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## **A COMPARATIVE STUDY ON THE COGNITIVE AND METACOGNITIVE STRATEGIES OF 6<sup>th</sup> GRADE PRIVATE AND STATE SCHOOL STUDENTS USE WHILE READING SCIENCE TEXTS**

*Research Article*

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# A COMPARATIVE STUDY ON THE COGNITIVE AND METACOGNITIVE STRATEGIES OF 6th GRADE PRIVATE AND STATE SCHOOL STUDENTS USE WHILE READING SCIENCE TEXTS

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## Abstract

The aim of this qualitative case study was to determine the cognitive and metacognitive strategies used by the Secondary School 6th grade students while reading science texts in a Biology unit titled "Support and Motor System", and to compare these strategies in accordance with the type of their school (private or state school), their grade point averages and their perceptions concerning the difficulty level of the chapter. The number of the participant students was 6; 3 from a private school and 3 from a state school. After the students read the texts in the unit, semi structured interviews were administered in order to determine their strategy types, to compare and contrast these strategies in accordance with the type of their schools, their grade point averages and their perceptions concerning the difficulty level of the chapter. The results of the study revealed that the private school students had "High" and "Very high" grade point averages and assessed the chapter as "Easy" and "Very Easy", used a higher number and a wider variety of cognitive and metacognitive strategies whereas the state school students had "Low" and "Very Low" grade point averages and assessed the chapter as "Difficult" and "Very Difficult".

*Keywords:* Cognitive and Metacognitive Strategies, Support and Motor System Chapter, reading strategies, state school and private school students

## 1. Introduction

Today, individuals need to obtain the information they need, produce new knowledge and have the ability to think scientifically. In order to have this ability, they need to learn and understand science. Students should be made to gain insights, knowledge, skills and values related to science, improve their research, problem solving and decision making skills and acquire the basic skills in this field (Güçlüer & Kesercioğlu, 2010). One of the basic skills in science is to read and understand science texts. Reading has a highly significant and wide influence on human life, and learning to read is a long and difficult way. Reading involves understanding and comprehending the emotions, thoughts and messages in a text (Topuzkanamış & Maltepe, 2010). The reading skill is a factor that students will need both in primary education and in the later stages of the education life and will shape the achievements of students (Calp, 2005; Oz, 2003; Sever, 2004). Science texts are among informative texts and contain concrete and scientific information. The quality of a text has a determining role in reading comprehension (Bayat & Yüce, 2015). As for readability, it refers to the "ease" or "difficulty" with which the reader can understand the text. The readability concept is related to the level of difficulty of a text and its compliance with the reader's level (Ateşman, 1997). Reading and reading comprehension are cognitive behaviours. It can be argued that studies aiming at determining the cognitive processes of students and identifying their deficiencies in this respect will decrease the difficulty students have in reading and reading comprehension

and increase their levels of success (Çakıroğlu, 2007). The reader must be mentally active during the reading process for comprehension, which is the purpose of reading. For a successful reading, readers need to make sense of and use both cognitive and metacognitive processes (Yore et al., 2003). Since science texts do not contain subjects easy to learn and there are different dimensions of reading the texts, they are often difficult to make sense and read (Yore et al., 1998; Sonleitner, 2005). Therefore, students may have trouble in reading comprehension with science texts. In order to overcome this problem, students can use strategies while reading science texts (Yore, 1986). In the literature, reading strategies have been discussed in two groups as cognitive strategies and metacognitive strategies (Kumlu, 2016). Cognitive strategies are the ones used by the students in order to conduct cognitive processes such as achieving the goals they have determined with respect to the subject, completing a task or accomplishing learning (Boekaerts, 1996). As for metacognitive strategies, they are used by the students to understand the information about the learning processes and to control these processes during learning (Flavell, 1979). Both in Turkey and abroad, studies conducted on cognitive and metacognitive reading strategies generally aim at students who learn Turkish and foreign languages and have reading difficulties. In general, these studies tried to determine the cognitive and metacognitive strategies used by the students use in their reading processes through scales and questionnaires (Anderson, 2003; Ay, 2008; Babacan, 2012; Baydık, 2010; Çakıroğlu, 2007; Çelik, 1997; Güngör, 2005; Hall, Bowman & Myers, 1999; Hamdan, Ghafar, Sihes & Atan, 2010; Kumlu, 2012; Oluk & Başöncül, 2009; Padron, 1992; Sonleitner, 2005). In the literature, studies conducted to determine the cognitive and metacognitive strategies used by students while reading science texts are quite limited. Based on the limited number of studies carried out in Turkey to determine the cognitive and metacognitive strategies used by students in reading science texts; in this study, cognitive and metacognitive strategies used by the 6th grade students while reading the "Support and Motor System" chapter of the 6th Grade Science Textbook as part of the Biology learning domain were determined and these strategies were compared by the type of schools where the students were studying, their grade point averages and their perceptions concerning the level of difficulty-easiness of the chapter. Indeed, Özay Köse (2009) stated that science is a field, which contains a lot of technical terms by its nature and students have difficulty in understanding, and that biology, in particular, is a branch of science where reading difficulties are experienced more due to the definitions of principles, concepts and theories when compared to the physics, chemistry and other branches (Yılmaz, Gündüz, Çimen & Karakaya, 2017; Karakaya, Uzel, Gül, Yılmaz, 2019). It is thought that identifying cognitive and metacognitive strategies and comparing them in terms of some factors might contribute to the use of these strategies by the students more effectively while reading science texts related to the Biology learning domain through the instruction of these strategies in the future studies and in this way, students may overcome the reading difficulties they experience.

