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Determination of the Readability Levels of the Texts Related to Biology Topics in the Science Textbook-6

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Abstract

The aim of this study is to examine the readability levels of the texts on the biology units in the science textbook prepared for the sixth grade. This study, which is based on a qualitative approach, was carried out with the method of document analysis. The textbook examined in the study is Middle School and Imam Hatip Middle School Science Textbook 6, which has been used since the 2018-2019 academic year. Regarding biology topics, the textbook includes in two units (Unit-1: Our Body Systems, Unit 2: Our Body Systems and Health). In the study, the learning outcomes of the units were taken as a basis in the selection of the texts to be analyzed in the textbook. In the study, a total of 22 texts were randomly selected by taking into account the learning outcomes in the curriculum. In addition, it has been paid attention that each text contains at least 100 words. Ateşman readability formula was used to determine the readability levels of the selected texts. According to the findings obtained as a result of the analysis, it was determined that the readability level of the texts for unit-2 was medium, while the readability level of the texts for unit-6 was found to be difficult. In the light of the findings, suggestions were made that the textbooks should be prepared in accordance with the student level in terms of readability and that texts consisting of simpler and shorter sentences should be used more.

Keywords: 6th grade, biology, textbook, readability.

1. Introduction

Today, the need for enlightenment through knowledge has led nations to structure curricula based on contemporary learning theories. Curriculums can be defined as theoretical and practical structures aiming to train the type of people defined in the general objectives of education (Epçaçan & Erzen, 2008). There are four basic elements in a curriculum, including the dimensions of goal, content, learning-teaching process and evaluation (Gül, 2019). For the success of the curriculum, it is extremely important that all four elements are in harmony with each other and none of them are ignored in practice. Of these, the content element searches for an answer to the question "what will be taught in a curriculum?". Textbooks have a very important role in transferring the content of the program to students (Taş, 2007). Because textbooks are one of the most important materials that present the information on the subjects in the curriculum in a regular and planned manner, as well as guiding as a source of information and educating the students in line with the objectives of the course (Karamustafaoğlu, Salar & Celep, 2015). In other words, textbooks are a mirror and visible face of the curriculum because they are prepared on the basis of curriculum and they are tools that embody learning outcomes generally stated abstractly

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in curricula (Çelik, Çetinkaya & Yenmez, 2020; Demirel & Kıroğlu, 2008; Kılıç & Seven, 2006). Therefore, in addition to teachers, administrators and other factors, the role of textbooks is also important for the success of a curriculum (Çelik et al., 2020). As a matter of fact, according to Ceyhan and Yiğit (2004), textbooks have an important place as teachers, physical facilities and training programs in improving the quality of human resources as indispensable tools of educational services.

Textbooks are the basic element of educational environments because they are portable and stable and can be used without the need for another power source, unlike other electronic course tools (Çelik et al., 2020; Sunday, 2014). For this reason, they are the most frequently used tools by teachers in the classroom environment (Çakıroğlu, 2015). Textbooks are important teaching materials that teachers use to conduct their lessons in a correct, systematic and conceptual framework (Ellis, 1997). Textbooks help teachers especially when teaching materials are insufficient, laboratory facilities are limited and classes are crowded (Şahin, 2012). When textbooks are considered as instruction materials that convey 99% of the information along with a teacher and whiteboard (Yılmaz, Gündüz, Çimen & Karakaya, 2017), it is unthinkable that textbooks that are commonly used comprise of materials written haphazardly and imprecisely. In other words, to receive the expected benefit from textbooks, textbooks should possess certain qualities and be prepared according to certain standards (Anılan, Balbağ, Anılan, Görgülü & Çemrek, 2007; Chiappetta, Fillman & Sethna, 1991; Gül, Özay Köse & Diken, 2020; Kelly, 1989). Accordingly, the standards that will be developed for textbooks can be analyzed under the main titles; physical features, educational design, visual design and language and expression (Gül et al., 2020; Yurt & Arslan, 2014).

