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Review Article

Evaluation of Science and Mathematics Textbooks in Context of Digital Competence

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Abstract

In this study, it is aimed to evaluate the content of the textbooks between the 5th- 8th grade science and mathematics textbooks in the context of digital competence. Textbooks MoNE publications in the 2020-2021 academic year were used and document analysis method was preferred. For data analysis, a checklist was created by using the digital competence criteria published in the MoNE curriculum. To the findings, there is very little attention on the content for digital competence in Science and Mathematics textbooks. The content is mostly oriented "access to information" and digital-oriented content is in the book chapters mostly took part in the "unit sections.". There is no increase in the content for digital competence as the grade level increases and no content for "retention of information" and "presentation of information" at any grade level. Also there are significant differences in the content of the textbooks at the same grade level in the context of digital competence. To fill the main gaps between the learning goals and textbooks in the context of digital competence and to create related content for the dimensions, a digital competence framework of our country should be.

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Introduction

In today's world, the superiority of technology and the fact that digital technologies play an essential role in our lives are accepted by many individuals and institutions. This situation has reflections on our lives as well as on education systems. We may state that there is an increasing interest in technological developments on how to provide more effective and more permanent learning or how to create a society that can keep up with the developments, and the effectiveness of a new application in education is discussed every day. In this context, we can say building societies consisting of digitally equipped individuals are

perhaps one of the most important educational goals of this century. Especially the technological developments in the field of artificial intelligence, space exploration, medicine, and engineering and the professions that are planned to occur in our lives in the future have also changed the expectations of the individuals who will be educated and instructed in schools. These goals and skills, which are expected to be seen in all segments of a digital society, are defined in a report by the European Parliament and the Council (2006) that play a key role in lifelong learning (communication in mother tongue, communication in foreign languages, mathematical competence and basic competences in science/technology, digital competence, learning to learn, social and civic competences, initiative and entrepreneurship, cultural awareness and expression). The concept of digital competence constitutes the main subject of this study, and we see it useful to specify what is meant by the word competence, to use the concept of competence more widely, and to create a conceptual framework. Competence is defined in the OECD (2002) report as "(…) the ability to meet demands or perform a task successfully and consists of both cognitive and non-cognitive dimensions". The relationship between competence and skills is defined in another OECD project "Competence is more than knowledge and skills. It includes the ability to meet complex demands by utilizing and promoting psychosocial resources (including skills and attitudes) in a given context" (OECD, 2005, p. 4). Regarding digital competence, there are many definitions in the literature. Ilomäki, Kantosalo and Lakkala (2011) mentioned the novelty of the concept and emphasized that it has been defined by two different perspectives in the literature. From this perspective, the main definitions of digital competence are summarized in Figure 1.

Definitions in Policy-Based Reports

- *European Union Commission (2006);* «Involves confident and critical use of Information Society Technology (ICT) for business, entertainment and communication. It is supported by the following basic skills in ICT: the use of computers to receive, evaluate, store, produce, present and share information, and to communicate via the Internet and participate in common networks".
- *In the Joint Research Center (JRC) technical report; Ferrari (2012)* defined digital competence performing tasks, solving problems; contact; manage information; to cooperate; the knowledge and skills required when using ICT and digital media to create and share content, as well as to structure information in an effective, efficient, appropriate, critical, creative, autonomous, flexible, ethical, reflective way for work, leisure, participation, learning and socialization , attitude, ability, strategy and awareness (DigComp, 2012).
- According to *UNESCO (2018),* digital competence is defined as the ability to use digital devices, communication applications and networks to access and manage information. It allows people to create and share digital content, communicate and collaborate, and solve problems of effective and creative self-actualization in life, learning and work in general and social activities.

Research and Evidence-Based Definitions

- We can start with *Gilster's (1997)* definition of "the ability to understand and use information in a multitude of formats from a wide variety of sources when presented through computers".
- *Erstad (2005)* defines it as "the skills, knowledge and attitudes required in the use of digital media to manage difficulties in the learning society" within the scope of a broad national curriculum reform for Norwegian schools called "Culture of Learning" in 2005.
- *Krumsvik (2008)* stated in his published study that the concept of competence has a more holistic meaning in Scandinavian English and stated that the concept is more geared towards pedagogy and courses, and that technical skills are only a part of this complex digital competence concept.

Figure 1. Digital competency definitions

Although the inclusion of the concept in the literature coincided with the beginning of the 90s (Janssen, Stoyanova, Ferrari, Punie, Pannekeet & Sloep, 2013), it can be stated that the preliminary theoretical studies on the subject are the studies carried out by the European Union Commission. It can be stated that after the presentation of the concept of digital competence within the framework of the European Union's core competencies published in 2006, many frameworks have been created on the subject, including in organizations supported by the European Union Commission. In the report named "A Framework for Developing and Understanding Digital Competence in Europe", Ferrari (2013) lists and explains digital competence areas (DigComp 1.0).

1. Information: Identifying, finding, retrieving, storing, organizing and analyzing digital information, assessing its relevance and purpose.

2. Communication: Communicating in digital environments, sharing resources through online tools, connecting with others, and collaborating through digital tools, interacting, and participating in communities, and networks, cross-cultural awareness.

3. Content Creation: Creating and editing new content (from word processing to image and video); integrating and detailing previous knowledge and content; producing creative

expressions, media output, and programming; dealing with and enforcing intellectual property rights and licenses.

4. Safety: Knowledge and practice of personal protection, data protection, digital identity protection, security measures, safe and sustainable use.

5. Problem Solving: Identifying digital needs and resources, making informed decisions about which digital tools are most appropriate for the purpose or need, solving conceptual problems with digital tools, using technology creatively, solving technical problems.

In 2015, in the report "Promoting Effective Digital-Age Learning- A European Framework for Digitally Competent Educational Organizations" (DigCompOrg) prepared by Kampylis, Punie and Devine, they mentioned the digital competency framework created for educational institutions. The DigCompOrg framework has seven core elements and fifteen sub-elements common to all education sectors. The framework with 74 items in total is given in Figure 2.

