Text Readability Level Investigation about Biology Subjects-related Units in 'Science 7 Textbook'

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ABSTRACT This study investigates text readability level investigation about biology subjects-related units in 'Science 7 Textbook'. A document analysis method was used in this study based on a qualitative research approach. The textbook, which has been used since the 2019-2020 academic year, has been selected as the study material. In the textbook, a total of 15 texts were randomly determined from two units related to biology subjects, one for each of the learning outcomes specified in the 2018 Science Course Curriculum. In calculating the readability levels of the texts, the 'Ateşman Readability Formula' was used. The findings obtained as a result of the analysis showed that the overall readability levels of the texts in both units were in the 'medium difficulty' category. Furthermore, when the findings of each unit were examined on a subject basis, it was determined that the texts belonging to all of the topics included in both units (Cell and Divisions, Reproduction, Growth and Development in Living Beings) were found in the 'medium' category. These findings were interpreted as the science textbook prepared for the seventh grade for the student level in terms of readability.

Keywords Sciences, Biology, Textbook, Readability

1. INTRODUCTION

People learn new things from the moment they are born and try to apply them in their lives. The most critical period of this life-long event is the education and training process in schools. Therefore, one of the primary objectives of the education and training process in schools is to prepare the individual for daily life and understand the events they encounter (Coştu, Ünal, & Ayas, 2007). If the events and phenomena we encounter in daily life are compared with the lessons given in schools, it will be seen that they are very close to science. This shows how essential fields of science such as biology, physics, and chemistry are in preparing the individual for life. Today, the contributions of the learning outcomes to the individual's life are clearly stated in the Science Education Program. Thanks to the learning outcomes in the Science Education Program, students can solve the problems they encounter in their lives, establish healthy communication with their environment, produce information themselves, and develop critical thinking skills (MEB, 2018). Therefore, the importance of science in our lives is seen when we look at the benefits of science in the curriculum. This situation reveals the necessity of providing students with adequate science education.

In almost every field, including science teaching, many factors need to be considered to carry out the education-teaching process effectively. One of them is the materials used in the courses. Duman (2013) emphasizes the importance of materials by stating that course materials support learning, make the course more interesting, and provide permanence in the knowledge learned. Furthermore, considering the effect of the science course on the individual's life and considering the low academic achievement in the field of science, it becomes clear that the course materials courses should be evaluated because the use of materials in science courses is a critical situation compared to other courses (Kaptan, 1999).

Textbooks are essential material used regularly in courses. In our country, textbooks are preferred primarily due to factors such as their systematic content, style of expression, language, the accuracy of scientific information, visual design layout, and factors such as

suitability to students' levels, accessibility, and low cost (Uçar & Somucuoğlu Özerbaş, 2017). Furthermore, Demirbaş (2008) described textbooks as teaching materials that complement the achievement of teaching objectives. Therefore, textbooks can be defined as educational materials that contain texts prepared by taking into account the affective and cognitive skills of the student according to the age and knowledge level of the student and provide the information that the student needs to acquire (Çiftçi, Çeçen, & Melanlıoğlu, 2007).

Since textbooks are used in schools located in rural areas and schools located in more central regions, they are the only teaching materials that offer students opportunity equality in education. In this respect, it is essential to prepare and evaluate the textbooks used at all levels of education throughout the country and have a significant place for teachers and students in the teaching process (Sungur Gül & Marulcu, 2014; Tekbıyık, 2006). In the preparation and evaluation of the textbooks, the Ministry of National Education (MEB) regulation should be followed. In the 6th article of the Ministry of National Education's Textbooks and Education Materials Regulation (2012), the qualifications of the textbooks are clearly stated. Considering these qualities, it is seen that the textbooks should be supportive of learning outcomes in terms of content, should support learning, should not contain scientific errors, and also what qualifications should be in terms of design (MEB, 2012). The principle to be adopted while preparing the textbooks is to include activities where students can gain the behaviors, knowledge, skills, and characteristics targeted in the curriculum (Ünsal & Güneş, 2002). Textbooks are materials that contain the entirety of scientific knowledge and skills related to learning outcomes, enable them to be reinforced with activities, and concretize abstract concepts with various visuals. Failure to concretize abstract science concepts is also one of the most critical factors of failure in science. Especially in biology subjects, there are highly abstract concepts. At the same time, Latin terms and new topics are frequently encountered by students. Biology is one of the most challenging courses for teachers and students due to its scope to understand (Gül, 2019). Textbooks can effectively visualize abstract concepts, make them concrete, and comprehend the topics and terms encountered for the first time more efficiently. For this reason, textbooks become an essential material in the fields of science, especially biology. Considering the importance of textbooks in education, many studies are carried out to evaluate textbooks.