In addition to the above, the instructional effectiveness of the textbook depends on four basic variables. These consist of the readability level of the book, the content and structure of the book, the pattern features of the book, and student characteristics such as interest, motivation, prior knowledge and skills (Şahin, 2012; Yalın, 1996). Among these variables, the readability of the textbook can be explained as the student's reading the material quickly and the level of understanding the text, she/he reads (Çakmak & Çil, 2014). This definition emphasizes the interaction between a group of readers whose characteristics such as reading skills, prior knowledge and motivation are known (Güney, Temur & Solmaz, 2009).

The number of words in the sentences, the number of syllables in the words and the number of ideas to be emphasized in the sentences are factors affecting readability (Tekbıyık, 2006). The readability of a text requires being appropriate to the level of the target audience as well as all its features (Çakmak & Çil, 2014). Each class includes students with different reading levels and experiences. Some students may be above the reading level and some students may be below this level. Likewise, the difficulty levels of the texts differ from each other. While students can easily read some texts in textbooks, they may have difficulty with some texts (Ulu Kalın & Aydemir, 2017). Overlapping the reading levels of the texts with the reading levels of the students will make the texts easy to understand (Ulusoy, 2009). In this respect, it is extremely important that the texts in the textbooks are suitable for the students' level and therefore the author takes these features into account when preparing a textbook (Bağcı & Ünal, 2013; Gül et al., 2020). The author aims to teach new concepts to students and to convey the text content correctly while establishing communication strategies. However, to what extent these goals are realized is a matter of debate (Kılıç, Atasoy, Tertemiz, Şeren & Ercan, 2001). Regarding this subject, due to the nature of science, quite a lot of technical terms are used in science books. These are difficult for students to understand. Compared to physics, chemistry and other sciences, especially biology is a science with more reading difficulties due to the definitions of concepts, theories and principles. Therefore, readability gains a great importance in the selection of such science books (Özay Köse, 2009). However, it is known that students face some problems in reading and understanding such written sources used in biology lessons. One of the problems faced by students is that a technical

language is used in scientific writings and this language is not fully and adequately understood by students (Özay Köse & Gül, 2016). Another problem is that terms that are not used much in daily life are used excessively in written sources. It is stated that if technical and scientific concepts are used too much in the texts, the perception of students can be prevented, and if they are used adequately, the perception of information will be easier (Yürümez, 2010). Therefore, as important as the accuracy of scientific information in the texts of biology textbooks, it is also important to convey this information to the reader in an understandable way. Presentation of information in an understandable way is possible with a good language, good expression and readability (Köseoğlu et al., 2003).

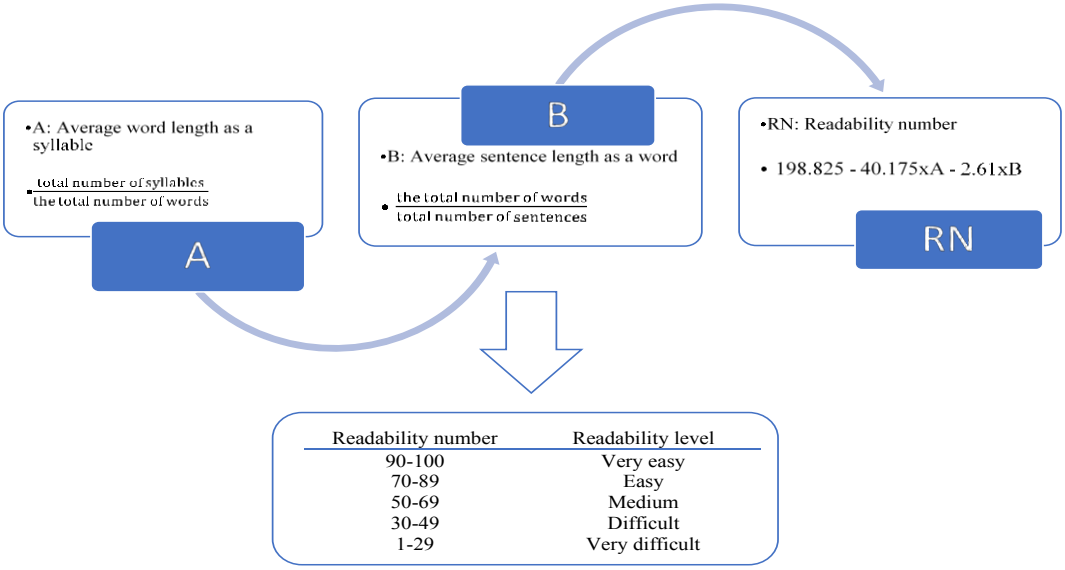
Numerous studies have been conducted in the literature so that the texts in the textbooks can be easily understood by students (Çeçen & Aydemir, 2011; Gül et al., 2020; Ulu Kalın & Aydemir, 2017). In these studies, it was tried to determine the suitability of the texts to the reader level with the help of formulas that help to predict the reading level. These formulas are called readability formulas (Çakmak & Çil, 2014). In order to determine the difficulty levels of the texts, formulas such as Dale-Chall formula, Gunning Fox Index, Fry Readability Graph, Flesch-Kincaid formula and Raygor were developed in different countries (Ulu Kalın & Aydemir, 2017). These formulas are generally used to determine at which level the text is suitable for the reader. Formulas are usually applied to a hundred words of selected texts. Word length and sentence lengths are generally used to determine readability (Zorbaz, 2007). Readability studies in Turkey began in the 1990s (Bağcı & Unal, 2013).

