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Metacognition Awareness and Perceived Teacher Behaviors of Fifth-Grade Students

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Abstract

The study examined the metacognition levels of middle school fifth-grade students and their perceived mathematics teacher behaviours in different variables. A survey model of the quantitative research methods was used. Convenient sampling was adopted from non-random sampling types in the study. Two hundred ninety-two fifth-grade students at a public school in the Central Anatolian region participated. “Students' Perceived Teacher Behaviours” (SPTB) and “Metacognition Awareness Levels of Students” (MALS) scales were used as data collection tools. Students perceived teacher behaviours and metacognitive awareness levels were analyzed regarding gender and age. As a result of the analysis, the metacognition levels of fifth-grade students did not affect perceived teacher behaviours, and found relationship was not statistically significant. There is no significant mean difference in fifth-grade students’ metacognition beliefs and perceived teacher behaviours concerning their gender.

Keywords: Gender, Metacognition Awareness, Middle School Students, Perceived Teacher Behaviour

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INTRODUCTION

People's attitudes and beliefs determine whether the child's behavior is healthy or unhealthy (Uyanık Balat et al., 2008). The teachers' and parents' attitudes and behaviors towards the child are the main environmental variables in gaining the desired behavior in the individual, which is the most basic purpose of education and academic success (Erdoğdu, 2007). After children start school, the role of the family in teaching gradually decreases, and the role of the teacher increases. Because children begin to spend most of their time in school, they stay in touch with their teachers and friends. They spend 12 years of their lives communicating compulsorily with their teachers at school. Therefore, the education they receive in schools and teachers' attitudes towards children are vital in raising healthy individuals in society. Children in our country's education life participate in primary, middle, and high school departments as compulsory.

It is undeniable that with the advancement of technology, the ways of accessing information have changed, and there have been many changes in education and every field. The contemporary education approach has changed teaching from teacher-centered to student-centered (Şentürk & Oral, 2008). Brophy and Alleman (1991) state that the teacher being friendly, full of enthusiasm and passion, being a supporter of change and development, being humane, thinking and reflecting his thoughts are indispensable elements of effective teaching (cited in Şahin, 2011). Considering that in the fifth grade, children switch from the single classroom teacher they used to for years to many branch teachers and try to adapt to a new system, it is understood how important the personality traits and attitudes of the teachers are for this grade level. Because in the fifth grade, children are in the process of both seeking a new identity in the transition to adolescence and getting used to being in contact with many teachers, The quality of student-teacher relations affects academic success and student behavior (Şahin, 2011). The present research was conducted on how fifth-grade students perceive the behaviors of mathematics teachers because mathematics is one of the essential primary areas of teaching (Aydın & Yeşilyurt, 2007). Students perceive mathematics as challenging to understand and achieve success in (Başar et al., 2002). The present research has been carried out mainly on how the students evaluate the mathematics teacher from their own perspective.

Considering that each student is a separate individual and has a unique complex structure, it is noticed that his evaluation of events and people will be unique to him. It is a fact that they need to be at a certain level of consciousness to evaluate the teacher's behaviors they perceive correctly. Therefore, the concept of metacognition is essential. The definitions of metacognition focus on the individual's awareness and control of the knowledge and processes related to himself/herself -

learning. Cognition includes individuals' mental learning; metacognition includes monitoring, controlling, and evaluating learning (Ataalkın, 2012). Metacognition can be defined as high-level cognitive structures and processes that control, regulate, and assess cognitions (Irak et al., 2015). There are many studies on the change of metacognitive difference according to age. One of the general results on this subject is that some cognitive processes change with healthy growth (Irak et al., 2015). Research focuses on wide age ranges, and it is to be wondered if the gender and age-related changes of students at the same grade level and with similar learning environments affect metacognitive differences. Thus, this research examines the metacognitive differences of middle school fifth-grade students by different variables in terms of their perceived mathematics teacher behaviors. Within the scope of the investigation, the sub-problems of the study were determined as follows:

• Do fifth-grade students' metacognition levels differ according to gender and age?

• Do fifth-grade students' perceived mathematics teacher behaviors differ according to gender and age?

• Is there a meaningful relationship between the metacognition levels of fifth-grade students and their perceived mathematics teacher behaviors?

This research is limited to the 2019-2020 academic year. Two hundred ninety-two fifth-grade students at a public school in the Central Anatolia region participated in the study. The assumptions of this research are:

• Students answered the research scales independently without being influenced by each other.

• Students answered the questions in the measurement tools sincerely and correctly.