In our country, it is seen that the studies on science textbooks in recent years have increased compared to the past (Akçay, Akçay, & Kahramanoğlu 2017; Bakır, 2018; Bakırcı & Öçsoy, 2017; Bakırcı & Gülseven, 2018; Bolat & Uluçınar Sağır, 2020; Duruk & Akgün, 2020; Eroğlu Doğan, Ekinci, & Doğan, 2020; Kardeş, 2018; Kaya, 2019;

Kırtman, 2019; Özdemir & Yanık, 2017; Polat & Sarıtaş, 2017; Selçuk, 2019; Yücel & Karamustafaoğlu, 2020). Among these studies, Özdemir and Yanık (2017) examined the fifth-grade textbook in terms of activities. They investigated how much the activities enabled students to collect and analyze data and make inferences by using and presenting the data. Akçay et al. (2017) examined the sixth, seventh and eighth-grade science textbooks according to the Bloom Taxonomy and investigated to what extent they included the cognitive domain steps. Duruk and Akgün (2020) investigated the suitability of science books to the nature of science and concluded that textbooks could not adequately represent the components of the nature of science. In his master's thesis study prepared by Selçuk (2019), he examined the visual and educational designs of science textbooks taught from the Tanzimat Period to the Republic Period. As a result of the examination, it is seen that the physical characteristics of the books are compatible and that the books are generally suitable for the curriculum.

On the other hand, Polat and Sarıtaş (2017) investigated the compatibility of the learning outcomes with the textbooks and how the learning outcomes are given in the textbooks based on the teachers' opinions. Pekel (2019) identified misconceptions and scientific errors by examining the language and expression, pedagogy, and visuals of biology topics in the eighth-grade textbook. Bakırcı and Öçsoy (2017) investigated how life skills related to "entrepreneurship" are related to activities in science books. On the other hand, Kardeş (2018) investigated whether the current information about atomic models in the seventh-grade textbooks and the scientists who revealed them was sufficient and concluded that it was insufficient.

The study conducted by Bakırcı and Gülseven (2018) examined the level of interest, arousing curiosity, and visuality of the fifth-grade textbook by taking the teachers' opinions. In addition, however, Bakır (2018) examined the unit-end questions of science textbooks cognitively and structurally. Yücel and Karamustafaoğlu (2020), on the other hand, took the teachers' opinions about the fifth and sixth-grade textbooks and examined the contents, activities, experiments, and the teaching approach used.

When the studies given above are evaluated, it is seen that the textbooks were examined in terms of features, such as content, learning outcomes suitability, design, and visuality. All of these features examined have great importance in making textbooks more efficient. However, another feature that should be considered is the readability level of the texts in the textbooks. Textbooks, which are widely used in the teaching process, must be readable for all levels of education (Özay Köse, 2009). Gül (2019) states that the physical characteristics of the textbooks should be prepared following specific qualifications to carry out the teaching effectively by transferring the content in the curriculum. No matter how well a textbook is prepared in

terms of content, visual elements, being free from scientific errors, subject integrity, and compliance with the learning outcomes, when the readability level of the texts in the book is difficult, it becomes difficult for them to be understood. The readability of a text is related to the reader's understanding of the text as simple or complex (Ateşman, 1997). Students must understand what they read to understand the information in the book better and concretize abstract concepts. The fact that the readability level of the textbooks is suitable for the student level will make it easier to understand the subjects (Ulu Kalın & Koçoğlu, 2017).

For this reason, the texts in the textbooks should be selected carefully. Çiftçi et al. (2007) emphasize reading to realize learning and the importance of text selection. In addition, readable texts affect students' reading habits. A text that is difficult to read can affect students' reading habits and cause them to stay away from books.

The features that affect the readability of a text are the number of words in the sentences, syllables, ideas to emphasize, and the continuity of the ideas (Tekbıyık, 2006). Grafstein (2001) states that readability also depends on factors such as the style of the text, grammar features, the information it contains, and consistency (as cited in Benjamin, 2012). Quantitative features of texts such as sentence, word length, and unknown words are generally in the foreground in determining the difficulty of the text (Zorbaz, 2007). The more words used in a sentence, the less readability of the text decreases (Bezirci & Yılmaz, 2010).