Since there was no readability formula suitable for Turkish texts in studies in our country, readability formulas adapted for English texts were used in the past (Çakmak & Çil, 2014). However, these formulas were not suitable for Turkish texts because the structure of a language is not similar to another language. For this reason, studies were carried out for the readability of Turkish texts, and a readability formula suitable for the Turkish language structure was first developed by Ateşman (1997).

As it is known, readability in Turkish is affected by factors such as average sentence length and the number of syllables/words. Average sentence length is important not only for Turkish but also for other languages. As the number of words in a sentence increases, the readability level of that text decreases (Bezirci & Yılmaz, 2010). According to this, Ateşman's readability formula, which is frequently preferred in studies in our country, was created by taking these two variables into consideration. The formula created by Ateşman and the readability number (RN) according to this formula and the reading level (RL) corresponding to this number value range are as follows in Figure 1.

Although there are many studies in our country using both Ateşman and other readability formulas, it is seen that Turkish textbooks are examined in the vast majority of these studies (Bağcı & Ünal, 2013; Çepni, Gökdere & Taş, 2001; Durukan, 2014; Mirzaoğlu & Akın, 2015; Okur & Arı, 2013). However, studies on science and especially biology are also rare (Dikmenli, Çardak & Altunsoy, 2008; Gül, 2009; Çakmak & Çil, 2014; Gül et al., 2020; Özay Köse, 2009). One of these studies was done by Özay Köse (2009). In Özay Köse's study (2009), the readability level of the texts on "cell" in the ninth-grade biology textbook was calculated and compared according to different formulas. The findings showed that the readability level of the "Cell" subject was easy and readable in terms of Ateşman and Cloze tests. Another study on biology textbooks was done by Gül (2019). Gül (2019) researched the readability of the texts in the tenth-grade biology textbook and revealed that the overall readability level of the book is difficult. Similarly, Gül et al. (2020) examined the readability level of the texts in the ninth-grade biology textbook and found that readability in general was difficult. When looking at the studies conducted at lower class level, Çakmak and Çil's study (2014) comes to the fore. These researchers examined the readability of the texts in the unit "Let's Travel to the World of Living Beings, Get to Know" in the

fourth-grade science textbook. As a result of the findings, it was concluded that the difficulty level of the texts was medium and the text was understandable.



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

Figure 1. Ateşman (1997) readability formula and readability levels

When the above studies are evaluated in general, it is seen that the majority of the studies were done with high school biology textbooks. Therefore, it becomes a necessity to carry out similar studies for the biology subjects covered within the science course at lower levels of education. On the other hand, it is thought that it is necessary to primarily address textbooks that include biology subjects, where students have the most learning difficulties and where foreign terms are frequently included (Gül et al., 2020). In addition, it is thought that such a study can serve as an example in determining the readability of biology subjects in textbooks prepared for higher-level classes. Hence, in this study, the readability formula adapted by Ateşman (1997) from Flesch (1948) into Turkish was applied to the biology topics in the 6th grade science textbook.

