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The Relationship between Metacognitive Awareness of Reading Strategies and Success of Science of the 5th Grade Students in Secondary School

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Abstract

In this study, the relationship between metacognitive awareness of reading strategies and success of science of 5th grade students in secondary school is aimed to reveal. In this sense, using levels of students' reading strategies, the relationship between these strategies and their success of science and also whether these strategies varies according to certain demographic characteristics is investigated. Turkish version –adapted by Öztürk (2012)- of reading strategies scale which was originally developed by Mokhtari and Reichard (2002) was used for that purpose. 5 point likert scale consists of 30 items. The scale consists of three factors including General Reading, Problem Solving Based Reading Strategies and Supportive Reading Strategies. The study was conducted with the participation of 241 secondary school students in the 5th grade. The final grades of students in science classes were taken as a basis as a measure of success. In this study, methods of descriptive statistics including; frequency, percentage and averaging analysis, T-test, Anova and Scheffé tests for the detection of differences between independent variables and Pearson correlation analysis to determine the level and direction of the relationship between the two variables were performed. As a result of analyses, it was found that students have moderate levels of metacognitive awareness about each reading strategies. It was seen that students have higher levels of metacognitive awareness in terms of Problem Solving-based Reading Strategy rather than General Reading Strategies and Supportive Reading Strategies. Students' metacognitive awareness of reading strategies were found to vary in favor of girls and moderate and meaningful relationships have been identified between their awareness and success in science classes.

Key Words: Reading Strategies, General Reading Strategy, Problem Solving Based Reading Strategy, Supportive Reading Strategy, Metacognitive Awareness, Science Achievement, 5th Grade Students

1. INTRODUCTION

Recently there has been developments and innovations in every areas especially science and technology. What means by this development and innovations is society of knowledge. The main reason for mentioning about this concept of society of knowledge is fast increase of knowledge in technology and science and using this knowledge intensively.

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Peoples' and society's harmony with this progress will be possible by doing researches, solving problems, thinking creatively, using creative knowledge, critical thinking and producing knowledge and technology.

In order to train people who have these qualities, progress of learning should be organised properly. As learning and data processing terms couldn't be observed directly, ''computing theory'' is developed to objectify this process and help us to understand better.

Computing theory consists of three main components, these are;

(1) Storages of knowledge: It is the first component of computing theory where knowledge is stored. It consists of three memories; short term record, long term record and sensorial record.
(2) Cognitive process: It is the second component of computing theory. It has cognitive activities that ensure knowledge transferring from one memory to the other.
(3) Metacognition: The third component of computing theory. It contains knowledge about process of cognition and their control (Gurbetoğlu, 2015).

The third component of computing theory, metacognition; is vitally important in learning process. Metacognition is used as an umbrella that surrounds people's own thought process and knowledge (Leader, 2008). Although it has many meanings in literature, the most common meaning is; people's having information about their own cognitive strain and organising this strain (Flavell, 1979; Wellman, 1985; Brown, 1987; Jacobs and Paris, 1987; Schraw, 1994; Livingston, 1997; Dunlosky and Hertzog, 2000; Georghiades, 2004; as cited in Aktürk and Şahin, 2011).

Metacognition controls and directs cognitive processes like; care, sense, coding, revision and restoration. Then, students with metacognitive strategies can revise their own learning strategies and cognitive process. In this way, they gain the ability ofthinking independently and master in learning by thinking on the study they do (Oluk and Başöncül, 2009). Metacognition brings ability of sense of learning process, planning and selecting strategies, following learning process, correcting mistakes, controlling usefullness of the strategy and changing learning strategy when necessary (Özsoy, 2006).

There are some concepts in metacognitive awareness, such as person's acting conscious, controlling himself, evaluating himself, planning, following how to learn andlearning how to leearn. It means that a person is aware of himself and his own learning style. So metacognitive awareness can be defined as people's owning and using the abilities of metacognitive thinking (Selçioğlu Demirsöz, 2014).