Multiple measuring tools can be used to measure the readability of texts. the Dale Cale Formula, Gunning Formula, Fry Readability Chart, Flesch Readability Formula adapted to Turkish texts by Ateşman (1997), Smog Formula, Cloze Formula, Sönmez Formula and Çetinkaya-Uzun formula, which was developed by Çetinkaya and Uzun (2010), are examples of these measurement tools (Arslan & Özpınar, 2009; Bağcı & Ünal, 2013; Özay Köse, 2009). These formulas are based on the words and the length of the sentences in the texts (Durukan, 2014). Formulas developed in a foreign language cannot be used comfortably in texts written in another language. Since the structure and rules of each language are different, these formulas may not give reliable results (Zorbaz, 2007). In order to obtain reliable results, the formula used must be adapted to the text language. In our country, it is seen that Flesch Readability Formula was first translated into Turkish by Ateşman (1997). The formula of Ateşman (1997), which is frequently preferred in many studies on readability in our country, can be used for texts analysis suitable for all levels in Turkish. There are few readability studies in our country for science in general and biology in particular regarding this subject. The studies conducted by Çepni, Gökdere, and Taş (2001), Çakmak and Çil (2014), Dikmenli, Çardak, and Altunsoy (2008), Gül

(2019), Gül, Özay Köse, and Diken (2020), Güven (2010), Özay Köse (2009), Tekbıyık (2006), Ünsal and Güneş (2002) are examples of these. When these studies are examined, Çakmak and Çil (2014) examined the readability of the texts in the "The Case of Exploring and Knowing the World of Living Creatures" unit in the fourth-grade science textbook. The findings obtained showed that the difficulty level of the texts was medium, and the text was understandable. Gül (2019) investigated the readability of the texts in the tenth-grade biology textbook and stated that the readability level of the book, in general, was difficult. Gül et al. (2020) examined the readability level of the texts in the ninth-grade biology textbook, and it was observed that the readability in the texts was difficult. Supporting these findings, Özay Köse (2009) states that biology is more difficult when compared to other science fields in terms of reading difficulty and attributes this to various principles, theories, and concepts in biology. Of course, considering the abstract concepts and terms contained in biology topics, readability should not be difficult, and the texts should be understandable to increase academic success. On the other hand, when the studies on biology subjects mentioned above are evaluated in general, it is seen that these are done with textbooks prepared for biology lessons at secondary education levels. Therefore, it becomes necessary to examine whether a similar situation exists for the biology subjects in the science textbook prepared for the lower levels of education. At this point, because of the lack of studies examining the readability level of biology subjects within the scope of the science lesson, and the existing studies were carried out directly on biology textbooks, the units for biology subjects in the seventh-grade science textbook were examined in this study.

1.1 Purpose of the study

This study examines the readability levels of the texts in the units for the field of biology (Unit-2: Cell and Divisions, Unit-6: Reproduction, Growth, and Development in Living Beings) in the seventh-grade science textbook.
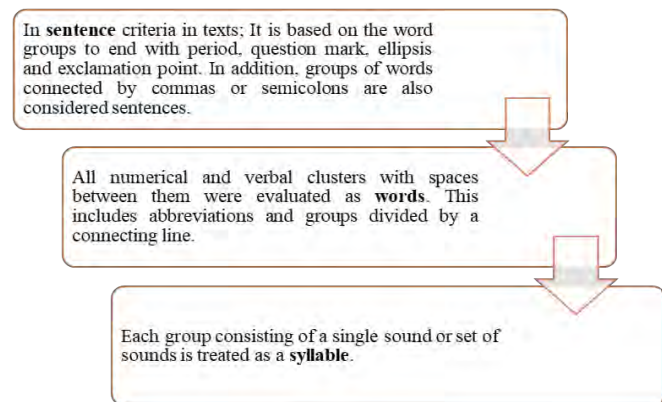
2. METHOD

This section includes information about the research design, study material, data collection, and data analysis process.

2.1 Research design

The study design is based on a qualitative research approach. However, the texts of the textbook in the study were analyzed with the method of document analysis. The document analysis method is based on the systematic analysis and examination of written materials to provide information about the case(s) to be studied. In a qualitative study, document analysis can be only a data collection tool, or it can be used with other data collection methods (Yıldırım & Şimşek 2005).