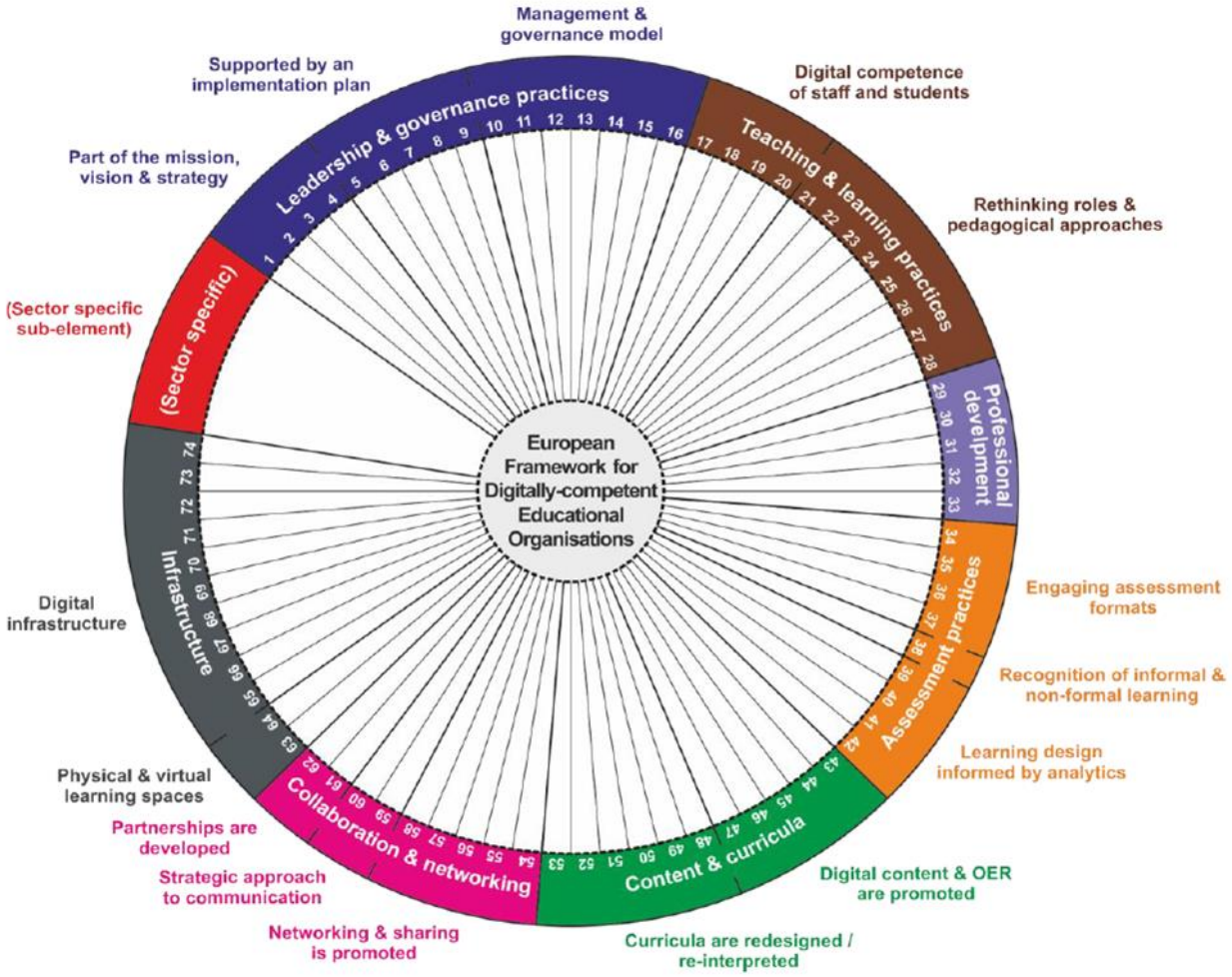

Figure 2. DigCompOrg element and sub-elements

In the relevant framework, it is seen that all the items belonging to the description that the institution will determine according to its digital competence needs are defined in detail. In 2016, in the study of Vuorikari, Punie, Carretero Gomez and Van den Brande, in the report called DigComp 2.0, it is stated that some changes were made in these five areas, and definitions of some concepts are given. The main changes in this report are outlined in Table 1.

Table 1. Conceptual changes in competence areas

DigComp 1.0	DigComp 2.0
Information	Information and ***Data Literacy***
Communication	Communication and ***Collaboration***
Content Creation	Creating ***Digital*** Content
Safety	Safety
Problem solving	Problem solving

It is seen that the digital competence levels in the DigComp 1.0 report, in which digital competence areas are determined, have been increased to eight different levels in the (Carretero Gomez, Vuorikari & Punie, 2017) report. It can be stated that the tasks at each level are defined in detail (Table 2).

Table 2. Updates to DigComp 1.0-Digcomp 2.1 frameworks

Levels in DigComp 1.0	Levels in DigComp 2.1	Complexity of Tasks	Autonomy	Cognitive Domain
Foundation	*1*	Simple tasks	With guidance	Remembering
	2	Simple tasks	Autonomy and with guidance where needed	Remembering
Intermediate	*3*	Well-defined and routine tasks, and straightforward problems	On my own	Understanding
	4	Tasks, and well-defined and non-routine problems	Independent and according to my needs	Understanding
Advanced	*5*	Different tasks and problems	Guiding others	Applying
	6	Most appropriate tasks	Able to adapt to others in a complex context	Evaluating
Highly specialised	*7*	Resolve complex problems with limited solutions	Integrate to contribute to the professional practice and to guide others	Creating
	8	Resolve complex problems with many interacting factors	Propose new ideas and processes to the field	Creating

When the relevant reports are analyzed, it is explained with examples that the digital competency framework can be used in policymaking and support, training, education, and training for employment, assessment, and certification.

From all the definitions made so far, we can say that digital competence is the versatile knowledge, skills, and attitudes that enable a bridge to be built between the virtual world and real life, that is, to get the right decisions and apply them. In our country, we see that eight main competencies determined within the framework of European competencies are based on the curriculum to achieve this goal (MoNE, 2018 Science and Mathematics Curriculum, p.6). Correspondingly in the curriculum, digital competence is defined as; "It encompasses the safe and critical use of information and communication technologies for business, daily life and communication. This competence is supported through basic skills such as using computers to access and evaluate information, store, produce, present and exchange information, as well as participate in and communicate in common networks via the Internet." In this context, it is seen that the basic skills and attitudes that are expected to be realized in students are drawn through the curriculums. It can be stated that textbooks are the first source of guidance and help in gaining the knowledge, skills or attitudes related to the subject to teachers and students. Since the textbooks cover "what will be taught or learned" during education, these books include a detailed description of the content in the program, and for this reason, most of the teachers use textbooks as the primary source (for lesson plans or activities) (Doğan & Torun, 2018). It can be stated that all knowledge, skills and attitudes that are planned to be acquired by students in the context of digital competence should be supported by high-level thinking teaching (Özbay, 2003). In other words, confronting the learners with different and complex situations will enable them to both gain and use these competencies. The intensive use of technology in science and mathematics lessons, where daily life and problem-solving skills are used intensively, and the inclusion of STEM-based activities in the classrooms are important in terms of proofing how the digital competence is tried to be taught through textbooks. It has been determined that digital competence is evaluated within the classification of life skills and in terms of achievements in curriculums (Ekmen & Bahar, 2018; Kana & Kiler, 2021; Kurudayıoğlu & Soysal, 2020; Pala, 2020; Yalkın & Işık, 2019; Yüksel & Taneri, 2020). Kurudayıoğlu and Soysal (2020) examined the learning goals of the 2018 Turkish Lesson Curriculum (1, 2, 3, 4, 5, 6, 7, and 8th Grades) in terms of the European digital competence framework to analyze

the learning goals' relevance with digital competence. According to their results, there is digital competency content in the Turkish Lesson Curriculum but there is no balance based on skill areas and grade levels in the distribution of learning goals. The study of Ekmen and Bahar (2018), it was aimed to reveal the place of digital competence in primary education. Document analysis was carried out for this purpose. They have found digital competence is not limited to Information Technologies and Software courses. In addition, they stated that this situation is considered as a whole in all other courses, and in this direction, it has been determined that content, subject, achievement, warning, and so on are included in each lesson. In the study of Yüksel and Taneri (2020), Life Studies textbooks are examined in terms of key competencies within the framework of Turkish qualifications, and accordingly, digital competency is given a low rate in books at all grade levels. In the study of Kana and Kiler (2021), the texts and activities in the secondary school Turkish textbooks were examined in the context of the competencies in the Turkish curriculum, and digital competency was among the competencies that were included in the least number. Pala (2020) stated in his study that the relationship between the learning goals in the 5th- grade Social Studies Curriculum according to key competencies was examined and that some of the learning goals in the Social Studies curriculum were directly related to digital competency. In the study of Otuz, Kayabaşı and Ekici (2018), the relationship between the key competencies in the Basic Competency Framework of the 2017 Social Studies Curriculum was examined, and the dimensions of "Basic Skills" and "Values Education" were analyzed through content analysis. They stated that "Mathematical Competence and Basic Competencies in Science and Technology" were included, but many competencies, including digital competency, found little or no place in the curriculum. Yalkın and Işık (2019), on the other hand, examined the primary school (3-4th Grades), Secondary School, and Imam Hatip Secondary School (5th-8th grades) science course curriculum achievements according to the lifelong learning key competencies determined in the Turkey Qualifications Framework. They stated that they achieved digital competency in only one sub-achievement in the 8th grade. As seen from the literature we think that examining the textbooks, which is one of the platforms on which the achievements in the curriculum will be put into practice, will enable the current situation to be revealed in this context. For this reason, the aim of this study is to evaluate the content in the secondary school 5th - 8th-grade science and mathematics textbooks in the context of

digital competence. We have determined our sub-problems related to the subject as follows and we have determined our sub-problems related to the subject as follows:

1. What is the distribution of digital competence content in textbooks?

2. How does the distribution of digital competence content in textbooks change according to grade levels?

3. How does the distribution of digital competence in Science Textbooks' Chapters?

4. How does the distribution of digital competence in Mathematics Textbooks' Chapters?

Scope and Limitations of the Study

Obtained data was analyzed within the framework "digital competence" in the MoNE Curriculum. Since there is no purpose of comparing the books (MoNE and private publishers) included in the study, only the books belonging to MoNE Publications are selected to avoid bias. The fact that the study was carried out between 5th and 8th grade textbooks can be stated as another limitation of this study.

Method

The study was carried out according to the document analysis processes, which is a qualitative method. This analyze method includes the analysis of written materials containing information about the case or cases that are purposed to be analyzed (Yıldırım & Şimşek, 2018). When the literature is reviewed, we see that there are different document analysis processes according to Altheide (1996), Forster (1995), and Corbin and Strauss (2008) (Kıral, 2020). In this study, the document review processes of Altheide (1996) is grounded and the analysis process is summarized in Figure 3.