Conducted researches show that metacognitive skills have a positive effect on students' success (Acat, 1996; Penner, 1999; Şen, 2003; Muhtar, 2006 and Özsoy, 2008). So, metacognition is a main member of learning states and learning process. In other words, increase of metacognitive skills increases learning development. Students can increase their success by learning how to be aware of their thoughts in reading, writing and problem solving process (Senemoğlu, 2003).

Metacognitive strategies are those which supplies awareness of people's own reading process. Metacognitive awareness of reading helps students to follow and control their reading process and organising reading process. In other words, a student's following reading process, evaluating himself in understanding in reading and organising reading process, determining

deficients, if necessary rereading can be symptoms of his metacognitive awareness (Çöğmen and Saraçoğlu, 2010; Baker and Brown, 1980).

Reading cannot reach its goal without understanding. People's making out of what has been read, thinking about it and evaluating are necessary for a qualified reading. As the main goal of reading is the communication of the text and its reader, students should have necessity of abilities and strategies in order to get information from written sources (Collins and Cheek, 1999).

The reasons of failure of students are thought as lack of ability in understanding what is read (Oluk and Başöncül, 2009). Mclnerney and Mclnerney (2002) states that metacognitive awareness exists in early ages and develops during puberty. So, the level of students in metacognitive awareness in reading strategies should be identified in the first years in school and relationship between this awareness and success in Science should be emerged. Studies in this area are thought to contribute to literature.

Aim of this study is to make out the relationship between the level of metacognitive awareness in reading of students in the fifth grade and the success in Science lesson. Concordantly, answers for these questions are required:

(4) How are the students' metacognitive awareness levels of reading strategies?
(5) How are the students' metacognitive awareness levels of reading strategies factors (General Reading Strategies, Problem Solving Based Reading Strategies and Supportive Reading Strategies)?
(6) Do the students' metacognitive awareness levels of reading strategies differ depending on gender?
(7) Do the students' metacognitive awareness levels of reading strategies factors (General Reading Strategies, Problem Solving Based Reading Strategies and Supportive Reading Strategies) differ depending on gender?
(8) Is there a significant relationship between students' metacognitive awareness levels of reading strategies and their achievement in Science lesson?
(9) Is there a significant relationship between students' metacognitive awareness levels of reading strategies factors (General Reading Strategies, Problem Solving Based Reading Strategies and Supportive Reading Strategies) and their Science lessons achievements?

2. METHOD

2.1. Model

In research, correlational method from relational searching methods and scanning method from descriptive searching methods are used. Scanning method is a kind of searching method which is considered of participants opinions or attention, ability, attitude etc. is determined and generally bigger than the other samples. Correlational method is a kind of searching method; which is examined the relationship between 2 or more factors without interfering to both factors (Büyüköztürk and others, 2010). In the study this method is chosen, because it is thought to bring solutions and describing problems if met, and obtaining level of the relationship between metacognitive awareness of reading strategies and success of Science of the fifth grade students.

2.2. Searching Group

Study group is composed of 241 students of the fifth grade in different schools in Giresun, Muş and Bitlis. 113 of the students are girls and 128 of them are boys. They all attend schools which are in villages.

2.3. Data Collection Tools

Data has been taken from Students' Information Form and Reading Strategies Metacognitive Awareness Scale. Students' 2014-2015 education year school reports is relianced for success criteria.

2.3.1. Students' Information Form

Students' Information Form which is developed by researchers is used collected from study group for demographic information. The information used in the study were asked about in the form.