Table 1 General information about unit-2 and unit-6 in the textbook

Unit no	Unit Name	Number of learning outcomes	Time/course hours	Rate (%)
Unit 2	Cell and Divisions	8	16	11.1
Unit 6	Reproduction, Growth, and Development in Living Beings	7	18	12.5
Total		15	34	23.6

In **sentence** criteria in texts; It is based on the word groups to end with period, question mark, ellipsis and exclamation point. In addition, groups of words connected by commas or semicolons are also considered sentences.

All numerical and verbal clusters with spaces between them were evaluated as **words**. This includes abbreviations and groups divided by a connecting line.

Each group consisting of a single sound or set of sounds is treated as a **syllable**.

Figure 1 Criteria for sentences, words, and syllables

2.2 The study material

Secondary School and Imam Hatip Secondary School Science 7 Textbooks were chosen as the study material. The Ministry of National Education [MEB], the Board of Education and Discipline, has published the board of Education and Discipline, with the board decision dated 18.04.2019 and numbered 8, for a period of five years starting from 2019-2020 academic year. The units of biology subjects in the textbook, the number of learning outcomes, anticipated time/course hours, and percentages of course hours are given in the Science Education Program (MEB, 2018) as follows.
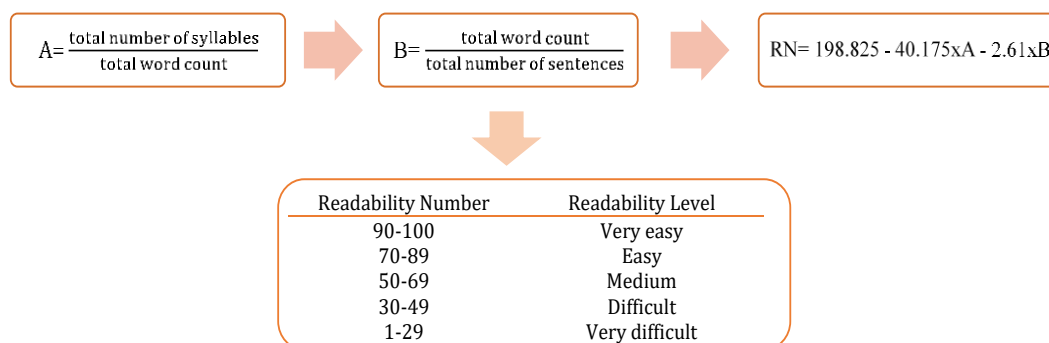
As seen in Table 1, there are two units for the field of biology in the textbook: Cell and Divisions (Unit-2) and Reproduction, Growth, and Development in Living Things (Unit-6). While there are three topics and eight learning outcomes in Unit-2, Unit-6 includes two topics and seven learning outcomes. At the same time, concerning the number of learning outcomes and course hours, it is

understood that their proportions are close to each other in both units.

2.3 Data collection and analysis process

In the study, the learning outcomes of the relevant units were taken as a basis in the selection of the texts to be analyzed in the textbook. Accordingly, texts as many as the learning outcomes specified in the curriculum were selected for each unit. In addition, care was taken to select the texts from the sections related to the relevant learning outcomes and to include at least 100 words. Accordingly, a total of 13 texts, eight for Unit-2 and seven for Unit-6, were selected, and their readability levels were examined. Considering that each language differs in terms of grammar and that the readability formulas developed in the literature were prepared based on the English language structure (Ulu Kalın & Aydemir, 2017), it was deemed appropriate to use the Ateşman readability formula developed following the Turkish language for this study. Accordingly, the readability levels of the texts selected in the study were determined using the readability formula adapted by Ateşman (1997) from Flesch (1948) to Turkish. Making the necessary calculations using the Ateşman formula requires knowing the number of sentences, words, and syllables in the selected text. In determining these (sentence-word-syllable), the criteria put forward by Mirzaoğlu and Akın (2015) were taken into account (Figure 1).