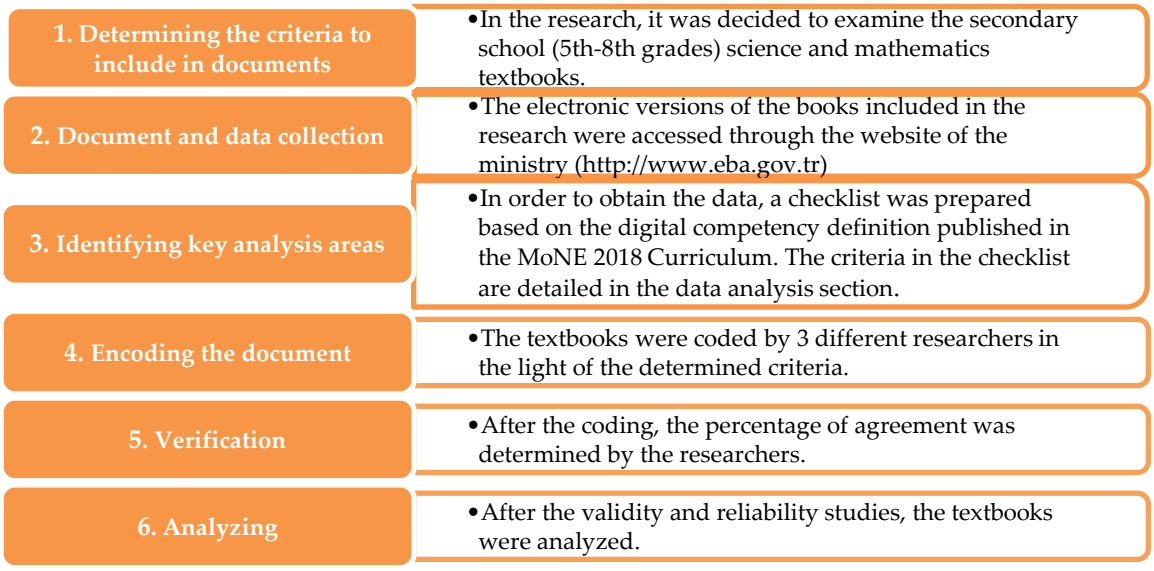

Figure 3. Document review process.

The method must be specified in experimental studies. In the method section, there are also subheadings; analysis techniques used in the research model, Sampling/Study population, data collection and tools, analysis in the analysis of data should be explained. Procedure as sub-sections if an original research method has been used.

Sample

In the study, a total of ten books related to grade levels of MoNE Publications were analyzed. For Mathematics, two books were analyzed which belong to MoNE publications at 6th- and 8th-grades. The only source at the 8th-grade level belongs to a private publishing house, so the relevant book was regarded at this grade level for science (Table 3).

Table 3. Textbooks included in the study

Texbook	Code
Akter, S., Arslan, H. B., Şimşek M. (2021). Ortaokul ve İmam Hatip Ortaokulu 5. Sınıf Fen Bilimleri Ders Kitabı. Ankara: MEB Yayınları.	**S5**
Yıldırım, F. S., Aydın, A., Sarıkavak, İ. (2021). Ortaokul ve İmam Hatip Ortaokulu 6. Sınıf Fen Bilimleri Ders Kitabı. Ankara: MEB Yayınları.	**S6**
Akdemir, E., Çetin Atasoy, D. (2021). Ortaokul ve İmam Hatip Ortaokulu 7. Sınıf Fen Bilimleri Ders Kitabı. Ankara: MEB Yayınları.	**S7**
Yiğit, E. (2018). Ortaokul ve İmam Hatip Ortaokulu 8. Sınıf Fen Bilimleri Ders Kitabı. Ankara: Adım Adım Matbaa Yayıncılık.	**S8**
Cırıtcı, H., Gönen, İ, Araç, D., Özarslan, M., Pekcan, N., Şahin, M. (2021). Ortaokul ve İmam Hatip Ortaokulu 5. Sınıf Matematik Ders Kitabı. Ankara: MEB Yayınları.	**M5**
Çağlayan, N., Dağıstan, A., Korkmaz, B. (2021). Ortaokul ve İmam Hatip Ortaokulu 6. Sınıf Matematik Ders Kitabı. Ankara: MEB Yayınları	**M6 I**
Bektaş, M., Kahraman, S., Temel, Y. (2021). Ortaokul ve İmam Hatip Ortaokulu 6. Sınıf Matematik Ders Kitabı. Ankara: MEB Yayınları.	**M6 II**
Keskin Oğan, A., Öztürk, S. (2021).). Ortaokul ve İmam Hatip Ortaokulu 7. Sınıf Matematik Ders Kitabı. Ankara: MEB Yayınları.	**M7**
Böge, H., Akıllı, R. (2021). Ortaokul ve İmam Hatip Ortaokulu 8. Sınıf Matematik Ders Kitabı. Ankara: MEB Yayınları	**M8 I**
Çetin, Ö., Aksakal, U., Ertürk, Ü., Şay, G., Tığlı, İ. (2021). Ortaokul ve İmam Hatip Ortaokulu 8. Sınıf Matematik Ders Kitabı. Ankara: MEB Yayınları	**M8 II**

Data Collection and Analysis

A checklist was created by using the digital competence framework included in the curriculum to collect data. After determining the criteria which will be used in the analysis of the textbooks, the checklist was examined by three researchers who are experts in the field, and the final version was revisioned with the feedbacks given. The determined dimensions and detailed definitions of the criteria in this checklist are introduced in Table 4 and the checklist in Table 4.

Table 4. Digital competency skills checklist, definition and sub-dimensions

Digital Competency Skills		Definition and Sub-Dimensions
Access to Information		Inclusion of basic information that will enable searching, browsing, and accessing the concepts and topics in the courses using the internet and computer. (Does the textbook direct and encourage the student to research topics and concepts with the internet and other digital world tools, or does it talk about how to do this?) (Search engine or keywords) (Ferrari, 2013, s.5; Vuorikari, et al.,2016, s.8).
Evaluation of Information		Inclusion of information for analyzing, comparing, and critically evaluating the validity and reliability of information accessed on the Internet (Vuorikari, et al., 2016, s.8).
		Inclusion of criteria for analyzing, interpreting, and critically evaluating data, information, and digital content (Carretero, Vuorikari & Punie, 2017, s.23).
Retention of Information		Knowing the necessary ways to securely store the obtained information in the digital environment (Is the student informed about how the information in the textbook will be stored in the digital environment? (Vuorikari, et al., 2016, s.9).
Production of Information		Using digital and online tools and technologies to create knowledge and innovate processes and products (Carretero, Vuorikari & Punie, 2017, s.32).
Representation of Information		To ensure that the obtained information is presented again via computer or internet. (Presentation, slide etc.) (Digital Competencies Course Program, Ankara, 2017, s.13)
Sharing Information	*Joining Public Networks via the Internet*	Ensuring the sharing of valid and reliable information (internet-based communication services) (Ferrari, 2013, s.14).
		Introducing existing and new communication environments for sharing information about subjects and concepts in textbooks. (social network etc.) (Ferrari, 2013, s.14).
	Communication via the Internet	Inclusion of information about the subject or concepts to provide communication and interaction between students, supporting individuals (Mail etc.). (Ferrari, 2013, s.14).
Ethics and Safety		Protecting devices and digital content for digital environments' risks and threats.
		Containing information to protect himself/herself and others from possible dangers in the digital environment.
		Include information on health risks and threats to physical and psychological health when using digital technologies,
		Being aware of the environmental effects of digital technologies and about their use,
		Ethical rules to be considered in the use of accessed information (Ferrari, 2013, s.14; Wilson, Grizzle, Tuazon, Akyempong & Cheung, 2011, s.77-89., Ferrari, Punie & Redecker, 2012, s.89).

In Table 4, the conceptual framework used in predicting the content of digital competence in the textbooks is summarized in detail. All dimensions and definitions in the relevant framework have been created and supported with the information in the literature. We would like to mention that in all dimensions, more emphasis was placed on educational processes and the prediction of technical information was also included.

Table 5. Checklist for textbook context used in the study

Science/ Mathematics																		
Grade Level	*Unit Sections*	*Key Words*	*Draw Attention*	*Lecturing*	*Readiness*	*Classroom Practice*	*Recall*	*Advanced Thinking Skills*			*Evaluation*						*I'm an Engineer (STEM)/Project Tasks*	
								Examples of Technology from Daily Life	*Problem Solving*	*Creativity*	*SUMMARY*	*SS*	*SÇS*	*ÜDS*	*BY*	*AD*		
BE																		
BD																		
BS																		
BÜ																		
BSNM																		
BA	***İAOAK***																	
	İAİK																	
EveG																		

Note. It's Your Turn: **SS**, Exam Questions: **SÇS**, Unit Evaluation Questions: **ÜDS**, Let's Do/Solve Together: **BY**, Let's Research Let's Think: **AD**, Access to Information: **BE**, Evaluation of Information: **BD**, Storage of Information: **BS**, Production of Information: **BU**, Presentation of Information: **BSNM**, Sharing Information: **BA**, Joining Public Networks via the Internet: **İAOAK**, Communication via the Internet: **İAİK,** Ethic and Safety: **EveG.**

An example of data analysis is given in Figure 4 and 5. Decision making process can be seen on these figures.