2. Method

This study, which is based on a qualitative approach, was carried out with the method of document analysis. In document analysis, written materials are systematically analyzed and examined in order to provide information about the phenomenon and phenomena to be studied. In qualitative research, document analysis can be used both as a data collection tool and as a data collection method (Yıldırım & Şimşek 2005).

2.1 *Study material and analysis process*

The textbook examined in the study is Middle School and Imam Hatip Middle School Science Textbook 6, which has been used since the 2018-2019 academic year with the decision of the Board of Education and Discipline dated 28.05.2018 and numbered 78. Regarding biology topics, the textbook includes in two units namely: “Our Body Systems” and “Our Body Systems and Health”. The units related to biology subjects in the textbook, the number of learning outcomes, course hours and percentages of course hours are given in the Science Curriculum (MEB, 2018) as follows om Table 1.

Table 1. The units related to biology subjects for sixth graders in the science curriculum

Unit no	Name of unit	Number of learning outcomes	Course hours	Rate (%)
Unit 2	Our Body Systems	11	24	16.7
Unit 6	Our Body Systems and Health	11	18	12.5
Total		22	42	29.2

As seen in Table 1, there are two units in the textbook for the field of biology. Both units include 11 learning outcomes. At the same time, it is understood that the ratio of the second unit is higher in relation to the number of learning outcomes and course hours.

In the study, the learning outcomes of the units were taken as a basis in the selection of the texts to be analyzed in the textbook. Accordingly, texts as many as the number of learning outcomes specified in the curriculum were selected for each unit. Therefore, 11 texts for the Unit 2 and 11 texts for the Unit 10, which consisted of at least 100 words were, selected and analyzed in terms of readability. However, since the text given under the F.6.2.3.2 coded learning output is less than 100 words, this entire text is included in the analysis. Making the necessary calculations using the Ateşman readability formula requires knowing the number of sentences, words and syllables in the text. In determining these, the criteria put forward by Mirzaoğlu and Akın (2015) were taken into account. After determining the number of sentences, words and syllables in each text, average word length (A) and average sentence length (B) were calculated as shown in Figure 1. Later, these values were placed in the formula of Ateşman (1997), which is shown in Figure 1, and the readability number (RN) of each text was calculated, and these values were evaluated according to the readability levels developed by Ateşman (1997). Below is an example of texts selected from two units in the study. An example of texts selected from two units in the study is given in Figure 2 and Figure 3.