After determining the number of sentences, words, and syllables in each text, average word length (A) and average sentence length (B) were calculated with the following formula. Later, these values were replaced in the formula of Ateşman (1997), and the readability number (RN) of each text was calculated. Finally, these values were

$$A = \frac{\text{total number of syllables}}{\text{total word count}}$$

$$B = \frac{\text{total word count}}{\text{total number of sentences}}$$

$$RN = 198.825 - 40.175 \times A - 2.61 \times B$$

Readability Number	Readability Level
90-100	Very easy
70-89	Easy
50-69	Medium
30-49	Difficult
1-29	Very difficult

Figure 2 Ateşman's readability formula and readability levels

Hücrelerden bazıları belli bir büyüklüğe ulaştığında sayılarını arttırmak için bölünür. Buna hücre bölünmesi adı verilir. Hücre bölünmesi bir hücrenin sayısını artırmak için geçirdiği evrelerin tamamını kapsar. Bu evreler sonucu oluşan hücrelerin sayısı ve özellikleri bölünme çeşidine göre farklılık gösterir. Bölünme çeşitlerinden biri mitozdur. Mitoz; bazı canlılarda büyümeyi, bazılarında hasarlı dokuları onarmayı, bazılarında ise üremeyi sağlar. Bu şekilde bölünen her hücre için mitozun önemi farklıdır. Toprağa dikilen küçük bir fidan, bir süre sonra büyüyerek büyük bir ağaca dönüşür. Ağacın enine ve boyuna büyümesi için hücre sayısının artması gerekmektedir. Hücre sayısındaki bu artış mitozla sağlanır. Bir tohumun çimlenmesi sonucu yeni bitki oluşumu da bu şekilde gerçekleşir.

A: 2.81   B: 9.46   RN: 60.04
RL: MEDIUM

Figure 3 A sample text from the unit 'cell and divisions'

Eşeyli üreme hem bitkilerde hem de hayvanlarda görülebilir. Erkek üreme hücresi bitkilerde erkek organ tarafından oluşturulur ve buna polen adı verilir. Dişi üreme hücresi ise dişi organda oluşturulan yumurtadır. Bitkilerde polen ve yumurtanın döllenme yoluyla birleşmesi sonucu yeni birey meydana gelir. Çiçekli bir bitkide polen ve yumurtanın oluştuğu kısımlar aşağıda gösterilmiştir. Eşeysiz üreme hem bitkilerde hem de hayvanlarda görülebilen bir üreme çeşididir. Ayrıca bazı tek hücreli canlılarda görülür. Bu üreme şeklinde sperm ve yumurtaya ihtiyaç olmadığı için döllenme gerçekleşmez. Bunun sonucunda canlı çeşitliliği artmaz, sadece birey sayısı artar. Bu üreme şekli daha çok basit yapılı canlılarda görülür. Eşeysiz üremede, eşeyli üremeye göre çok daha kısa sürede üreme gerçekleşir. Eşeysiz üremenin farklı türleri vardır.

A: 2.74   B: 9.42   RN: 64.16
RL: MEDIUM

Figure 4 A sample text from the unit 'reproduction, growth, and development in living things'

evaluated according to the readability levels (RL) developed by Ateşman (1997) (Figure 2).

During the analysis process of the study, the texts were divided into sentences, words, and syllables by both researchers, and the necessary calculations were made. Below is an example of texts selected from two units in the study (Figure 3, Figure 4).

Figure 3 is given an example text for the learning outcomes, namely 'F.7.2.2.1: Explains the importance of mitosis for living things' in the 'Cell and Divisions' unit. When the text was examined, it was seen that it consisted of 11 sentences, 104 words, and 295 syllables. Therefore, according to the category of Ateşman (1997), the readability level of this text was determined as 'medium difficulty'.

In Figure 4, it is given an example text for the learning outcomes, namely 'F.7.6.2.1: Compares the reproduction types in plants and animals in the 'Reproduction, Growth and Development in Living Organisms' unit.

When Figure 4 is examined, it is seen that the selected text consists of 12 sentences, 113 words, and 310 syllables. According to the category of Ateşman (1997), this text's readability was 'medium difficulty'.

3. FINDINGS

Each of the 15 texts belonging to the two units examined in the study, the subject area, the learning outcomes, the topic title from which the text is selected, average word length (A), average sentence length (B), readability number (RN) and readability level (RL) are given in Table 2 and Table 3.

When Table 2 is examined, it was determined that the general readability level for all the texts of Unit-2 in the textbook is 'medium difficulty' (RN = 53.55). However, it was observed that the highest RN value belongs to the text 'cell-tissue-organ-system-organism relationship' (RN = 68.20). In contrast, the lowest RN value belongs to the text titled 'structure of the cell from past to present (RN = 33.26). On the other hand, it was determined that two of the eight texts examined fall into the 'difficult' category.