2.3.2. Reading Strategies Metacognitive Awareness Scale

Turkish version –adapted by Öztürk (2012)- of reading strategies scale which was originally developed by Mokhtari and Reichard (2002) was used for that purpose. 5 point likert scale consists of 30 items. The scale consists of three factors including General Reading Strategies, Problem Solving Based Reading Strategies and Supportive Reading Strategies. During validity and reliability studies of the scale made by Öztürk (2012), exploratory and confirmatory factor analysis and construct validity was analyzed. At the same time, reliability analyses were performed with Cronbach's alpha and coefficient of internal consistence. The correlation between the scale scores obtained from the Turkish and English forms were found to be 0.96. Factors of the scale were found to have reliability values between .76 and .85. Depending on these varieties, it can be thought that this scale can be used in education in terms of reliability and validity. Below is the table of dispersion of the items in the scale.

Table 1. Dispersion of The Questions in Scale

Factors in scale	**Item number**
General Reading Strategies	**2, 5, 6, 9, 12, 15, 20, 24, 28**
Problem Solving Based Reading Strategies	**8, 11, 13, 16, 18, 21, 27, 30**
Supporting Reading Strategies	**1, 3, 4, 7, 10, 14, 17, 19, 22, 23, 25, 26, 29**

2.4. Analysing Datas

Collected datas are analysed after they are coded in computer by using SPSS 16.0 programme. In this study, methods of descriptive statistics including; Frequency, Percentage and Averaging analysis, T-test for the detection of differences between independent variables and Pearson correlation analysis to determine the level and direction of the relationship between the two variables were performed.

3. FINDINGS

In this study, metacognitive awareness levels of reading strategies are examined in 3 factors as *General Reading, Problem Solving Based Reading and Supportive Reading Strategies*. With this reason, findings related to students' metacognitive awareness levels of reading strategies and arithmetic means they got from each factor and analysis results of variables between gender and achievement in science lesson are handled individually.

3.1. Students' Metacognitive Awareness Levels of Reading Strategies

The first research question is 'How are the students' metacognitive awareness levels of reading strategies?'. Students' average points of the scale measuring their metacognitive awareness of reading strategies are given in Table 3.1.

Table 3.1. Arithmetic Means and Standard Deviations of the Students' Points of Reading Strategies Metacognitive Awareness Scale

	N	$\bar{x}$	S
Points of Reading Strategies Metacognitive Awareness Scale	241	3.6397	.59564

When Table 3.1. is examined, it is seen that students' points of Reading Strategies Metacognitive Awareness Scale are at midlevel.

3.2. Students' Metacognitive Awareness Levels of Reading Strategies Factors (General Reading Strategies, Problem Solving Based Reading Strategies and Supportive Reading Strategies)

The second research question is 'How are the students' metacognitive awareness levels of reading strategies factors (General Reading Strategies, Problem Solving Based Reading Strategies and Supportive Reading Strategies)? With regard to this question, students' average points of the scale measuring their metacognitive awareness of reading strategies are given in Table 3.2.

Table 3.2. Arithmetic Means and Standart Deviations of the Factor Points of Scale Measuring Students' Metacognitive Awareness of Reading Strategies

Reading Strategies Metacognitive Awareness Scale Factors	N	$\bar{x}$	S
Supportive Reading Strategies	241	3.5690	.63303
Problem Solving Based Reading Strategies	241	3.8827	.69637
General Reading Strategies	241	3.5258	.66381

When Table 3.2. is examined, it is seen that students' points they get from reading strategies metacognitive awareness scale are at midlevel and their metacognitive awareness levels of problem solving based reading strategies are higher than the other factors.

3.3. The Relation Between Gender and Students' Metacognitive Awareness Levels of Reading Strategies

The third research questions is 'Do metacognitive awareness levels of students' reading strategies differ depending on gender?'. Analysis results regarding this question are

given in Table 3.3. to determine whether there is a significant relation between students' gender and their metacognitive awareness levels of reading strategies.

Table 3.3. T-Test Results of Reading Strategies Metacognitive Awareness Scale Points According to Gender

Gender	N	$\bar{x}$	S	sd	t	p
Female	113	3.7821	.55	240	3.080	.002
Male	128	3.5137	.61			

When Table 3.3.is examined, Reading Strategies Metacognitive Scale Points of female students are found as ($\bar{x}$=3.79) and male ones as ($\bar{x}$=3.51). A significant difference in favor of female students [$t_{(1-240)}$=3.080, p<.05] is found in students' metacognitive awareness levels of reading strategies.