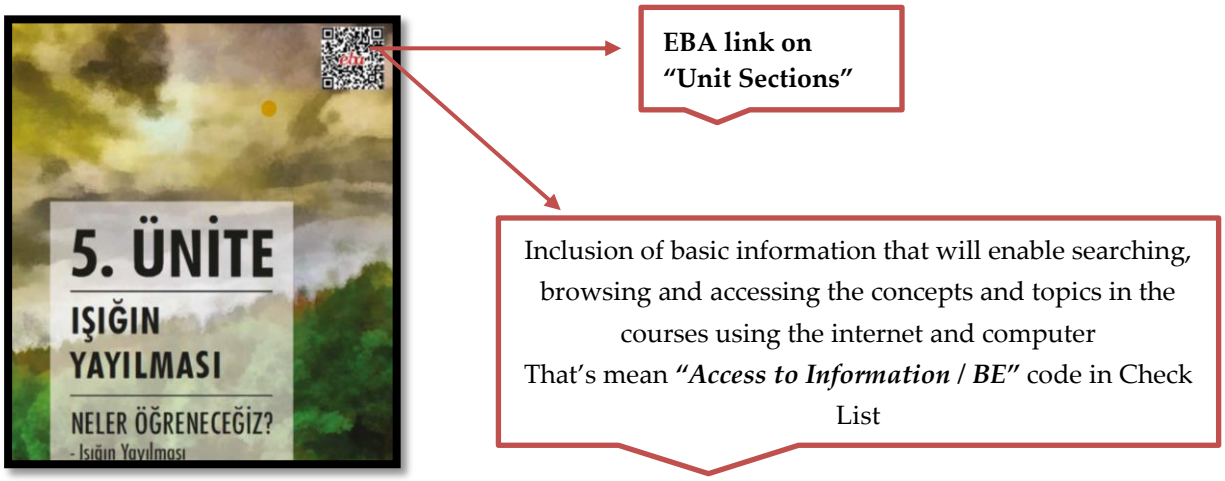

Figure 4. An example of science textbook analysis. (S5, 2018, p.162).

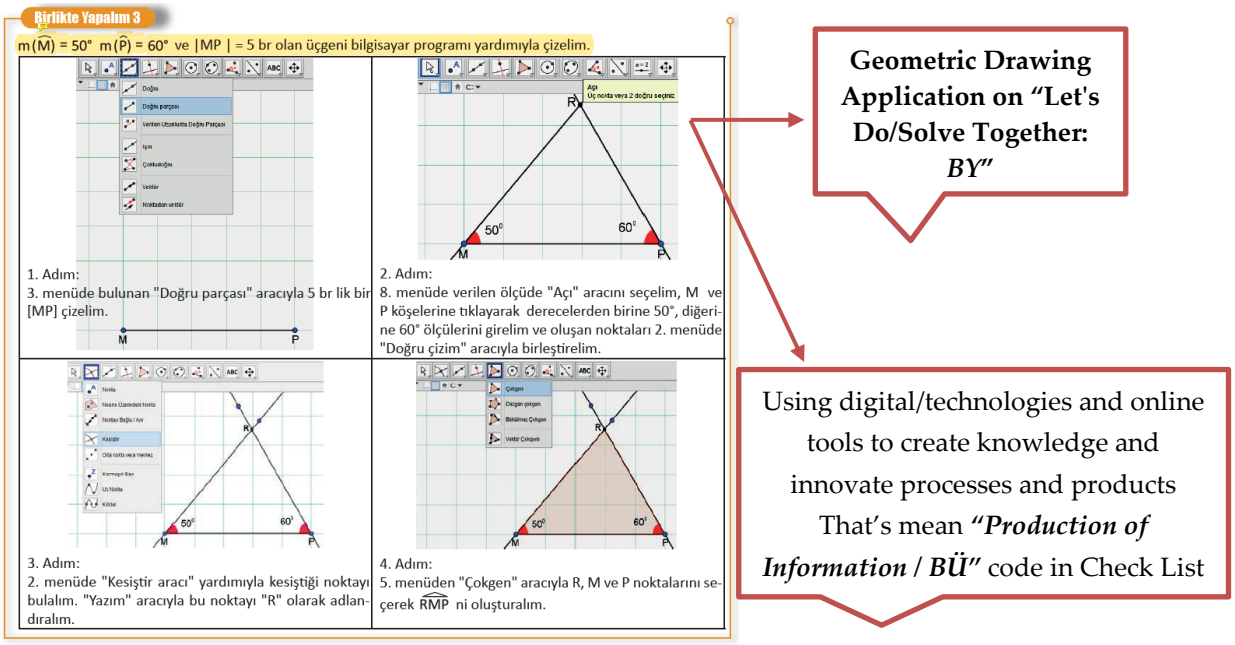

Figure 5. An example of mathematics textbook analysis. (M8 I, 2018, p.159).

Validity and Reliability

The studies carried out for the validity and reliability of the research are presented in Table 6.

Table 6. Validity and reliability process

Validity and Reliability Process		
	External Validity	*Internal Validity*
Validity	• The textbooks examined in the research were specified, and the analysis processes (data collection tools and criteria) were explained in detail in the theoretical context. • The limitations of the study and possible obstacles were defined, and the results were presented in detail.	• The findings were associated with sub-problems. • All phases of the research were arranged in accordance with document analysis from qualitative patterns and the process was explained in detail.
	External Reliability	*Internal Reliability*
Reliability	• The scope of the research was drawn, and a conceptual framework was created for the concept of Digital Competence in the curriculum.	• All phases of the study were carried out by the researchers. • More than one researcher participated in the study, opinions were received from field experts related to the data collection tool, and the percentage of consensus was checked for the reliability of the data, and it was calculated as 96% (Miles & Huberman, 1994).

Findings

The data obtained in the study were explained based on sub-problems and presented in tables.

1. What is the distribution of digital competence content in textbooks?

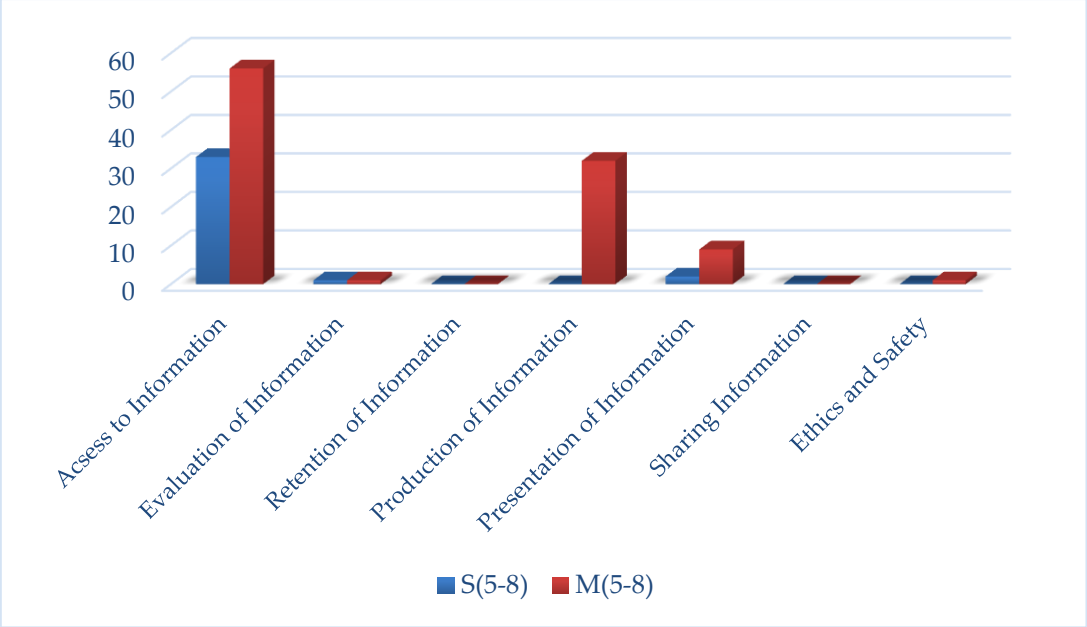

Figure 6. Frequency distribution of digital competency content in science and mathematics textbooks

According to Figure 6, it has been determined that the content in the Science textbooks provides the most access to information digitally, and presentation of information very little. On the other hand, the content in the Mathematics textbooks provides "access to information", "production" and "presentation of information" digitally. It's remarkable that no content related to the criteria of "Evaluation of Information, Retention of Information, Production of Information, Sharing Information and Ethics and Safety" can be found in the science textbooks.

2. How does the distribution of digital competence content in textbooks change according to grade levels?

In this section, it is presented how the content of digital competence in both Science, and Mathematics textbooks varies according to grade levels.