## **1. Method**

### **2. 1. Objective of the Research**

The objective of this study was to compare and contrast the cognitive and metacognitive strategies of the 6th grade students in private and state secondary schools while reading the texts in the "Support and Motor System" unit in their Science course book in accordance with the type of their schools (private-state school), their grade point averages as well as their perceptions concerning the level of difficulty-easiness of the unit.

### **2. 2. Research Design**

This qualitative research employing the case study aimed to determine the cognitive and metacognitive strategies used by the students, who were attending a private and a state school

and had different grade point averages, while reading the “Support and Motor System” included as a subject of Biology in the 6th Grade Science Textbook and to compare these strategies by the type of school attended (private or state school), grade point average and perceptions concerning the level of difficulty-easiness of the chapter. Before choosing the unit, the opinions of science teachers and two faculty members, specialized in Biology Education, were received. The study was a holistic multiple case study (Yin, 2003) since each case was addressed in itself as a holistic one and then cases were compared with one another (Yıldırım and Şimşek, 2006). Qualitative data were collected via semi-structured interviews with respect to the cognitive and metacognitive strategies used by the students while reading the chapter with the aim of comparing them by some factors. Then, the patterns among the cases were analysed.

### 2. 3. Participants

The participants of the study were six 6th grade students; 3 studying at a private school and 3 at a state school in the province of Kars. These students were chosen on the basis of "the principle of maximum diversity" developed by Patton (2002). During the selection of these students, their grade point averages and opinions of the teachers working in their schools were taken into consideration. After the schools were determined, students were chosen by considering the opinions of all teachers working in these schools and the grade points averages of the students in order to ensure that the students who would provide rich data about the use of cognitive and metacognitive strategies while reading the “Support and Motor System” chapter of the 6th Grade Science Textbook could be selected. The students participating in the research were determined on a voluntary basis. In the research, the names of schools and students were not disclosed, and schools were named as “private school or state school” and six students in these schools were named as “S1, S2, S3, S4, S5 and S6”.

The grade point averages of six students participating in the study were assessed in four categories as "Very Good, Good, Low and Very Low” based on the criteria determined in the Ministry of National Education Regulation on the Secondary Education Institutions (MoNE, 2019).

According to the Ministry of National Education Regulation on Secondary Education Institutions (MoNE, 2019), the grade point averages of the students correspond to the levels given in the following Table 1.

Table 1. *Levels of Grade Point Averages of Students according to MoNe*

GPA	Level
85.00-100	Very Good
70.00-84.99	Good
60.00-69.99	Moderate
50.00-59.99	Low
0-49.99	Very Low

As can be seen in Table 1, according to the Ministry of National Education Regulation on Secondary Education Institutions (MoNE, 2019), the grade point averages between “85.00 and 100” are assessed as “Very Good”, between “70.00 and 84.99” as “Good”, between “60.00 and 69.99” as “Moderate”, between 50.00 and 59.99 as “Low” and between “0 and 49.99” as “Very Low”.

In line with the said Regulation (MoNE, 2019), the type of school where the students participating in the study were attending, their grade point averages and their levels by the grade point average are given in Table 2.

Table 2. *Grade Point Averages and Levels of the 6th Grade Students in their School*

	Students	Grade Point Averages	Levels
Private School	S1	96	Very Good
	S2	93	Very Good
	S3	81	Good
State school	S4	57	Low
	S5	53	Low
	S6	43	Very Low

When Table 2 is examined, out of the students studying in the private school, S1 and S2 fall into the category of “Very Good” with their grade point averages of 96 and 93, respectively, while the level of S3 is “Good” with his/her grade point average of 81. As for the students attending the state school, S4 and S5 fall into the category of “Low” with their grade point averages of 57 and 53, respectively, while the level of S6 is “Very Low” with a grade point average of 43. This means that the research was conducted with six students who were attending a public or private school and had varying grade point averages or different levels of success. This selection aimed at determining a maximum number and variety of cognitive and metacognitive strategies while students were reading the “Support and Motor System”. Students were selected from two different schools on a voluntary basis based on the opinions of teachers. In this way, the study aimed at determining the cognitive and metacognitive strategies of these students, who were attending different schools and had different levels of success, in depth, and comparing the differences between the strategies used by certain parameters (type of school, grade point average, level of difficulty-easiness of the chapter).