When the analysis results were examined on a subject basis, the general average of the readability levels of the texts of all three subjects was included in the "medium difficulty" category. Findings of Unit-6 in the study are given in Table 3.

When Table 3 is examined, it has been determined that the general readability level for all the texts of Unit-6 is 'medium difficulty' (RN = 59.13). However, it was observed that the highest RNvalue belongs to the text 'Factors affecting growth and development in plants and animals' (RN = 71.63), while the lowest RN value belongs to the text titled 'from zygote to baby' (RN = 39.17). On the other hand, it was determined that one of the seven texts analyzed is in the 'difficult' category and the other in the 'easy' category. When the analysis results are analyzed on a subject basis, the general average of the readability levels of the texts belonging to both subjects was included in the "medium difficulty" category.

4. DISCUSSION

In this study, the readability levels of the texts in two units containing biology subjects in the Middle School and Imam Hatip Secondary Schools Science Textbooks 7, which were accepted as textbooks for five years from the 2019-2020 academic year, were examined. As a result of the examinations, it was concluded that the general readability of each unit of biology subject in the textbook was at a medium level. Accordingly, it can be said that the texts for the relevant units were appropriately written in terms of suitability to the student level.

When the studies examining the readability level of textbooks are examined, we come across studies that examine the readability of textbooks for different class levels and different courses in Turkey. Gül (2019) drew attention to the fact that the studies on this subject have gained more intensity, especially in the last fifteen years. When the studies on the readability level of the textbooks were examined, for example, 50 storybooks included in a story set prepared for preschool were examined by Çeçen

Table 2 Analysis results for the 'cell and divisions' unit

Subject Area	Learning outcome	Topic-title	A	B	RN	RL
F.7.2.1. The Cell	F.7.2.1.1. Compares animal and plant cells in terms of their essential parts and functions.	Cell and parts of the cell	2.88	10.18	56.55	Medium
	F.7.2.1.2. Discusses the views on the cell structure from the past to the present concerning technological developments.	The structure of the cell from the past to the present	3.32	12.33	33.26	Difficult
	F.7.2.1.3. Explains the cell-tissue-organ-system-organism relationship.	Cell-tissue-organ-system-organism relationship	2.59	10.18	68.20	Medium
Mean score			**2.93**	**10.90**	**52.67**	**Medium**
F.7.2.2. Mitosis	F.7.2.2.1. Explains the importance of mitosis for living things.	The importance of mitosis for living things	2.84	9.46	60.04	Medium
	F.7.2.2.2. Explains that mitosis consists of different phases that follow each other.	The stages of mitosis	2.98	11.44	49.25	Medium
Mean score			**2.91**	**10.45**	**54.65**	**Medium**
F.7.2.3. Meiosis	F.7.2.3.1. Explains the importance of meiosis for living things.	The importance of meiosis for living things.	3.24	10.90	40.21	Difficult
	F.7.2.3.2. Demonstrates on the model how meiosis occurs in reproductive mother cells.	How does meiosis occur?	2.77	9.35	63.14	Medium
	F.7.2.3.3. Compares the differences between meiosis and mitosis.	The differences between meiosis and mitosis	3.04	7.69	56.62	Medium
Mean score			**3.02**	**9.31**	**53.32**	**Medium**
Overall mean score			**2.95**	**10.22**	**53.55**	**Medium**

and Aydemir (2011). When examining the readability level of the books, the Ateşman formula was used. As a result of the study, it was revealed that the texts in the books differ in terms of readability level and these differences showed a change generally classified as very easy-easy-medium difficulty. When the literature for higher levels of education was examined, a similar study was conducted by Mirzaoğlu and Akın (2015) at the fifth-grade level. In the study, the texts in the Turkish textbook prepared for fifth graders were analyzed according to the Ateşm an formula.