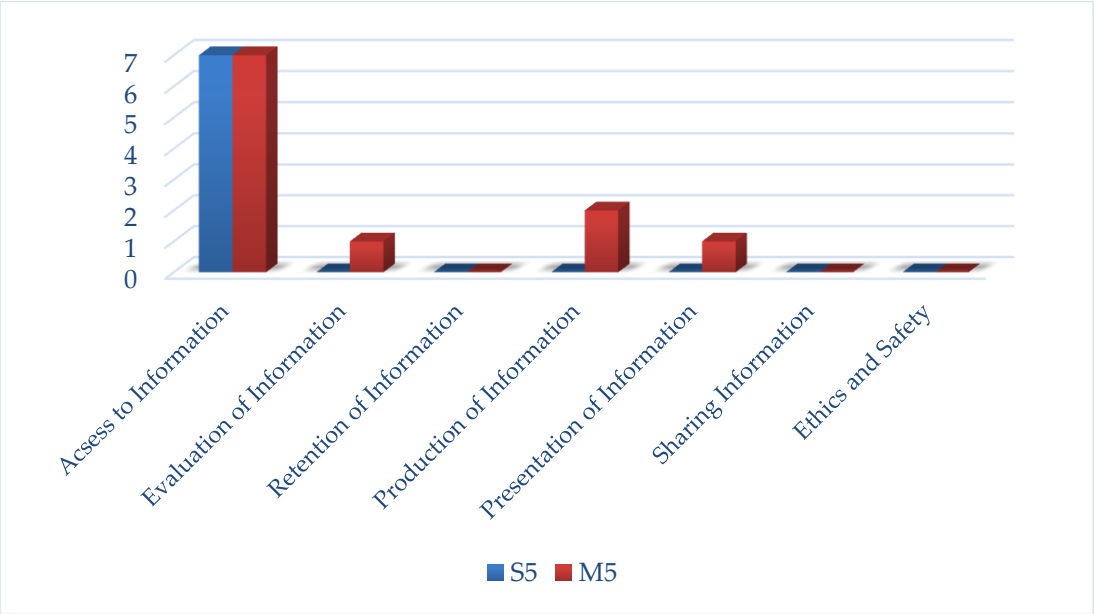

Figure 7. Frequency distribution of digital competency content in 5th grade science and mathematics textbooks

In Figure 7, while the 5th grade Science textbook contains only content for accessing information, the Mathematics textbook contains content for accessing information, producing, presenting, and evaluating information, respectively. As we mentioned before, it is seen that there are no other dimensions in science books at the 5th-grade level also.

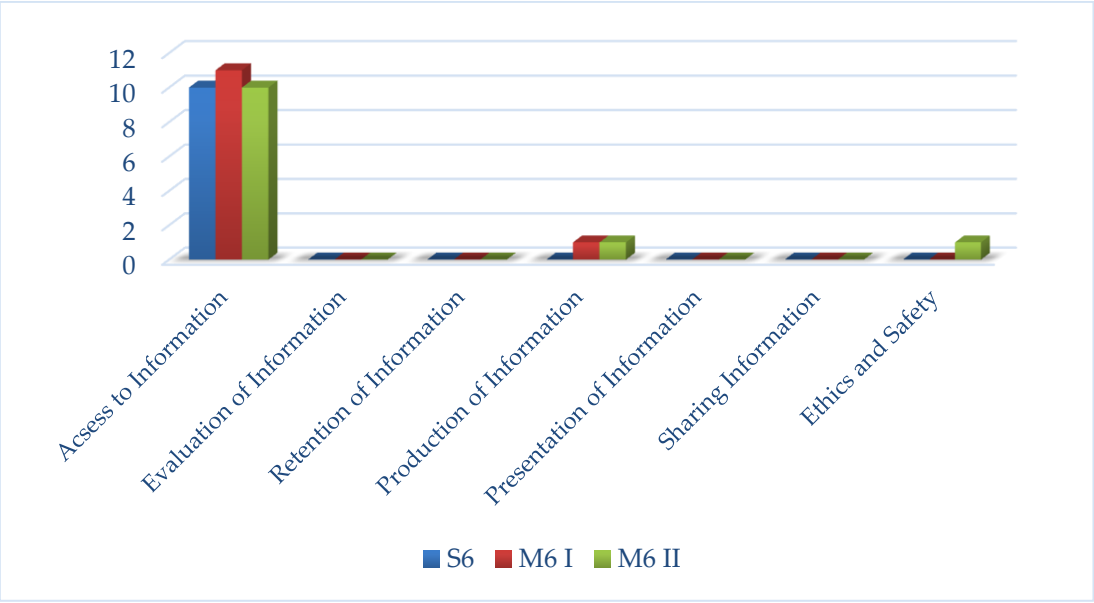

Figure 8. Frequency distribution of digital competency content in 6th grade science and mathematics textbooks

In 6th-grade, two books (M6 I, M6 II) were examined for the Mathematics textbook, and the data for each book are listed separately in Figure 8. Accordingly, it is seen that all three books contain content for "access to information". In addition, only Mathematics

textbooks contain content for "production of information", while content for "ethics and safety" was determined in the M6 II coded book. The Science textbook contains only content for “access to information”.

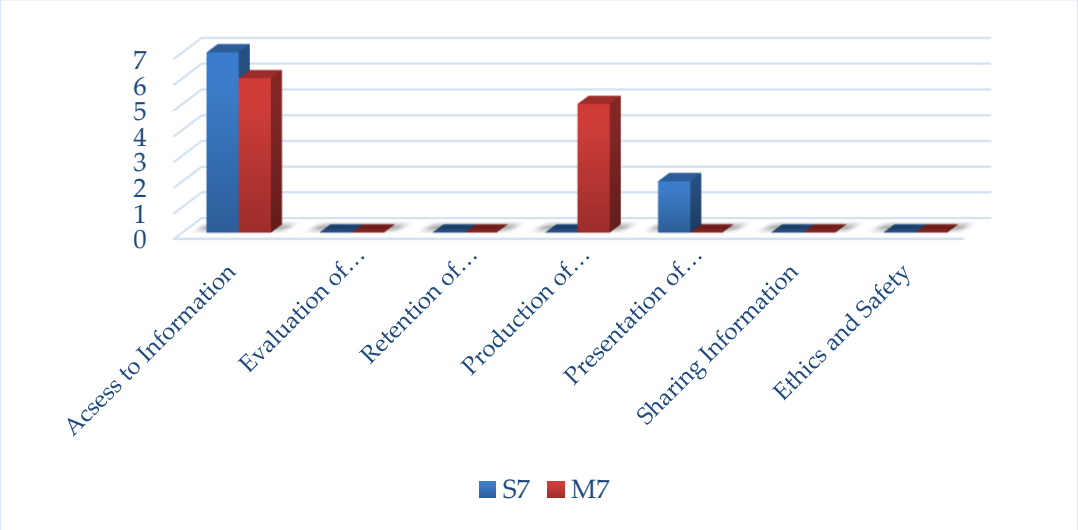

Figure 9. Frequency distribution of digital competency content in 7th grade science and mathematics textbooks

It is seen that apart from the content for "access to information" at the 7th grade, there is content for "presentation of knowledge" in the Science textbook and content for "production of knowledge" in the Mathematics textbook. In both books, it is seen that there is no content on "evaluation of information", "retention of information", "sharing of information" and "ethics and safety".

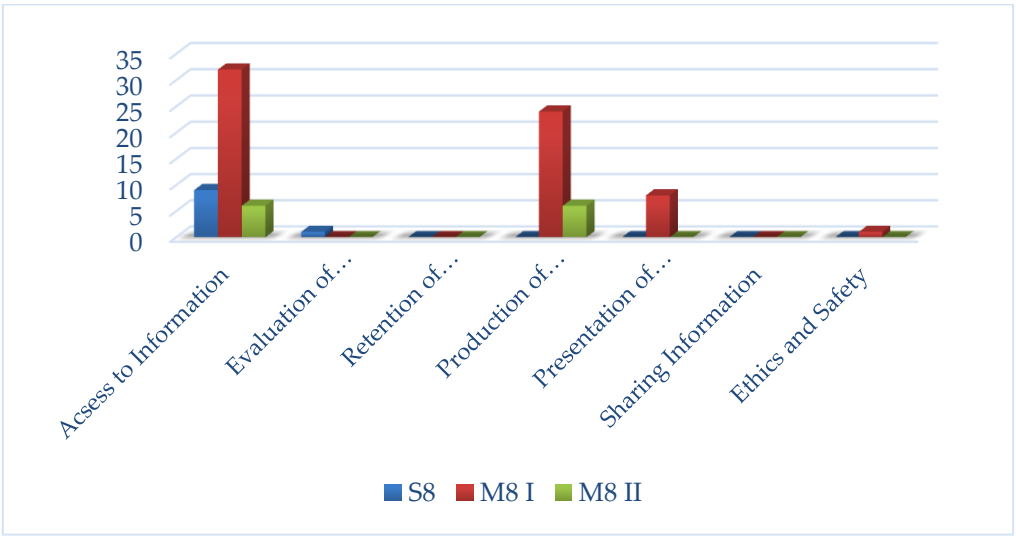

Figure 10. Frequency distribution of digital competency content in 8th grade science and mathematics textbooks

According to Figure 10, number of contents for digital competence in the 8th-grade textbook coded as M8 differs significantly from the other book coded as S8 and M8 II. It can be stated that the Science textbook only contains content for “access to information”. While M8 I coded textbook contains 32 contents for “access to information”, M8 II coded book

contains only 6 contents. There are 24 contents for the "production of information" in M8 coded book, while M8 II coded book contains 6 contents. In addition, there is no content for "presentation of information" in the M8 II coded book.