#### 2. 4. Data Collection Tools

Several data collection tools were used in the study so that analyses could be reliable, consistent and thorough (Yin, 2003).

The data collection tools used in the research are as follows:

##### 2.4.1 Think Aloud Session with the “Support and Motor System” Chapter

The first data collection tool used in the research is the think aloud sessions conducted while the students were reading the “Support and Motor System” chapter. “Support and Motor System” chapter is a part of the subject of “Systems in our Body” in the 6th Grade Science Textbook (Çiğdem, Balçık, Minoğlu and Karaca, 2018), which is instructed by the Ministry of National Education (MoNE) as textbook in all schools throughout Turkey. “Support and Motor System” chapter of the 6th Grade Science Textbook was determined with the science teachers since the subject of “Systems in our Body”, of which the chapter is a part, has a high number of learning outcomes, the chapter has a rich content (images, figures etc.), the possibility of encountering questions from this chapter in the High School Entrance Exam (LGS) is high, and students are expected to use a higher number and a wider variety of cognitive and metacognitive strategies while reading it. Also, two faculty members specialized in the field of Biology education were asked to control the content of the chapter to see whether there were any incorrect information, and the necessary corrections were made in the chapter based on the

feedbacks of the experts. Students read the “Support and Motor System” chapter in think aloud sessions. Thinking aloud is a technique, which determines the relation between the reading performances of students and the other factors affecting reading (Van Someren, Barnard and Sandberg, 1994). Before students read the chapter, they were informed about the think aloud session by the researcher. In other words, students were asked to read the chapter aloud. In order to ensure that students could get accustomed and adapt to this method, before the actual practice, they were asked to read a small text from a chapter other than the “Support and Motor System” chapter aloud. The students’ readings of these different texts were not taped. After that, students were asked to read the “Support and Motor System” chapter aloud, and these sessions were taped. During the exercise, researcher kept the camera in his/her right hand and stood right behind the student on the left. While the students were reading the chapter, when needed, the researcher controlled and adjusted the focus and direction of the camera. The reading processes of students were observed through tape recording while the cognitive and metacognitive strategies used by them in these processes were noted down by the researcher. When students stayed silent for a long time while reading the chapter, they were warned for “thinking aloud”. Observations concerning the think aloud sessions held while the students were reading the chapter allowed for determining the strategies used by them and dividing them as cognitive and metacognitive ones.

#### *2.4.2 Semi-Structured Interview Form*

Semi-structured interviews were held with the students for once after each student read the chapter with the aim of determining the cognitive and metacognitive strategies used by six 6-grade students of a public and a private school selected within the scope of the research while reading the “Support and Motor System” chapter and comparing these strategies by certain parameters (type of school, grade point average, level of difficulty-easiness of the chapter). The form consisting of the semi-structured interview questions developed by Diken (2014) was applied to the students. In the study, researcher asked questions to the students after they completed reading in order to determine the cognitive and metacognitive strategies used by six 6-grade students of a public and a private school selected within the scope of the research while reading the “Support and Motor System” chapter and to compare these strategies by certain parameters (type of school, grade point average, level of difficulty-easiness of the chapter). All the interviews were semi-structured, and they were videotaped, as well.

Some sample semi-structured questions taken from the form developed by Diken (2014) with the aim of determining the cognitive and metacognitive strategies used by the 6-grade students while reading the “Support and Motor System” chapter and comparing these strategies by certain parameters (type of school, grade point average, level of difficulty-easiness of the chapter) are as follows:

- \* What appeared in your mind while reading this chapter? Can you explain?
- \* What did you do while reading the chapter? Which ways did you implement? Can you explain step by step?
- \* What did you do while reading the chapter (like comparing figures). Why did you do that?

#### *2.4.3 Student Opinion Form about the Level of Difficulty-Easiness of “Support and Motor System” Chapter*

After the 6th grade students read the “Support and Motor System” chapter, they were distributed a form to determine their perceptions concerning the degree of difficulty-ease of the chapter. In this form, they were asked to choose and mark the most appropriate category for them out of “Very Difficult”, “Difficult”, “Moderately Difficult”, “Easy” and “Very Easy”.



## 2.5. Research Process

The research process was examined in three stages as the process before the students read the “Support and Motor System” chapter, the process of reading the chapter and the process after reading the chapter.