3.4. The Relation between Students' Metacognitive Awareness of Reading Strategies Factors (General Reading Strategies, Reading Strategies Based on Problem Solving and Supportive Reading Strategies) and Gender

The fourth research question is 'Do metacognitive awarenes levels of students' reading strategies factors (General Reading Strategies, Problem Solving Based Reading Strategies and Supportive Reading Strategies) differ depending on gender?'. With regard to this question, analysis results to determine whether there is a significant relation between students' gender and metacognitive awareness levels of students' general reading strategies, problem solving based reading strategies and supportive reading strategies are given in Table 3.4.

Table 3.4. T-test Results of Reading Strategies Metacognitive Awareness Scale Factors According to Gender

Reading Strategies Factors	Gender	N	$\bar{x}$	S	sd	t	p
SRS	Female	113	3.7253	.59	240	3.185	.002
	Male	128	3.4308	.64			
PSRS	Female	113	4.0134	.67	240	2.393	.018
	Male	128	3.7671	.70			
GRS	Female	113	3.6587	.62	240	2.559	.011
	Male	128	3.4082	.68			

When Table 3.4 is examined, significant differences in favour of female students are seen in students' metacognitive awareness levels of Supportive Reading Strategies [$t_{(1-240)}$=3.185, p<.05], Problem Solving Based Reading Strategies [$t_{(1-240)}$=3.185, p<.05], and General Reading Strategies [$t_{(1-240)}$=2.559, p<.05].

3.5. The Relation between Students' Metacognitive Awareness of Reading Strategies and Their Achievement in Science Lessons

The fifth research question is 'Is there a significant relationship between students' reading strategies metacognitive awareness levels and their achievement in Science lesson?'. Regarding this question, Pearson Correlation Test is applied to determine the direction and

level of the relation between the students' metacognitive awareness levels of reading strategies and their achievement in Science lessons.

Table 3.5. Pearson Correlation Analysis Results of Students' Achievements in Science Lessons and Their Metacognitive Awareness Levels of Reading Strategies

		Science Lesson Achievement Points	Reading Strategies Metacognitive Awareness Scale Points
Science Lesson Achievement Points	**R**	1	.421**
	p		.000
	N	241	241
Reading Strategies Metacognitive Awareness Scale Points	**R**	.421**	1
	p	.000	
	N	241	241

p=.01

When Table 3.5. is examined, correlation coefficient between students' Science lesson achievement and their metacognitive awareness levels of reading strategies is found as (R=.421) as a result of Pearson Correlation test. As correlation coefficient's being between 0.30-0.50 means midlevel relation (Büyüköztürk et. al, 2010), a positive and significant relation is seen between students' Science lessons achievements and their metacognitive awareness levels of reading strategies (R=.421, p<.01).

3.6.The Relation Between Students' Metacognitive Awareness Levels of Reading Strategies Factors (General Reading Strategies, Problem Solving Based Reading Strategies and Supportive Reading Strategies) and Their Science Lessons Achievements

The sixth research question is 'Is there a significant relationship between students' metacognitive awareness levels of reading strategies factors (General Reading Strategies, Problem Solving Based Reading Strategies and Supportive Reading Strategies) and their Science lessons achievements?'. Concerning this question, Pearson Correlation Test is applied to determine the direction and level of the relation between the students' metacognitive awareness levels of reading strategies factors and their achievements in Science lesson.