The findings showed that the readability levels of the narrative texts were higher than the informative texts. Another similar study was conducted by Çiftçi et al. (2007). On the other hand, these researchers analyzed the prose texts in the Turkish textbooks prepared for the sixth grade using the Ateşman formula. The findings obtained in the study showed that the sentences and word lengths that make up the narrative texts in the book are shorter compared to the informative texts. Therefore, these findings were interpreted as the high readability level of the narrative texts. A different process was followed in a study conducted by Durukan (2014) at the seventh-grade level. In this study, the researcher examined the relationship between the readability levels of the texts in the Turkish textbook, the reading speed, and comprehension of the

texts. In addition to the readability scores calculated using the Ateşman formula, the students' reading speed was determined with the data obtained from the reading comprehension test. As a result of the study, it was determined that the students' reading speed and comprehension levels showed statistically significant differences according to the readability levels of the texts. In another study, Bağcı and Ünal (2013) examined the eighth-grade Turkish textbook. As a result of the analysis, it was concluded that the readability of the analyzed texts was mainly at a medium level. Therefore, the reading level of the book was sufficient for students. Finally, Okur and Arı (2013) examined Turkish textbooks prepared for different grade levels. According to the findings of the study, it was observed that the readability level of the texts in the textbook was easy, and the readability level of the texts increased as the grade level increased.

When the studies given above are evaluated in general, it is seen that all of them are for Turkish textbooks and the readability level of the texts is suitable for the student level. However, there are studies that examine textbooks in the field of social sciences (Ulu-Kalın & Koçoğlu, 2017), mathematics (Çelik, Çetinkaya, & Yenmez, 2020), geography (Geçit, 2010) and sciences (Çepni et al., 2001; Güven, 2010; Tekbıyık, 2006) on readability in our country.

Table 3 Analysis results for the unit 'reproduction, growth and development in living things'

Subject Area	Learning outcome	Topic-title	A	B	RN	RL
F.7.6.1. Reproduction, Growth, and Development in Human	F.7.6.1.1. Explains the structures and organs that enable reproduction in humans by showing them on a diagram.	The structures and organs that enable reproduction in humans	3.02	8.33	55.76	Medium
	F.7.6.1.2. Explains the relationship between sperm, egg, zygote, embryo, fetus, and baby.	From zygote to baby	2.68	9.73	65.76	Medium
	F.7.6.1.3. Discusses the measures to be taken for the healthy development of the embryo based on research data.	From zygote to baby	3.24	11.30	39.17	Difficult
Mean score			**2.98**	**9.79**	**53.56**	**Medium**
F.7.6.2. Reproduction, Growth, and Development in Plants and Animals	F.7.6.2.1. Compares the reproduction types in plants and animals.	The reproduction types in plants and animals	2.74	9.42	64.16	Medium
	F.7.6.2.2. Explains the growth and development processes in plants and animals by giving examples.	Growth and development in plants and animals	2.88	8.41	61.17	Medium
	F.7.6.2.3. Explains the primary factors affecting the growth and development of plants and animals.	the factors affecting the growth and development of plants and animals	2.73	6.71	71.63	Easy
	F.7.6.2.4. Takes care of a plant or animal and reports its development process.	Factors affecting growth and development in plants and animals	2.69	11.09	61.81	Medium
Mean score			**2.76**	**8.91**	**64.69**	**Medium**
Overall mean score			**2.87**	**9.35**	**59.13**	**Medium**

However, it is noteworthy that the number of studies examining the readability level of the texts in the textbooks in terms of biology subjects is quite limited. Therefore, considering the studies conducted on biology subjects at the secondary education level, it is concluded that the readability levels of textbooks are mostly difficult (Blystone, 1987; Gould, 1977; Gül, 2009; Gül et al., 2020; Kennedy, 1979; Soyibo, 1996; Wright, 1982).

As stated before, one of the essential criteria sought in a textbook is the fluency, simplicity, and readability of the language used, and its content being free from scientific errors (Altun, Arslan, & Yazgan, 2004; Köseoğlu et al., 2003). The readability of texts depends mainly on the number of sentences, words, and syllables that make up the texts (Çakmak & Çil, 2014). Of course, from a language structure point of view, especially the number of foreign terms used in Turkish texts may also affect the understandability of the subject, hence its readability. Özay-Köse and Gül (2016) stated that the frequency of using foreign terms could affect students' perception and learning. In the literature, the readability levels of especially high school biology textbooks are difficult because the subjects are more detailed in the upper-grade levels than the lower grade levels. Therefore, foreign terms are used more. The study's findings examining the texts on biology subjects at lower levels of education reveal that the readability levels of the examined texts are primarily of medium difficulty (Çakmak & Çil, 2014).

Similarly, this study was determined that the texts of the two units examined in the textbook for the seventh graders were readable at a medium level. This finding may be because the subject's content is more straightforward in lower levels of education, and the texts are written more simply following the student level, and foreign terms are less preferred. In other words, it can be said that scientific and technical concepts were used in a balanced way in the book, and the words in the texts were selected according to the class level.