### 2.5.1. Before the Students Read the “Support and Motor System” Chapter

a) In the research, first, studies conducted on cognitive and metacognitive strategies at home and abroad were examined. Based on the literature review, a list of cognitive and metacognitive strategies was prepared.

b) The chapter on “Support and Motor System”, which is a subject of the Biology domain of science, from the MoNE 6th Grade Science Textbook (Çiğdem, Balçık Minoğlu and Karaca, 2018) was determined for being used in the research in line with the opinions of science teachers, as well.

c) Semi-structured interview questions developed by Diken (2014) were used with the aim of determining the cognitive and metacognitive strategies used by the students while reading the “Support and Motor System” chapter.

d) Students included in the research were selected by consulting the science teachers in the private school and the state school.

e) School administrators, science teachers and students included in the sample were informed about the research process.

f) Students were provided information on the think aloud session before they read the “Support and Motor System” chapter.

### 2.5.2. While the Students Read the “Support and Motor System” Chapter

a) Students were asked to think aloud while reading the “Support and Motor System” chapter with the aim of determining the cognitive and metacognitive strategies used by them in this process, and these processes were video-taped by the researcher.

b) The researcher controlled and adjusted the focus and direction of the camera when needed while video-taping both the readings and the semi-structured interviews.

c) Since it took a while for the students to read the chapter and complete the semi-structured interviews, short breaks were taken when the students felt tired during the process.

### 2.5.3. After the Students Read the “Support and Motor System” Chapter

a) After the students read the “Support and Motor System” chapter and the semi-structured interviews were held with them, the researcher controlled whether there were any deficiencies regarding the reading process.

b) Video records of the students’ readings of the “Support and Motor System” chapter through think aloud techniques well as the semi-structured interviews held with the students were transcribed.

c) Observations of students thinking aloud while reading the “Support and Motor System” chapter and the transcripts of the semi-structured interviews held with them after the readings were completed were analysed.

## 2.6. Data Analysis and the Techniques Used

In the research, cognitive and metacognitive strategies used by six 6th grade students attending two different schools, one state school and one private school, in the province of Kars while reading the “Support and Motor System” chapter were determined, and these strategies were compared by certain parameters (type of school, grade point average, degree of difficulty-ease of the chapter). First of all, the data obtained from the observations of students’ readings of the chapter and the semi-structured interviews held with the students after the reading sessions were transferred to the computer environment and transcribed to determine the cognitive and metacognitive strategies used by the students.

In this way, the cognitive and metacognitive strategies used by the students while reading the “Support and Motor System” chapter were determined and these strategies were compared by certain parameters (type of school, grade point average, degree of difficulty-ease of the chapter). In order to determine whether the strategies the students used were cognitive or metacognitive, categories were determined for the data related to the observation records of the think aloud sessions and for what purpose they used the strategies and comparisons of the strategies.

The transcripts were coded in a computer program used for the analyses of the qualitative research. To make sure that the data obtained from coding were accurately coded, the researcher met the faculty member, who had frequently studied on the topic and had enough knowledge, and discussed whether the strategies were cognitive or metacognitive, comparisons of these strategies as well as the reliability and consistency of the codes.

After the coding was completed, the data set of a student’s reading of the “Support and Motor System” chapter was coded by the faculty member, who was the other coder, as well. At the end, the consistency between the codes given by the coders was calculated as 89%. The coders studied on the inconsistent data sets once more. The researcher and a faculty member having adequate knowledge went over the inconsistent data sets and reached an agreement.

## 3. Findings

In this part, cognitive and metacognitive strategies used by the students while reading the “Support and Motor System” chapter were determined and compared by the type of school where the students were studying (private school – state school), their grade point averages and their perceptions concerning the degree of difficulty-ease of the chapter. The tables presenting the findings of the research and the relevant explanations are provided below.

The cognitive strategies used by the 6th grade students who were studying in the private school and had different grade point averages while reading the chapter analysed are given in Table 3.



Table 3. *School Cognitive strategies used by the students having different grade point averages while reading the chapter*

SECONDARY SCHOOLS	PRIVATE SCHOOL			STATE SCHOOL		
STUDENTS	S1	S2	S3	S4	S5	S6
GRADE POINT AVERAGE	Very Good	Very Good	Good	Low	Low	Very Low
DEGREE OF DIFFICULTY OF THE CHAPTER	Very Easy	Easy	Easy	Moderate	Moderate	Difficult
COGNITIVE STRATEGIES	√	√	√			
Picturing in the mind	√					
Reading by following the words with coloured pencils	√		√			
Reading by underlining the words with coloured pencils	√		√			
Taking notes with coloured pencils	√		√			
Reading by following the words with highlighters		√				
Reading by underlining the words with highlighters		√				
Taking note with highlighters		√				
Reading by following the words with lead pencils				√	√	
Reading by underlining the words with lead pencils				√		
Taking notes with lead pencils				√		
Examining figures	√	√	√	√	√	√
Comparing figures	√	√	√	√		
Repeating the words					√	√
Rephrasing with his/her own sentences	√	√	√			
Reducing the reading speed			√	√	√	

According to Table 3, S1, who was attending the private school, had a “Very Good” grade point average and assessed the chapter as “Very Easy”, used the cognitive strategies of picturing in the mind, reading by following the words with coloured pencils, reading by underlining the words with coloured pencils, taking notes with coloured pencils, examining figures, comparing figures, rephrasing with his/her own sentences and reducing the reading speed while reading the “Support and Motor System” chapter.

