incidence of gender in the digital competence of higher education teachers in research work: Analysis with descriptive and comparative methods. *Education Sciences*, *11*(3), 98. https://doi.org/10.3390/educsci11030098

Halis, İ. (2002). *Öğretim teknolojileri ve materyal geliştirme*. Nobel Yayınları.

Ilomäki, L., Paavola, S., Lakkala, M., & Kantosalo, A. (2016). Digital competence–an emergent boundary concept for policy and educational research. *Education and information technologies*, 21, 655-679.

Janssen, J., Stoyanov, S., Ferrari, A., Punie, Y., Pannekeet, K., & Sloep, P. (2013). Experts' views on digital competence: Commonalities and differences. *Computers & Education*, 68, 473-481. https://doi.org/10.1016/j.compedu.2013.06.008

Karataş, Z. (2017). Paradigm transformation in social sciences research: rise of qualitative approach. *Turkish Journal of Social Work Research, 1*(1), 68-86.

Kayhan, E., Altun, S., & Gürol, M. (2019). Sekizinci sınıf Türkçe öğretim programı (2018)'nın 21. yüzyıl becerileri açısından değerlendirilmesi. *Adnan Menderes Üniversitesi Eğitim Fakültesi Eğitim Bilimleri Dergisi*, *10*(2), 20-35.

Keskin Oğan, A., & Öztürk, S. (2021). *Ortaokul ve imam hatip ortaokulu 7. sınıf matematik ders kitabı*. MEB Yayınları.

Krefting, L. (1991). Rigor in qualitative research: the assessment of trustworthiness. *The American Journal of Occupational Therapy, 45*(3), 214-222.

Kurudayıoğlu, M., & Soysal, T. (2020). 2018 Türkçe dersi öğretim programı'nın dijital yetkinlik bakımından incelenmesi. *Mehmet Akif Ersoy Üniversitesi Eğitim Fakültesi Dergisi,* 54, 184-199.

Mogalakwe, M. (2006). The use of documentary research methods in social research. *African Sociological Review, 10*(1), 221-230.

Merriam, S. B. (2009). *Qualitative research. A guide to design and implementation*. John Wiley-Sons.

Mertens, D. M. (2010). *Research and evaluation in education and psychology: Integrating diversity with quantitative, qualitative, and mixed methods*. Sage.

Miettinen, R. (2022). 21st-century competencies: The OECD as a reformer of the language of education. *Contemporary Educational Research Quarterly Journal*, 2022(9), 39-63. https://doi.org/10.6151/CERQ.202209_30(3).0002

National Research Council [NRC] (2011). *Assessing 21st century skills: Summary of a workshop*. National Academies Press. https://doi.org/10.17226/13215

Mersin, N., & Karabörk, M. A. (2021). The comparison of math textbooks in Turkey and Singapore in terms of technology integration. *International Journal of Curriculum and Instruction, 13*(1), 552-573.

Olofsson, A. D., Lindberg, J. O., Young Pedersen, A., Arstorp, A. T., Dalsgaard, C., Einum, E., ... & Willermark, S. (2021). Digital competence across boundaries-beyond a common Nordic model of the digitalization of K-12 schools?. *Education Inquiry*, *12*(4), 317-328. https://doi.org/10.1080/20004508.2021.1976454

Organisation for Economic Co-Operation and Development [OECD] (2018). *The Future of Education and Skills: Education 2030 Position Paper*. http://www.oecd.org/education/2030-project/about/documents/E2030%20Position%20Paper%20(05.04.2018).pdf

Organisation for Economic Co-Operation and Development [OECD] (2021). *Digital government: Progress towards digital competence and maturity, in Government at a Glance 2021*. OECD Publishing. https://doi.org/10.1787/2bed4623-en

Partnership for 21st Century Learning [P21] (2019). Framework for 21st century learning. https://www.battelleforkids.org/networks/p21/frameworks-resources.

Patton, M. Q. (2002). *Qualitative research and evaluation methods*. Sage.

Ranta, M., Kruskopf, M., Kortesalmi, M., Kalmi, P., & Lonka, K. (2022). Entrepreneurship as a neglected pitfall in future Finnish teachers' readiness to teach 21st century competencies and financial literacy: Expectancies, values, and capability. *Education Sciences*, *12*(7), 463. https://doi.org/10.3390/educsci12070463

Shidiq, A. S., & Yamtinah, S. (2019, February). Pre-service chemistry teachers' attitudes and attributes toward the twenty-first century skills. In *Journal of Physics: Conference Series* (Vol. 1157, No. 4, p. 042014). IOP Publishing.

Şimşek, Ş. (2022). Türkçe ders kitaplarında dijital yetkinlik. *Turkish Studies - Education, 17*(3), 469484. https://dx.doi.org/10.7827/TurkishStudies.57919

Tindowen, D. J. C., Bassig, J. M., & Cagurangan, J. A. (2017). Twenty-first-century skills of alternative learning system learners. *Sage Open*, 7(3), https://doi.org/10.1177/2158244017726116

Tømte, C. E. (2015). Educating teachers for the new millennium? Teacher training, ICT and digital competence. *Nordic Journal Of Digital Literacy*, 10(Jubileumsnummer), 138-154. https://doi.org/10.18261/ISSN1891-943X-2015-Jubileumsnummer-10

Uğur, Ü.E., & Sungur, S. (2021) Middle school students' perceptions about twenty-first-century learning practices in science classes: A multidimensional approach. *Hacet. Univ. J. Educ*., 36, 186–200. https://doi.org/10.16986/huje.2020058877

Undheim, M., & Ploog, M. (2023). Digital competence and digital technology: A curriculum analysis of Norwegian early childhood teacher education. *Scandinavian Journal of Educational Research*, 1-16. https://doi.org/10.1080/00313831.2023.2204109

Üredi, L., & Ulum, H. (2020). İlkokul matematik ders kitaplarında bulunan ünite değerlendirme sorularının yenilenmiş Bloom taksonomisine göre incelenmesi. *Mersin Üniversitesi Eğitim Fakültesi Dergisi*, *16*(2), 432-447. https://doi.org/10.17860/mersinefd.693392

Van Laar, E., Van Deursen, A. J., Van Dijk, J. A., & De Haan, J. (2017). The relation between 21st-century skills and digital skills: A systematic literature review. *Computers in Human Behavior*, 72, 577-588. https://doi.org/10.1016/j.chb.2017.03.010

Voogt, J., & Pareja Roblin, N. (2010). *21st century skills: Discussion paper*. Enschede: University of Twente.

Vuorikari, R., Kluzer, S., & Punie, Y., (2022). DigComp 2.2: The digital competence framework for citizens - with new examples of knowledge, skills and attitudes, EUR 31006 EN, *Publications Office of the European Union*, Luxembourg. ISBN 978-92-76-48882-8. https://doi:10.2760/115376

Yıldırım. A. & Şimşek. H. (2018). *Sosyal bilimlerde nitel araştırma yöntemleri*. Seçkin.

Zhao, Y., Llorente, A. M. P., & Gómez, M. C. S. (2021). Digital competence in higher education research: A systematic literature review. *Computers & Education*, 168, 104212. https://doi.org/10.1016%2Fj.compedu.2021.104212