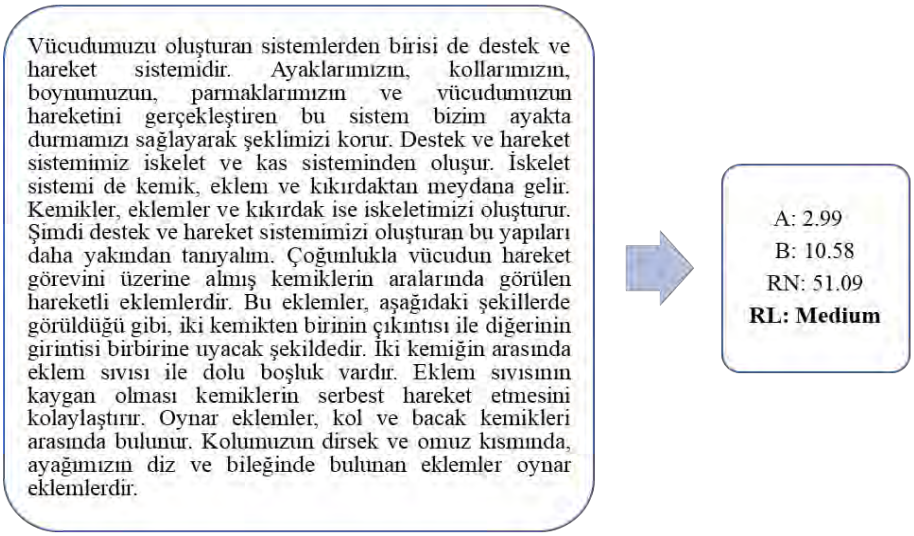


Figure 2. A sample text for the “Our Body Systems” unit

An example text examined in the “Our Body Systems” unit was given in Figure 2. When the text was examined, it was seen that it consisted of 12 sentences, 127 words and 380 syllables. As a result of the calculations made according to Ateşman’s formula, it was determined that the readability level of the text was “medium”. Figure 3 was showed an example text examined in the “Our Body Systems and Health” unit.

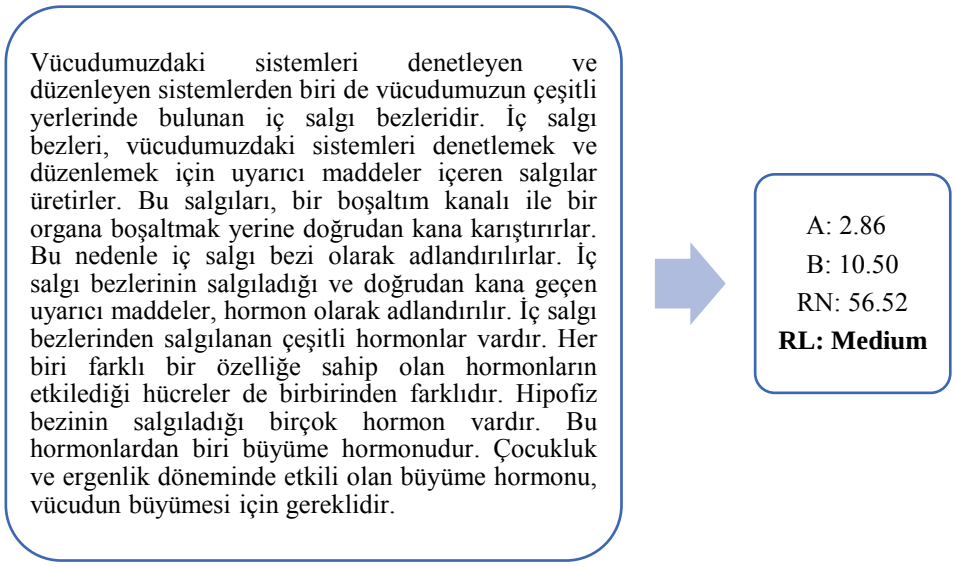


Figure 3. A sample text for the "Our Body Systems and Health" unit

When Figure 3 is examined, it is seen that the selected text consists of 10 sentences, 105 words and 300 syllables. As a result of the calculations, it was determined that the readability level of this text according to the category suggested by Ateşman (1997) is "medium".

2.2 *Ethical procedures*

Document analysis was performed in this study, and it does not require the approval of the ethics committee since the application was not performed on any person (s).

3. Results

In the study, each of the 22 texts, the subject area, the learning outcomes, the average word length (A), the average sentence length (B), the readability number (RN) and the readability level (RL) are given in Table 2 and Table 3 below.