Table 3 shows that S2, who was studying in the private school, had a “Very Good” grade point average and assessed the chapter as “Easy”, used the cognitive strategies of picturing in the mind, reading by following the words with highlighters, reading by underlining the words with highlighters, taking notes with highlighters, examining figures, comparing figures and rephrasing with his/her own sentences while reading the chapter.

As for S3 who was studying in the private school, had a “Good” grade point average and assessed the chapter as “Easy”, it is seen that the student used the cognitive strategies of picturing in the mind, reading by following the words with coloured pencils, reading by underlining the words with coloured pencils, taking notes with coloured pencils, examining figures, comparing figures, rephrasing with his/her own sentences and reducing the reading speed while reading the “Support and Motor System” chapter.

According to Table 3, S4, who was studying in the state school, had “Low” grade point average and assessed the chapter “Moderately Difficult”, used the cognitive strategies of reading by following the words with lead pencil, reading by underlining the words with lead

pencil, taking notes with lead pencil, examining figures, comparing figures and reducing the reading speed while the reading the chapter.

When Table 3 is examined, it is seen that S5, who was studying in the state school, had “Low” grade point average and assessed the chapter “Moderately Difficult, used the strategies of reading by following the words with lead pencil, examining figures, repeating the words and reducing the reading speed while reading the chapter.

Also, according to Table 3, S6, who was studying in the state school, had a “Very Low” grade point average and assessed the chapter as “Difficult”, used the cognitive strategies of examining figures and repeating the words while reading the chapter.

Table 3 shows that, differently from the 6th grade students studying in the state school, 6th grade students studying in the private school used the cognitive strategies of picturing in the mind, reading by following the words with coloured pencils, reading by underlining the words with coloured pencils, taking notes with coloured pencils, reading by following the words with highlighters, reading by underlining the words with highlighters, taking notes with highlighters and rephrasing with their own sentences.

Table 3 also shows that S1, who was studying in the private school, had a “Very Good” grade point average and assessed the chapter as “Very Easy” used a higher number and a wider variety of cognitive strategies while reading the chapter when compared to S2, who had a “Very Good” grade point average and assessed the chapter as “Easy”, and S3, who had a “Good” grade point average and assessed the chapter as “Easy”.

According to Table 3, S4, who was studying in the state school, had a “Low” grade point average and assessed the chapter as “Moderately Difficult” used a lower number of and less diverse cognitive strategies while reading the chapter when compared to S5, who had a “Low” grade point average and assessed the chapter as “Moderately Difficult” and S6, who had a “Very Low” grade point average and assessed the chapter as “Difficult”.

As indicated in Table 3, it was determined that the cognitive strategies used by the students, who were studying in the private school, had “Very Good” and “Good” grade point averages and assessed the “Support and Motor System” chapter as “Very Easy” and “Easy”, while reading the chapter were higher in number and wider in variety when compared to those used by the students who were studying in the state school, had “Low” and “Very Low” grade point averages and assessed the chapter as “Moderately Difficult” and “Difficult”.

The meta-cognitive strategies used by the 6th grade students who were studying in the state school and had different grade point averages while reading the chapter analysed are given in Table 4.

Table 4. *Meta-cognitive strategies used by the students having different grade point averages while reading the chapter*

SECONDARY SCHOOLS	PRIVATE SCHOOL			STATE SCHOOL		
STUDENTS	S1	S2	S3	S4	S5	S6
GRADE POINT AVERAGE	Very Good	Very Good	Good	Low	Very Low	Very Low
DEGREE OF DIFFICULTY OF THE CHAPTER	Very Easy	Easy	Easy	Moderate	Moderate	Difficult
METACOGNITIVE STRATEGIES	√	√	√			
Reading back	√		√			
Underlining the tips with coloured pencils	√		√			
Circling the tips with coloured pencils	√		√			
Taking notes with coloured pencils	√		√			
Taking notes on the figures with coloured pencils	√		√			
Putting marks on the figures with coloured pencils (star, arrow etc.)	√		√			
Underlining the tips with highlighters		√				
Circling the tips with highlighters		√				
Taking notes with highlighters		√				
Taking notes on the figures with highlighters		√				
Putting marks on the figures with highlighters (star, arrow etc.)		√				
Circling the tips with lead pencil				√		
Underlining the tips with lead pencil					√	
Reading by underlining the words with lead pencil				√		
Taking notes with lead pencil				√		
Taking notes on the figures with lead pencil						√
Putting marks on the figures with lead pencil (star, arrow etc.)					√	
Re-examining the figures	√	√	√	√	√	√
Repeating the tips aloud	√	√				
Asking questions to himself/herself	√	√		√		
Accentuation	√	√				
Thinking over the text	√		√	√		
Reviewing	√	√	√			
Visualisation	√	√				