3. How does the distribution of digital competence in science textbooks' chapters?

The distribution of the content for digital competence according to the sections in the Science textbooks is presented in Figure 11.

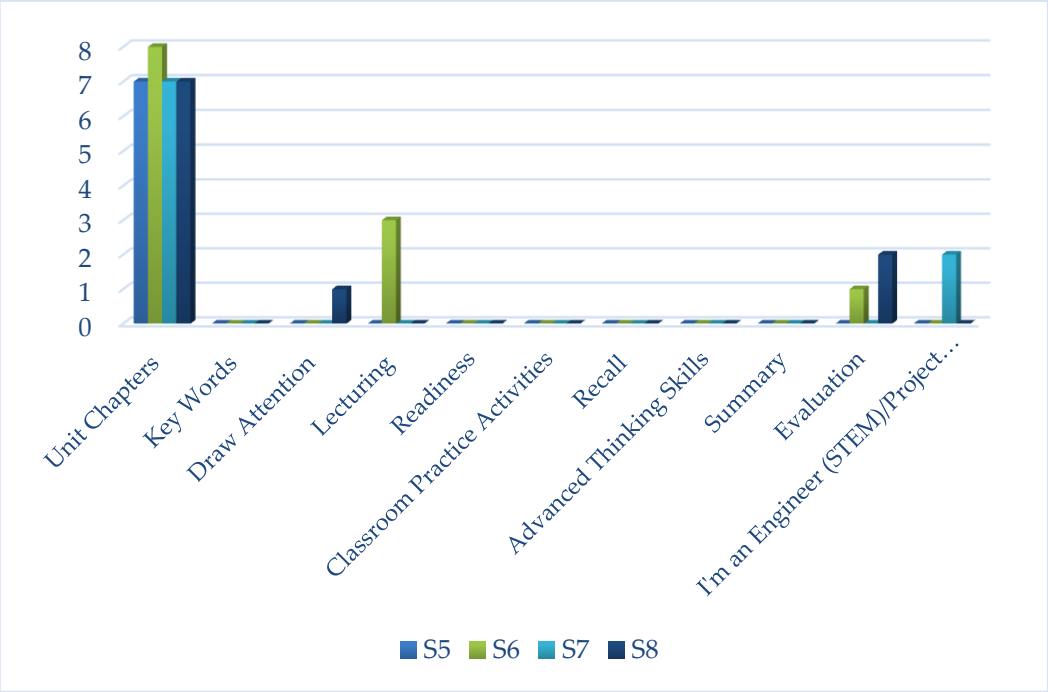

Figure 11. Frequency distribution of digital competency content in science textbook chapters by grade levels

According to Figure 11, there is digital competence content in the "unit chapters" section of every grade level in Science textbooks. While none of the chapters of the textbook in the 5th-grade, contains content for digital competence, it is seen that the content is determined in the "lecturing" section in the 6th-grade, in the "I am an engineer" section in the 7th-grade, and in the "attention" and "evaluation" sections in the 8th-grade.

4. How does the distribution of digital competence in mathematics textbooks' chapters?

In this section, the distribution of digital competence content according to the sections in the Mathematics textbooks is presented in Figure 12.

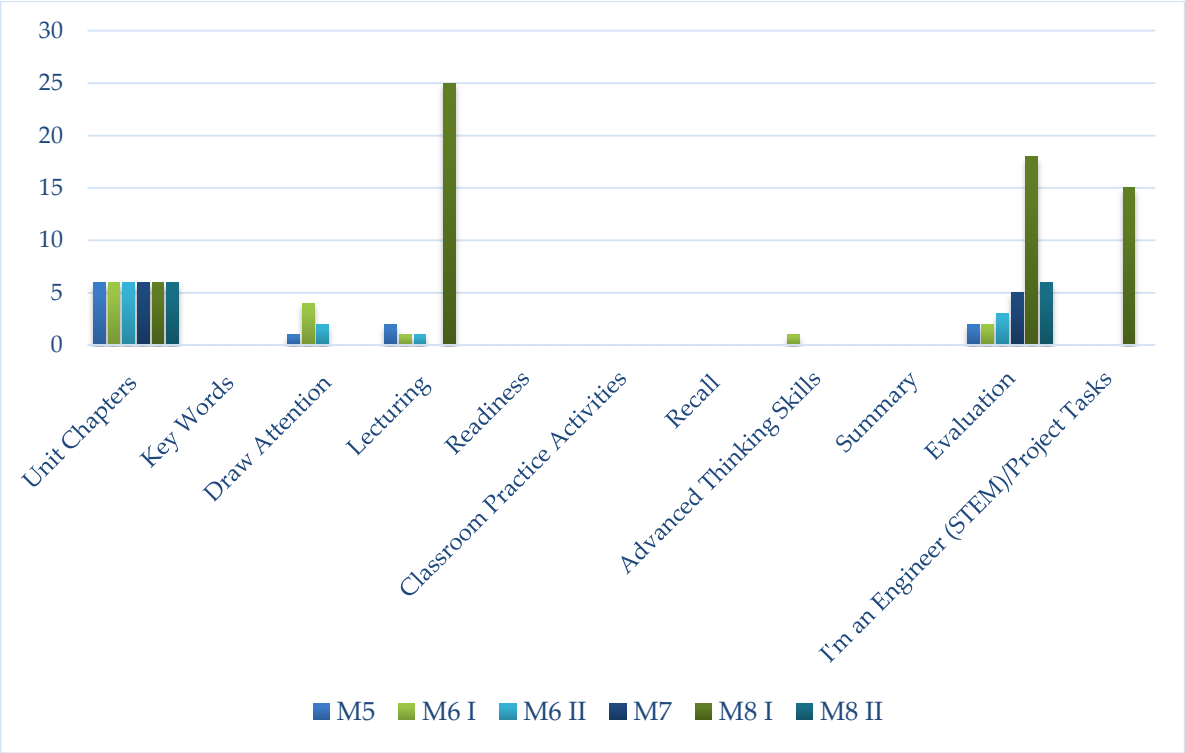

Figure 12. Frequency distribution of digital competency content in mathematics textbook chapters by grade levels

In Figure 12, it is seen that all of the Mathematics textbooks include content for digital competence in the "unit chapters". It is not possible to talk about a regular increase or decrease for the digital competency content based on grade level. We may say there is a higher number of digital competency content in M8 coded textbooks compared to other grade levels. In addition, there is a notable amount of content in the M8 coded textbook's sections of "lecturing", "evaluation" and "project tasks" compared to other grade levels. As we mentioned before that there are two books in the 6th and 8th-grade. Although there is no significant difference for the number of the content between the textbooks in the 6th grade, the 8th-grade Mathematics textbooks have numerically differed based on content for digital competence.

Examples for Digital Competency Dimensions

In this section, the findings related to the determined dimensions are presented with examples.

Access to Information

By one result of the study, the dimension of "access to information" was focused in both Science and Mathematics textbooks but determined that included more in Mathematics textbooks. In the "Access to information" dimension, QR codes are placed in the textbooks to reach the content in the EBA in general and are expected from students to reach the relevant

content. Another notable point here is while the relevant guidance is given only in the "unit chapters" in Science textbooks, determined that access to the related content of the EBA is provided with QR codes in the "lecture" sections of the Mathematics textbooks (Figure 13).

Figure 13. Examples of «access to information» content in science and mathematics textbooks (S5, p.17, M5, p.11)

Evaluation of Information

The criterion for evaluating information is also one of the essential criteria for digital competence. Similarly, the content that meets this dimension is rarely included in the textbooks (Figure 14).