Table 3.6. Pearson Correlation Analysis Results of Students' Science Lesson Achievements and Metacognitive Awareness Levels of Reading Strategies Factors

		Science Lesson Achievement Points	Supportive Reading Strategies	Problem Solving Based Reading Strategies	General Reading Strategies
Science Lesson Achievement Points	**R**	1	.390**	.422**	.328**
	p		.000	.000	.000
	N	241	241	241	241
Supportive Reading Strategies	**R**	.390**	1	.670**	.804**
	p	.000		.000	.000
	N	241	241	241	241

Problem Solving Based Reading Strategies	**R**	.422**	.670**	1	.666**
	p	.000	.000		.000
	N	241	241	241	241
General Reading Strategies	**R**	.328**	.804**	.666**	1
	p	.000	.000	.000	
	N	241	241	241	241

p=.01

When Table 3.6. is examined, correlation coefficient between students' Science lessons achievement and their metacognitive awareness levels of supportive reading strategies is found as (R=.390) , correlation coefficient between metacognitive awareness levels of problem solving based reading strategies as (R=.422) and correlation coefficient between metacognitive awareness levels of general reading strategies as (R=.328) as a result of Pearson Correlation test. A significant, positive, midlevel relationship is seen between students' Science lesson achievements and their metacognitive awareness levels of reading strategies factors (p<.01).

4. RESULTS AND DISCUSSION

According to the obtained findings, students' points of the scale measuring metacognitive awareness of reading strategies are found to be at midlevel ($\bar{x}$ =3.64). The fact that teacher candidates are in midlevel in terms of using reading strategies is found in study conducted by Topuzkanamış (2009). This research has parallels with literature.

Besides students' points they got from factors of reading strategies metacognitive awareness scale being at midlevel, their metacognitive awareness of problem solving based reading strategies are found to be much higher than the other factors ($\bar{x}$ =3.88). This result matches up with the results of the studies of Oluk and Başöncül (2009).

A significant difference is found in favour of female students in students' metacognitive awareness levels of reading strategies [$t_{(1-240)}$=3.080, p<.05]. In a study carried out by Karatay (2009), it is determined that gender bound cognitive awareness levels differ in favour of female students in every step of teaching process. Therefore this research has similarity with literature.

Significant differences in favour of female students are found at the students' metacognitive awareness levels of Supportive Reading Strategies [$t_{(1-240)}$=3.185, p<.05], Problem Solving Based Reading Strategies [$t_{(1-240)}$=2.393, p<.05] and General Reading Strategies [$t_{(1-240)}$=2.559, p<.05]. This condition can be explained with male students' performing better at spatial and mathematical areas while female students' being better than males at verbal tasks such as writing out sentences, right spelling, reading and pronunciation (Maccoby and Jackin, 1974; as cited in Bilgin, Karakuyu and Tüysüz, 2008).

Correlation coefficient (R=.421) is found between the students' achievements in science lesson and their metacognitive awareness levels of reading strategies. With regard to this result, a positive significant relation is found between students' achievements in science lesson and their metacognitive awareness levels of reading strategies (R=.421, p<.01). This result has similarity with the study results of Oluk and Başöncül (2009) and Selçioğlu Demirsöz (2014). Volet (1991) ascertained that students' using metacognitive strategies

contribute to their affective and cognitive learning.

Correlation coefficient (R=.390) between the levels of students' science lesson achievements and their metacognitive awareness levels of supportive reading strategies, correlation coefficient (R=.422) of metacognitive awareness levels of problem solving based reading strategies and correlation coefficient (R=.328) of metacognitive awareness levels of general reading strategies are found. A positive, significant midlevel relation is found between the students' science lesson achievements and their metacognitive awareness levels of reading strategies factors. This result shows similarity with the study results of Howard et. al (2000), Oluk and Başöncül (2009), Aktürk and Şahin (2011).

In this study, there being significant relation between the students' metacognitive awareness of reading strategies and their achievement in science lesson leads to considering the necessity of supporting these skills. However, the programs in our country lack in the activities about developing these kinds of skills (Özsoy,2008). Regarding this situation, it will be beneficial to include activities and targets which will help students improve their metacognitive progress in program development studies.

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