When Table 4 is examined, it is seen that S1, who was studying in the private school, had a “Very Good” grade point average and assessed the chapter as “Very Easy”, used metacognitive strategies such as reading back, underlining the tips with coloured pencils, circling the tips with coloured pencils, taking notes with coloured pencils, taking notes on the figures with coloured pencils, putting marks on the figures with coloured pencils (star, arrow etc.), re-examining the figures, repeating the tips aloud, asking questions to himself/herself, accentuation, thinking over the text, reviewing and visualization while reading the “Support and Motor System” chapter.

According to the table, S2, who was studying in the private school, had a “Very Good” grade point average and assessed the chapter as “Easy”, used the metacognitive strategies of underlining the tips with highlighters, circling the tips with highlighters, taking notes with highlighters, taking notes on the figures with highlighters, putting marks on the figures with highlighters (star, arrow etc.), re-examining the figures, repeating the tips aloud, asking

questions to himself/herself, accentuation, reviewing and visualization while reading the “Support and Motor System” chapter.

As for S3, who was studying in the private school, had a “Good” grade point average and assessed the chapter as “Easy”, used the metacognitive strategies of reading back, underlining the tips with coloured pencils, circling the tips with coloured pencils, taking notes with coloured pencils, taking notes on the figures with coloured pencils, putting marks on the figures with coloured pencils (star, arrow etc.), re-examining the figures, thinking over the text and reviewing while reading the “Support and Motor System” chapter.

Table 4 also shows that S4, who was studying in the state school, had a “Low” grade point average and assessed the chapter as “Moderately Difficult” used the metacognitive strategies of circling the tips with lead pencil, reading by underlining the words with lead pencil, taking notes with lead pencil, re-examining the figures and asking questions to himself/herself while reading the chapter.

As for S5, who was studying in the state school, had a “Low” grade point average and assessed the chapter as “Moderately Difficult”, it was determined that the student used the metacognitive strategies of underlining the tips with lead pencil, putting marks on the figures with lead pencil (star, arrow etc.) and re-examining the figures while reading the chapter.

Finally, according to the table, S6, who was studying in the state school, had a “Very Low” grade point average and assessed the chapter as “Difficult”, used the metacognitive strategies of taking notes on the figures with lead pencil and re-examining the figures while reading the “Support and Motor System” chapter.

Table 4 shows that, differently from the 6th grade students studying in the state school, 6th grade students studying in the private school used the metacognitive strategies of reading back, underlining the tips with coloured pencils, circling the tips with coloured pencils, taking notes with coloured pencils, taking notes on the figures with coloured pencils, putting marks on the figures with coloured pencils (star, arrow etc.), underlining the tips with highlighters, circling the tips with coloured highlighters, taking notes with highlighters, putting marks on the figures with highlighters (star, arrow etc.), repeating the tips aloud, accentuation, reviewing and visualization while reading the “Support and Motor System” chapter.

According to Table 4, S1, who was studying in the private school, had a “Very Good” grade point average and assessed the chapter as “Very Easy”, used a higher number and a wider variety of metacognitive strategies when compared to S2, who had a “Very Good” grade point average and assessed the chapter as “Easy”, and S3, who had a “Good” grade point average and assessed the chapter as “Easy” when reading the “Support and Motor System” chapter.

When Table 4 is examined again, it is seen that S4, who was studying in the state school, had a “Low” grade point average and assessed the chapter as “Moderately Difficult”; S5, who had a “Low” grade point average and assessed the chapter as “Moderately Difficult”; and S6, who had a “Very Low” grade point average and assessed the chapter as “Difficult” used a small number of and less diverse metacognitive strategies while reading the “Support and Motor System” chapter.

Table 4 also shows that the metacognitive strategies used by the students who were studying in the private school, had “Very Good” and “Good” grade point averages and assessed the “Support and Motor System” chapter as “Very Easy” and “Easy” were higher in number and wider in variety when compared to those used by the students who were studying in the state school, had “Low” and “Very Low” grade point averages and assessed the chapter as “Moderately Difficult” and “Very Difficult”.