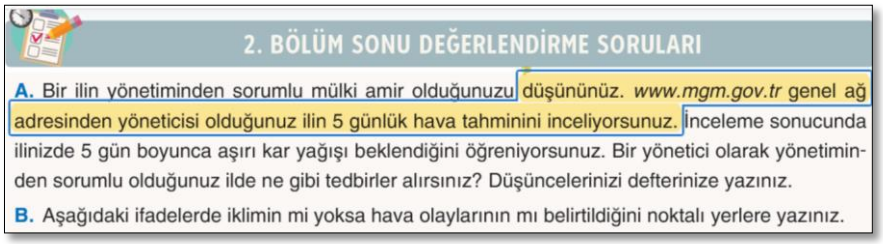

Figure 14. Example of «evaluation of information» in the science textbook (S7, 2018, p.21).

Retention of Information and Sharing Information

Another notable result obtained in the study is both Science and Mathematics textbooks do not include any content for "Retention of information" and "Sharing information".

Table 7. Number of contents for total digital competence in textbooks

	S(5-8) (f)	M(5-8) (f)
Access to Information	33	56
Evaluation of Information	1	1
Retention of Information	0	0
Production of Information	0	32
Presentation of Information	2	9
Sharing Information	0	0
Ethics and Safety	0	1

Production of Information

Another important result we obtained in the study is while there is no content for the "production of information" in science textbooks, Mathematics textbook contains a high number of contents.

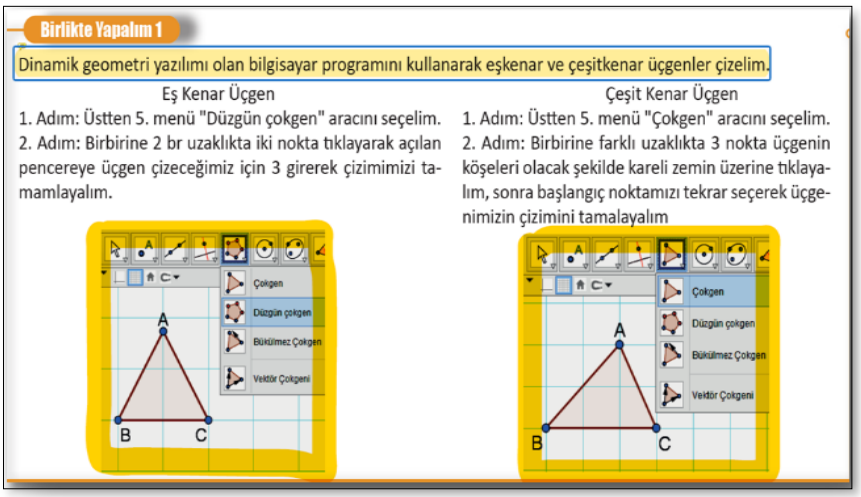

Figure 15. Example of «production of information» in the mathematics textbook. (M8 I, 2018, p.144).

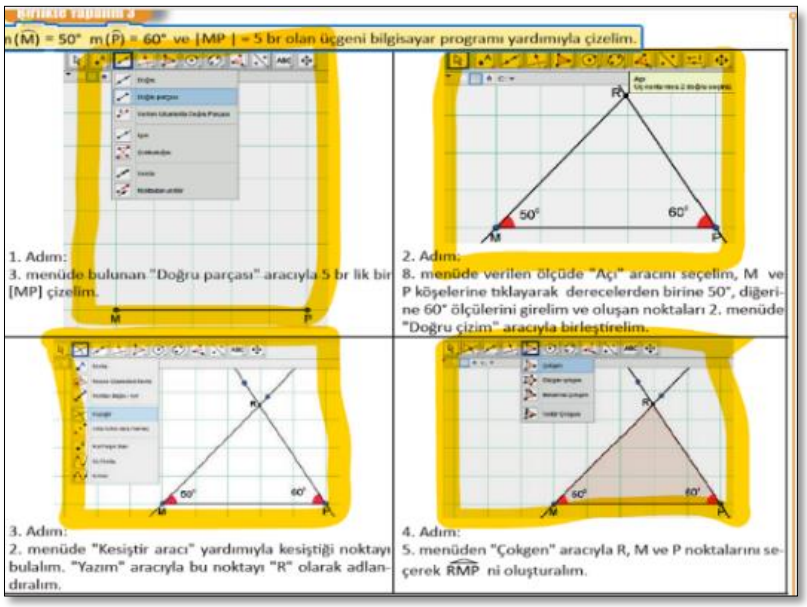

Figure 16. Example of «production of information» in the mathematics textbook. (M8 I, 2018, p.159).

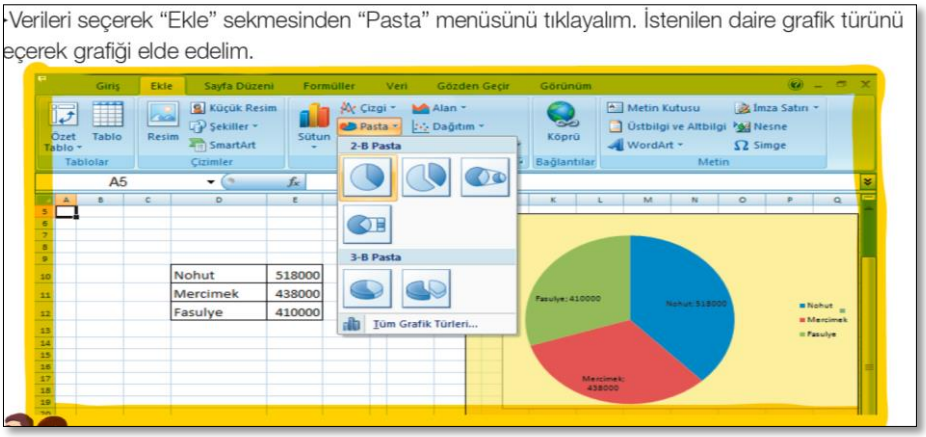

Figure 17. Example of «production of information» in the mathematics textbook. (M7, 2018, p.273).

Presentation of Information

The findings of the study show that Mathematics textbooks encourage students to make presentations via the internet or computer more than Science textbooks. Accordingly, regarding the "presentation of information" dimension, there are two contents in the science textbook, while there are nine contents in the mathematics textbooks.

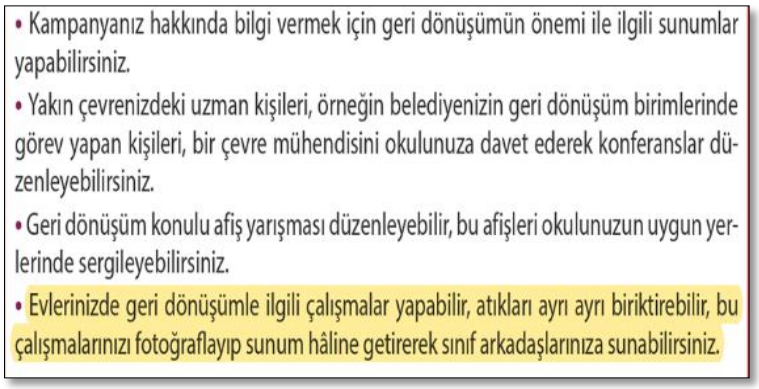

Figure 18. Example of «presenting information» in the science textbook. (S7, 2018, p.139).

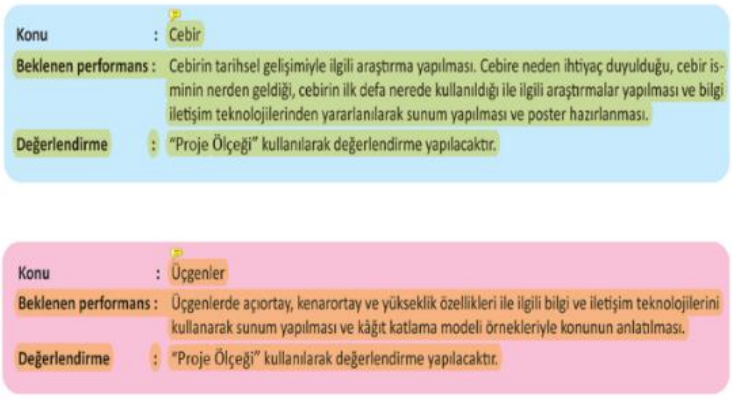

Figure 19. Example of «presenting information» in the mathematics textbook. (M8 I, 2018, p.232).

Ethics and Safety

"Ethics and safety" dimensions were determined only in the 8th-grade Mathematics textbook (**M8 I** coded textbook).