Table 2. Analysis results for “Our Body Systems” unit

Subject Area	Learning Outcomes	A	B	RN	RL
F.6.2.1. Musculoskeletal System	F.6.2.1.1. Explains the structures of the musculoskeletal system with examples.	2.99	10.58	51.09	Medium
Mean score		2.99	10.58	51.09	Medium
F.6.2.2. Digestive System	F.6.2.2.1. Explains the functions of structures and organs in the digestive system using models.	3.00	14.29	41.00	Difficult
	F.6.2.2.2. Makes the conclusion that nutrients must undergo physical (mechanical) and chemical digestion in order to pass into the blood.	3.14	11.83	41.80	Difficult
	F.6.2.2.3. Explains the functions of organs that help digestion.	2.92	12.75	48.24	Difficult
Mean score		3.02	12.96	43.68	Difficult
F.6.2.3. Circulatory System	F.6.2.3.1. Explain the functions of the structures and organs that make up the circulatory system using a model.	2.78	10.4	59.99	Medium
	F.6.2.3.2. Examines the pulmonary and systemic circulation on a diagram and explains their functions.	2.67	12.86	57.99	Medium
	F.6.2.3.3. Defines the structure and functions of blood.	2.71	9.83	64.29	Medium
	F.6.2.3.4. Explains the blood exchange between blood groups.	2.66	11.67	61.50	Medium
	F.6.2.3.5. Evaluates the importance of blood donation for society.	2.59	10.9	66.32	Medium
Mean score		2.68	11.13	62.02	Medium
F.6.2.4. Respiratory System	F.6.2.4.1. Explains the functions of the structures and organs that make up the respiratory system using models.	2.88	13.75	47.23	Difficult
Mean score		2.88	13.75	47.23	Difficult
F.6.2.5. Excretory System	F.6.2.5.1. Summarizes the functions of the structures and organs that make up the excretory system by showing them on the model.	3.03	11.60	46.82	Difficult
Mean score		3.03	11.6	46.82	Difficult
Overall mean score		2.92	12.00	50.17	Medium

As seen in Table 2, the overall readability level for all texts in five subject areas was determined to be at "medium" level (RL=50.17). However, it was observed that the highest RN value belongs to "F.6.2.3.5. Evaluates the importance of blood donation for society." learning outcome (RN=66.32), while the lowest RN value belongs to "F.6.2.2.1. Explains the functions of structures and organs in the digestive system using models." learning outcome (RN=41.00). When the findings were examined in terms of subject areas, it was determined that the texts on Musculoskeletal System and Circulatory System were medium, while the texts on Digestive System, Respiratory System and Excretory System were difficult. The findings of Unit-6 in the study are given in Table 3.

Table 3. Analysis results for "Our Body Systems and Health" unit

Subject Area	Learning Outcomes	A	B	RN	RL
F.6.6.1. Regulatory Systems	F.6.6.1.1. Explains the nervous system, the functions of the central and peripheral nervous system on the model.	3.00	14.75	39.80	Difficult
	F.6.6.1.2. Realizes the importance of endocrine glands for the body.	2.86	10.50	56.52	Medium
	F.6.6.1.3. Explains the physical and psychological changes that occur in the transition from childhood to adolescence.	2.97	9.82	53.88	Medium
	F.6.6.1.4. Discusses what should be done to have a healthy adolescence period based on research data.	3.20	10.58	42.65	Difficult
	F.6.6.1.5. Discusses the effects of the regulatory systems on the regular and coordinated operation of other systems in our body.	3.24	10.18	42.09	Difficult
Mean score		3.05	11.17	46.99	Difficult
F.6.6.2. Sense Organs	F.6.6.2.1. Explains the structures of sensory organs by showing them on the model.	3.31	11.89	34.81	Difficult
	F.6.6.2.2. Shows the relationship between the sense of smell and taste with an experiment she designed.	2.89	11.56	52.55	Medium
	F.6.6.2.3. Gives examples of the defects in the sense organs and the technologies used to eliminate these defects.	2.87	10.50	56.12	Medium
	F.6.6.2.4. Discusses the measures to be taken to protect the health of the sense organs.	2.92	11.00	52.80	Medium
Mean score		3.00	11.24	49.07	Difficult
F.6.6.3. Health of the System	F.6.6.3.1. Discusses the things to be done for the health of systems based on research data.	3.02	12.10	45.92	Difficult
	F.6.6.3.2. Understands the importance of organ donation in terms of social solidarity.	3.13	11.82	42.23	Difficult
Mean score		3.08	11.96	44.08	Difficult
Overall mean score		3.04	11.46	46.71	Difficult

As seen in Table 3, the overall readability level for all texts in three subject areas was determined to be at "difficult" level (RL=46.71). However, it was observed that the highest RN value belongs to "F.6.6.1.2. Realizes the importance of endocrine glands for the body." learning outcome (RN=56.52), while the lowest RN value belongs to "F.6.6.2.1. Explains the structures of sensory organs by showing them on the model." learning outcome (RN=34.81). When the findings

were examined in terms of subject areas, it was determined that the texts in all subject areas were difficult.