When Table 3 and Table 4 are compared, it is seen that the metacognitive strategies used by the 6th grade students studying in the private school while reading the “Support and Motor System” chapter are higher in number and wider in variety than cognitive strategies. On the other hand, there is no significant difference between the cognitive and metacognitive strategies used by the 6th grade students studying in the state school while reading the chapter in terms of number and variety.

#### **4. Conclusion and discussion**

In this study, it can safely be concluded that the participant students from the private school showed better performance in contrast to those from the state school. The following discussions with references to findings and the related literature are helpful enough to conclude the research.

It was determined that S1, who was attending the private school, had a “Very Good” grade point average and assessed the chapter as “Very Easy”, used the cognitive strategies of picturing in the mind, reading by following the words with coloured pencils, reading by underlining the words with coloured pencils, taking notes with coloured pencils, examining figures, comparing figures, rephrasing with his/her own sentences and reducing the reading speed while reading the “Support and Motor System” chapter; S2, who was studying in the private school, had a “Very Good” grade point average and assessed the chapter as “Easy”, used the cognitive strategies of picturing in the mind, reading by following the words with highlighters, reading by underlining the words with highlighters, taking notes with highlighters, examining figures, comparing figures and rephrasing with his/her own sentences; and S3, who was studying in the private school, had a “Good” grade point average and assessed the chapter as “Easy”, used the cognitive strategies of picturing in the mind, reading by following the words with coloured pencils, reading by underlining the words with coloured pencils, taking notes with coloured pencils, examining figures, comparing figures, rephrasing with his/her own sentences and reducing the reading speed. It was also found out that S5, who was studying in the state school, had “Low” grade point average and assessed the chapter “Moderately Difficult, used the strategies of reading by following the words with lead pencil, examining figures, repeating the words and reducing the reading speed while reading the chapter while S6, who was studying in the state school, had a “Very Low” grade point average and assessed the chapter as “Difficult”, used the cognitive strategies of examining figures and repeating the words while reading the chapter.

O’Malley et al. (1985) reported that students used cognitive strategies such as repeating, examining sources, grouping, note-taking, drawing conclusions, combining, visualization, paraphrasing, association and inference while reading plain texts. Güral (2000) stated that foreign language students used the cognitive strategies of reading back, reading aloud, associating sentences, research, note-taking, stressing, underlining, review, finding the main idea, finding idioms, translation, finding tips, detailing, skipping, presentation, picturing in the mind, tracing reading and expressing differently while reading plain texts. Karaçam (2009) determined that students used the cognitive strategies of repeating the answer aloud, picturing in the mind, repeating the tips aloud, paraphrasing, defining piece by piece, note-taking, following the figure by reading and examining the figure after reading while solving open-ended and multiple-choice questions. Kumlu (2012) reported that the preservice teachers used the cognitive strategies of repeating the procedures within the text, examining the figure, visualization, paraphrasing, reading back and reviewing while reading the plain texts on photosynthesis and respiration. Finally, Diken and Yürük (2019) determined that the 9th grade students used the cognitive strategies of picturing in the mind, reading by following the words with a pencil, examining the figure, note-taking, paraphrasing, examining the figure and



reading by underlining the word while they were solving the multiple-choice questions in the field of science.

It was determined that S1, who was studying in the private school, had a “Very Good” grade point average and assessed the chapter as “Very Easy”, used metacognitive strategies such as reading back, underlining the tips with coloured pencils, circling the tips with coloured pencils, taking notes with coloured pencils, taking notes on the figures with coloured pencils, putting marks on the figures with coloured pencils (star, arrow etc.), re-examining the figures, repeating the tips aloud, asking questions to himself/herself, accentuation, thinking over the text, reviewing and visualization while reading the “Support and Motor System” chapter; S2, who was studying in the private school, had a “Very Good” grade point average and assessed the chapter as “Easy”, used the metacognitive strategies of underlining the tips with highlighters, circling the tips with highlighters, taking notes with highlighters, taking notes on the figures with highlighters, putting marks on the figures with highlighters (star, arrow etc.), re-examining the figures, repeating the tips aloud, asking questions to himself/herself, accentuation, reviewing and visualization while reading the chapter; and S3, who was studying in the private school, had a “Good” grade point average and assessed the chapter as “Easy”, used the metacognitive strategies of reading back, underlining the tips with coloured pencils, circling the tips with coloured pencils, taking notes with coloured pencils, taking notes on the figures with coloured pencils, putting marks on the figures with coloured pencils (star, arrow etc.), re-examining the figures, thinking over the text and reviewing while reading the chapter.