When the study's findings are examined on a subject basis, it is seen that the readability of the texts on the cell subject is generally at a medium level. A similar study on the cell subject was conducted by Özay Köse (2009) by examining the ninth-grade biology textbook. Özay Köse (2009) compared the texts on the cell subject using different readability formulas. At the end of the research, it was concluded that the texts according to the Ateşman formula are suitable for the students' level. A similar study on the cell topic was made by Keskin, Gül, and Özay Köse (2018) using the Ateşman formula, and the findings of the study showed that the readability levels of the texts were moderate. In a study by Gül (2019), it was found that the readability level of the texts in the cell and divisions unit in the tenth-grade biology textbook is difficult.   The

researcher interpreted this finding as that the topics in the upper classes contain more complex information and that more foreign terms are used. When the learning outcomes of this unit were examined in the seventh-grade science curriculum, it was emphasized that, unlike secondary education, many concepts should be explained more simply, or some concepts should not be mentioned (MEB, 2018). For example; when the learning outcomes in the program are examined, it is highlighted that the detailed structures of the cell organelles and the stages of mitosis should not be included, the two main steps of meiosis as only meiosis-I and meiosis-II should be mentioned, cell names should not be mentioned during gamete formation, and the differences between cell divisions (meiosis and mitosis) should be mentioned. Therefore, the fact that these details are not included in the textbook following the level of the student may have made the subject content simple.

Looking at the findings of the sixth unit in the study, the readability of the text for the third learning outcome in the first subject was found to be difficult. In contrast, the readability levels of the texts belonging to the other learning outcomes and the unit, in general, were medium. It is not desirable for a text to have a difficult readability level. However, it is seen that the text on this subject is below the minimum 100-word limit determined as the criteria in the study. For this reason, the researchers have benefited from an excerpt from a sample text given on a different website under the title of "Research - Discussion" for the text on this subject. Therefore, it cannot be said that the entire text examined under this title was written directly by the authors of the textbook. At this point, although the text under the relevant title is examined within the scope of the study, the age group of the source from which the text is taken should also be taken into consideration. Therefore, it may be too ambitious to say that this text in the textbook is unsuitable for the target audience. When the other learning outcomes of the same subject are examined, it is seen that all of the texts are written following the target audience. This can be attributed to the fact that, as stated in the findings of the previous unit, the content of the subject for the lower grade level of education was written in a simpler and less detailed way. When looking at the related learning outcomes in the curriculum, it is emphasized the subjects such as the structure of reproductive cells, developmental stages of the embryo, metagenesis, fertilization types should not be emphasized. However, no other study examining the readability of the texts in this unit was found by the researchers. Therefore, to reach a more precise and concrete judgment about the results obtained in this study, it is helpful to examine the texts of this unit in the textbooks written at the same or different grade levels and compare the findings.

5. CONCLUSION

As a result, when the findings of the study are evaluated in general, it can be said that the readability of the texts in the units of the biology subjects in the science textbook prepared for the seventh grade is at the desired level and written in a quality suitable for the level of the target audience. However, in line with the results of the research, considering the issues put forward below may guide future research.

The study's findings showed that, compared to other studies in the literature, the textbooks prepared for lower grade levels in terms of biology subjects were written in a simpler and more understandable language. However, in future studies, the evaluation can be made clearer by examining the readability levels of the textbooks prepared for the first stages of primary education.

If quotations from different sources are required in the texts used in textbooks, revising and presenting them according to the student level, rather than writing them directly, may positively affect the readability level.

In the literature, it is seen that Turkish textbooks were examined in most of the studies on readability. However, it is important and necessary to do more similar studies, especially for textbooks on biology and other science fields that contain abundant abstract, foreign and technical terms.

In the study, the Ateşman readability formula, which is the most commonly used in the literature, was used to examine the readability levels of the texts. However, similar studies can be conducted. The findings can be compared using the readability formulas developed by some researchers, such as the Çetinkaya-Uzun formula following the Turkish language structure.

Although the Ateşman readability formula used in the study is suitable for the Turkish language structure. It is inevitable to use foreign / Latin terms in the texts containing biology topics. At this point, a new readability formula can be developed, especially for the field of biology.

The readability of the texts on biology subjects in the textbooks prepared for different grade levels can be examined.

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