4. Discussion and conclusion

It is quite common to use textbooks in learning environments in our country (Bağcı & Ünal, 2013). Textbooks are the educational environments where students use their reading comprehension skills most (Çelik et al., 2020). At this point, the preparation of textbooks in accordance with students' language development and reading comprehension levels will enable students to understand the texts they read. Understanding a text read shows the readability of that text (Bağcı & Ünal, 2013). For this reason, it is very important to prepare the texts in the textbooks in accordance with the reader level and to determine the reading difficulty levels. This study was examined the readability levels of the texts related to biology topics in the 6th grade science textbook.

When the findings for unit-2 were examined in the study, the readability level of the texts in general was determined as "medium". This finding shows that "Our Body Systems" unit in the textbook was prepared in accordance with the student level. When the studies on the determination of the readability levels of the texts on biology subjects are examined, it is seen that the results are mostly contrary to the findings of this study (Blystone, 1987; Cardak, Dikmenli & Guven, 2016; Çakmak & Çil, 2014; Gould, 1977; Kennedy, 1979). Of course, looking at these studies, it is known that the type of readability formula also affects the readability level. For example, Özay (2009) examined the readability level of the texts on the ninth grade 'cell' topic using the Flesch-Kincaid Formula, Gunning Fog Index, Sönmez Formula, Cloze Test Method and Ateşman formula. The findings of the study revealed that Sönmez, Ateşman and Cloze tests can be only used in Turkish texts. In a similar study, Yürümez (2010) examined the readability and compliance of the texts in the ninth grade biology textbook with the target age level using the same formulas. According to the findings, it was seen that the texts in the book were understandable only according to the Sönmez formula. In another study by Çakmak and Çil (2014), the applicability of FOG, Flesch-Kincaid, Flesch Ease of Reading Powers-Sumner-Kearl, Coleman-Liau, ARI, Linsear Write, Ateşman and Sönmez formulas for fourth grade the unit called "The Case of Exploring and Knowing The World of Living Creatures" was examined. As a result of the research, it was determined that only Ateşman and Sönmez formulas are applicable to this textbook.

There are many studies on the readability of textbooks belonging to different subject areas, along with the above examples of biology subjects (Bağcı & Ünsal, 2013; Benjamin, 2012; Çelik et al., 2020; Tekbıyık, 2006). The common conclusion reached in these studies is the necessity of developing formulas suitable for the Turkish language structure. At this point, a formula suitable for Turkish language structure was developed by Ateşman (2007) and it has been used in many studies in our country in recent years. For example, the Ateşman formula has been used in studies conducted by Gül (2019), Demirci, Gül and Özay Köse (2019), Gül et al., (2020), Gül and Kaya (2021) on biology topics, especially in recent years. However, as a result of the analyzes made in these studies, different findings from each other were determined. For example, Özay's study (2009) was determined that the readability of the texts on the cell subject is suitable for the target student population. Kaya and Gül (2021) examined the readability levels of the texts belonging to the "from Gene to Protein" unit in the twelfth grade biology textbook. As a result of the analysis, it was determined that the readability level of the texts in general was difficult. Demirci et al. (2019) examined the readability levels of the texts on "Photosynthesis" in the twelfth grade biology textbook. As a result of the analysis, it was revealed that the readability level of the texts in general is in the medium category. In Gül's study (2019), it was revealed that the readability level of the texts in the tenth grade biology textbook is difficult. When the findings were

evaluated separately for the units, it was found that the readability level of all three units in textbook was difficult. It was founded that the lowest unit of readability was "Basic Principles of Inheritance" and the highest unit of readability was "Ecosystem Ecology and Current Environmental Problems". Gül et al. (2020) revealed that the readability levels of texts in biology textbook were generally in category "difficult" but also close to the "medium difficulty" border. As separately examined the findings for three units, it was founded that the readability levels of the texts were generally as "difficult" for the first unit namely "Biology: The Science of Life", "medium" for the second unit namely "The Cell", and finally "medium" for the thirst unit namely "The World of Living Organisms".