It was also found out that S4, who was studying in the state school, had a “Low” grade point average and assessed the chapter as “Moderately Difficult” used the metacognitive strategies of circling the tips with lead pencil, reading by underlining the words with lead pencil, taking notes with lead pencil, re-examining the figures and asking questions to himself/herself while reading the chapter; S5, who was studying in the state school, had a “Low” grade point average and assessed the chapter as “Moderately Difficult”, used the metacognitive strategies of underlining the tips with lead pencil, putting marks on the figures with lead pencil (star, arrow etc.) and re-examining the figures; and S6, who was studying in the state school, had a “Very Low” grade point average and assessed the chapter as “Difficult”, used the metacognitive strategies of taking notes on the figures with lead pencil and re-examining the figures while reading the chapter.

O’Malley et al. (1985) reported that students used the metacognitive strategies of diverting one’s attention, selective attention, self-management, planning and self-assessment while reading the plain texts. Gral (2000) stated that foreign language students used the metacognitive strategies of determining the level of knowledge, planning, implementation, monitoring whether the subject was understood, finding the problem and self-assessment while reading the plain texts. Karaçam (2009) reported that the students used the metacognitive strategies of reading back, asking questions, questioning the expectation of the question, reducing the reading speed, paraphrasing and establishing causal relations while solving open-ended and multiple-choice questions. Kumlu (2012) determined that the preservice teachers used the metacognitive strategies of underlining with highlighters, circling, underlining with lead pencil, thinking over the text, putting an arrow mark, putting a star mark, accentuation and circling while reading plain texts about photosynthesis and respiration. Finally, Diken and Yrk (2019) determined that the 9th grade students used the metacognitive strategies of reading back, underlining the tips, circling the tips, re-examining the figure, repeating the important points, asking questions to himself/herself, putting marks on the explanations in the question text and paraphrasing while solving multiple-choice questions in the field of science.



According to the results of the study, differently from the 6th grade students studying in the state school, 6th grade students attending the private school used the cognitive strategies of picturing in the mind, reading by following the words with coloured pencils, reading by underlining the words with coloured pencils, taking notes with coloured pencils, reading by following the words with highlighters, reading by underlining the words with highlighters, taking notes with highlighters and rephrasing with their own sentences. Furthermore, it was determined that, differently from the 6th grade students studying in the state school, 6th grade students attending the private school used the metacognitive strategies of reading back, underlining the tips with coloured pencils, circling the tips with coloured pencils, taking notes with coloured pencils, taking notes on the figures with coloured pencils, putting marks on the figures with coloured pencils (star, arrow etc.), underlining the tips with highlighters, circling the tips with coloured highlighters, taking notes with highlighters, putting marks on the figures with highlighters (star, arrow etc.), repeating the tips aloud, accentuation, reviewing and visualization.

In the present study, it was determined that the 6th grade students, who were studying in the private school, had “Very Good” and “Good” grade point averages and assessed the “Support and Motor System” chapter as “Easy” and “Very Easy”, used a higher number and wider variety of cognitive and metacognitive strategies when compared to the 6th grade students, who were studying in the state school, had “Low” and “Very Low” grade point averages and assessed the chapter as “Moderately Difficult” and “Difficult”. Grabe (1991) reported that good readers are more active in using metacognitive skills than those having reading problems. O’Malley and Chamot (1990) determined that the students having higher levels of learning motivation used a higher number and wider variety of strategies when compared to those with lower levels of motivation.

In this study, it was determined that the metacognitive strategies used by the 6th grade students, who were studying in the private school, had “Very Good” and “Good” grade point averages and assessed the “Support and Motor System” chapter as “Easy” and “Very Easy” were higher in number and wider in variety when compared to the cognitive strategies. Kumlu (2012) reported that the students used metacognitive strategies much more than the cognitive strategies while they were reading plain texts. On the other hand, in the present study, no significant different was found between the cognitive and metacognitive strategies used by the students, who were studying in the state school and had “Low” and “Very Low” grade point averages, in terms of number and variety. Gelen (2003) reported that individual factors (previous knowledge, cognitive skills of the student etc.), tactics and techniques (learning cognitive awareness techniques and factors developed by the student on an individual basis) and situational (or environmental) factors (family, cultural and social factors, course content etc.) affected the acquisition of metacognitive skills.

In line with the results of this study, cognitive and metacognitive strategies used by the students while reading different chapters can be examined. Also, cognitive and metacognitive strategies used by the 6th grade students can be taught to all students of this grade. In particular, secondary school students, for whom reading and reading comprehension are of paramount importance, can be informed about the use of cognitive and metacognitive strategies for reading science texts through reading activities with science texts. In this way, comprehension and awareness of students regarding the texts can be ensured and increased.

## **5. Conflict of Interest**

The author declares that there is no conflict of interest.

## **6. Ethics Committee Approval**

The author confirms that the study does not need ethics committee approval according to the research integrity rules in their country.

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