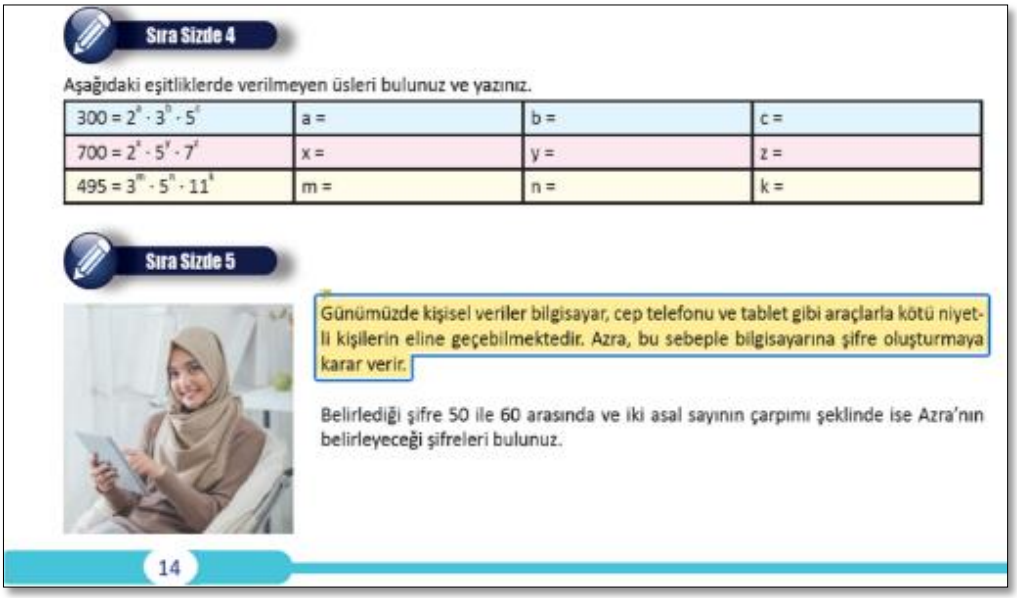

Figure 19. The example of "ethics and safety" in the M8 I coded textbook. (M8 I, 2018, p.14).

Discussion and Conclusion

According to the findings obtained in the research, Science and Mathematics textbooks do not include sufficient content for digital competence, but MoNE stated that acquiring competencies and values to students is the main purpose of the curriculums (MEB, 2018). However, it is seen that in many curricula, very little place is given to the achievements of digital competence (Kana & Kiler, 2021; Otuz, Kayabaşı & Ekici, 2018; Yüksel & Taneri, 2020). Ekmen and Bakar (2018) stated in their studies that there are activities, visuals, texts, and similar content that should be developed, will improve students' digital competence in the 2018 curriculum, while in the European Commission/EACEA/Eurydice (2019) report was mentioned that Turkey's national curriculum at primary education level clearly doesn't state digital competency and provide any content. Erstad (2008) and European Commission (2010) emphasized the importance of designing learning environments that include real-life applications to increase students' digital competence. Ekmen and Bakar (2018) in their study, were examined the "digital competency" state of curriculum and stated that the "Recognition of Technological Tools Encountered in Daily Life" course includes activities only in 3rd grade for Science and in 1st and 5th grade levels for Mathematics. According to the results obtained in the study, the

absence of digital applications and examples of daily life applications in textbooks supports this situation. In the study, it was determined that the content for digital competence in the textbooks from the 5th to the 8th-grades showed an uneven distribution. Kurudayıoğlu and Soysal (2020) state in their study that the learning goals for digital competence in the Turkish Course curriculum show a similar uneven distribution. Considering the spiral curriculum model, which is a presentation strategy of the curriculum the content for digital competence does not direct students to more specific topics as the grade level increases can be presented as another proof of this. Yalkın and Işık (2019) stated in their study there is no learning goal for digital competence in the Science curriculum from 5th to 8th- grade (except for one sub-achievement at the 8th grade). However, to the results of this study, all textbooks include content for digital competence. Considering that science and mathematics lessons are tried to be internalized with daily life examples, although it is not included as a learning goal in the curriculum, it can be said that this situation is since technology has a central place in many areas of our life, and it is an indication that technology has become undeniable in daily life. However, to make education activities planned, it is necessary to ensure harmony between the learning outcomes and the course materials such as textbooks. According to another result of the study, textbooks contain more content for "access to information". We can say that there is a redirection to the EBA content. It is noteworthy that the EBA platform is used only in terms of "access to information". However, after the establishment of the EBA platform and its widespread use during the pandemic period, it can be stated that there are programs or sections on this platform for storing or sharing the information obtained by students. Via the section "EBA File", groups can be created, and teachers can easily share their documents by predetermining which student group they will share. In this system, which gives 10 GB of space to teachers and 1GB of space to students, there are materials, activities, lectures, questions, and content to share with students and other teacher users on many different subjects (Aktay and Keskin, 2016). In addition, Tüysüz and Çümen (2016) stated that students use EBA in areas such as reinforcing topics, preparing for exams and repeating subjects, increasing their academic success, and find it beneficial and catchy. However, Fidan, Erbasan and Kolsuz (2016) state in their study that elementary school teachers don't have sufficient knowledge about EBA, and do not use EBA often but have the idea that EBA is a beneficial, effective, and productive site. Especially the internet environment has become such that all kinds of information where can be shared by thinking

twice, our students and teachers must be supported by MoNE on such a subject, and supplemental understanding that will enable them to benefit from this platform not only in the dimension of "access to information" but also in other dimensions should be included in the textbooks. Regarding “ethics and safety”, another dimension in the study, we have found one content in the 8th-grade level. However, this issue is essential because it is a subject that closely concerns the internet and all activities on the internet. Studies in the literature confirm that there are deficiencies in many curricula and textbooks on this issue. For example, Ekmen and Bakar (2018) reported that "Information Confidentiality and Safety on the Internet" and "Secure Internet Use" were only covered in Life Sciences, Social Studies, and Turkish Lessons. Accordingly, it's noteworthy that this important dimension to which students should pay attention while gaining or sharing information in the virtual world is given only at the primary education level. However, Kaşıkcı, Çağıltay, Karakuş, Kurşun and Ogan (2014) state in their study children in the 9-16 age group do not have enough knowledge about internet use, they are faced with many risks, and families do not have the knowledge to keep children away from these risks. Another element identified in the textbooks is there is content for digital competence in the books, but there is no chance for the students to examine this ability. For example, in the 8th grade, geometric shapes are drawn with a computer program many times (M8). However, there is no question for this skill in the "I Evaluate Myself" activity at the end of the unit. Due this reason, evaluation strategies for digital competency content in textbooks should also be included. Although the aim of this study was not to compare the books with each other, it was determined that there were serious differences between the books belonging to the MoNE, especially in terms of the “production of knowledge”. In this respect, it is beneficial to consider the equality of the content for all the competencies and values that are planned to be acquired while preparing the textbooks.

Suggestions

Although many sections are insufficient in both Science and Mathematics books, according to the results obtained in this research, there are subjects and activities for students to gain digital competence in accessing information, evaluating, producing, ethics and safety. However, content like EBA applications and other applications like simulation, video, animation, etc. where they can access over the internet isn’t included. EBA QR code or link of video, animation, interactive applications can be given specifically for the subject. In cases

where the digital competence of the teacher is not sufficient, it may be beneficial to include such content within the teacher. It's determined that there is a gap between the content in the textbooks and the learning goals expected to gain by the students in the curriculum in terms of digital competence. It should be ensured that the content which will gain digital competence is included in an adequate and balanced manner to consider the situation for the updates to be made in the curriculums. According to the Eurydice (2019) report, more than half of European countries have been using digital competence as a interdisciplinary/ cross-curricular theme in primary education. For example, Ireland, Czechia, Lithuania, France, Spain, Sweden, Italy, Southern Cyprus, Slovenia, and Liechtenstein offer digital competence by integrating it with other compulsory subjects. A quarter of education systems combine these two approaches. In our country, an interdisciplinary approach can be adopted to bring digital competence to our students and teachers, and it can be integrated into Science and Mathematics curricula and textbooks. Guidebooks can be prepared to guide teachers in developing their students' digital competencies. Children at the age of 9-12 want to know everything before puberty with the motivation to know and learn, and they have realized the importance of the internet at the point of research and learning (Kocakaya, Ersin, Baş, Ak, Şahin & Yosunkaya, 2019). This situation and process brings with it positive and negative knowledge learning and gaining habits. For this reason, the "ethics and safety" dimension should be added to the Science and Mathematics textbooks, which are the base field courses. In future studies, activities, subjects, or unit designs in which digital competency is integrated can be realized within a framework by selecting units from Science and Mathematics textbooks, and studies should be carried out for the digital competence framework of our country, which includes hardware and pedagogical integrity.

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Author Contribution Statement

***Meral ÇELİKOĞLU*:** *Methodology, data collection, data analysis, review and editing.*

***Erol TAŞ*:** *Methodology, review-writing and editing.*

***Hayrunisa AYYILDIZ*:** *Writing literature, introduction, data collection, data analysis*

Hacı Mehmet YEŞİLTAŞ: *Writing literature, introduction, data collection, data analysis.*

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