When the above findings are evaluated in general, it is seen that the readability of most of the texts is difficult according to the Ateşman readability formula. As a matter of fact, although the readability level of the texts for unit-2 was determined to be medium in this study, when the findings were analyzed according to subject areas the overall readability level for all texts was determined to be at "medium" level. When the findings were examined in terms of subject areas, it was determined that the texts on musculoskeletal system and circulatory system were medium, while the texts on digestive system, respiratory system and excretory system were difficult. On the other hand, when the findings for unit-6 were examined, it was found that the readability levels of all texts were difficult both in the unit and in the subject areas. These findings may suggest that although the texts belonging to unit-2 are prepared in accordance with the student level, the texts belonging to unit-6 are not suitable for the student level. When the studies examining the readability levels of the texts on biology subjects in the literature are examined, it is stated in the above sample studies that mostly similar or different results from this study have been reached. Of course, in order to make a definite judgment about these findings, it is necessary to examine the textbooks comparatively by developing different formulas suitable for Turkish texts. Because Temur, Sarı and Orhon (2011) examined the studies on the concept of readability in the fields of science and social sciences with document analysis. The findings revealed that both the readability formulas developed for Turkish and the formulas adapted from a foreign language to Turkish give different results in terms of readability level. At this point, it is beneficial to consider different elements from variables such as word or sentence length, which are frequently considered in formulas used in studies on readability. As a matter of fact, it is stated that the ratio of the items whose meaning is unknown rather than the proportions of long words and sentences in a text is more effective in determining the intelligibility ratio. In other words, as the proportion of items whose meaning is unknown increases, the level of comprehensibility of the text decreases (Budak, 2005). Biology is a field that includes a lot of foreign terms in terms of subject content (Özay Köse & Gül, 2016). In addition, the fact that more concepts are included in the higher levels of education and the subjects are more detailed, and also the readability level of the textbooks is difficult as can be seen from the studies carried out especially at the high school level, may support this view. On the other hand, although this study is at the level of sixth grade, it is known that the subject of Regulatory Systems (nervous and endocrine systems) in unit-6, whose readability level was found to be difficult, is among the subjects that students have the most learning difficulties (Bahar, Johnstone & Hansell, 1999; Güneş & Güneş, 2005). This may be effective in evaluating the readability level of unit-6 as difficult.

4.1 *Implications*

As a result, according to the findings of this study detailed above, it can be said that the readability level for all the texts on biology subjects in the science textbook-6 is not suitable for the student level. Based on this, in the light of the conclusion reached in the study, considering the following suggestions may be a guide for future research:

Especially in the lower levels of education, texts containing short, easy and understandable sentences should be used in textbooks prepared for both biology and other subject areas.

When the literature is examined, it is seen that the studies to determine the readability levels of biology texts are carried out with high school level textbooks. In addition, it was found that the readability levels of the texts in these studies are mostly difficult. This may be due to the fact that more foreign terms are used in textbooks prepared for upper classes. However, in this study in which the sixth grade textbook was examined, it was determined that the readability level of one of the units was medium, while the texts in the other unit were difficult. These results may imply that the textbooks will produce more appropriate results for the lower grades. However, it is recommended to examine the textbooks prepared for the first stages of primary education in order to clarify this situation.

As stated before, as the proportion of items whose meaning is unknown increases, the level of comprehensibility of the text decreases (Budak, 2005). Since biology is a field that frequently includes abstract and foreign terms, attention should be paid to the use of foreign elements in small numbers, as well as the texts being short and plain while preparing textbooks.

Since biology topics contain a large number of Latin/foreign terms, new readability formulas specific to this course can be developed. Thus, more accurate results can be obtained.

Finally, the readability levels of different books prepared for the same grade levels can be compared. Thus, it can be revealed more clearly whether the determined difficulty levels are due to the length of the texts or the content of the subject.

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