METHOD

Research Design

This study used a descriptive research design and survey model from the quantitative research methods. Descriptive research investigates the event as it is and determines the existing situation. In this type of research, the events and situations discussed are investigated in detail, their relationship with previous events and situations is examined, and it describes what they are. Survey research, which is widely used in social sciences, is research conducted on large groups in which the opinions and attitudes of the individuals in the group about a phenomenon and event are described (Aypay et al., 2009).

Sample

Convenient sampling was adopted from non-random sampling types in the study. Two hundred ninety-two fifth-grade middle students (133 girls & 159 boys) of a public school in the Central Anatolian region participated.

Data Collection Tools

In this study, "Students' Perceived Teacher Behaviors" (SPTB) and "Metacognition Awareness Levels of Students" (MALS) were used as data collection tools. In addition to two scales, a personal information form was used for data collection. In addition to the two scales, students' demographic information, such as gender, age, and grade level information, was requested.

Students' Perceived Teacher Behaviors Scale

"Students' Perceived Teacher Behaviors Scale" (SPTB), developed by Sezgin (2013), is a 3-point Likert-type scale from "disagree" to "agree" to determine perceived teacher behaviors. This scale included eight questions, and the reliability of this instrument was found to be 0.801.

Metacognition Awareness Levels of Students Scale

"Metacognition Awareness Levels of Students" (MALS), developed by Yıldız et al. (2009), is a 5-point Likert-type scale from "never" to "always" to determine metacognitive awareness. This scale included 30 questions, and the reliability of this instrument was found to be 0.917.

RESULTS

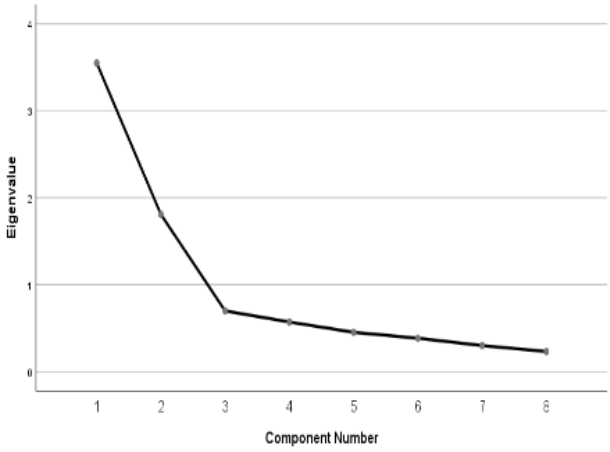
Factor analysis is used as a data reduction technique. It takes a large data set and looks for a way to reduce or summarize it by using a smaller set of factors or components. It searches groups among the mutual correlations of the set of variables (Pallant, 2017). Therefore, factor analysis was performed with SPSS. This section presents factor analysis of the perceived teacher behaviors scale and metacognition awareness levels of students' scale. In addition, according to the data obtained in line with the purpose of the research, the metacognition levels of the fifth-grade students and the perceived mathematics teacher behaviors were examined in terms of gender and age.

Factor Analysis of the Perceived Teacher Behaviors Scale

For the factor analysis of the perceived teacher behaviors scale, two statistical measures can be used to help assess the suitability of data for factor analysis: The Kaiser-Meyer-Olkin (KMO)

measure of sample adequacy ranges from 0 to 1, and 0.6 is recommended as the minimum value for a good factor analysis (Tabachnick & Fidell, 2013). According to the analysis results, since p=0.00<0.05, factor analysis can be done for the fifth-grade students' perceived teacher behaviors scale. Since the KMO index is 0.821>0.6, a good factor analysis can be done. It provides homogeneity according to the Barlett sphericity index (X^2= 996.007, df=28, p=0.000). For the factor analysis to be considered appropriate, the homogeneous distribution of the Barlett test should be significant (p<0.05).

Figure 1. The scree plot of the perceived teacher behaviors scale



According to Figure 1, between two points indicates a factor. The slope between items 1-3 is high; after the third item, the slope decreases and becomes almost flat. In other words, there is a clear break after the second and third items, and then no such break is observed.

Table 1

Rotated Factor Analysis Results of the Perceived Teacher Behavior Scale

Items	**Factors**	
	1	**2**
"It encourages us in the learning environment." (Q8)	0.861	
"Tells mathematics subjects and concepts in a clear and understandable way." (Q1)	0.838	
"Begins with a new topic, making sure that all students have learned the topic." (Q5)	0.811	
"It encourages us to ask questions." (Q3)	0.797	
"It says we have to memorize many formulas and concepts." (Q2)	0.764	
"Uses more punishment than reward." (Q7)		0.813
"He criticizes very harshly when mathematical mistakes are made." (Q6)		0.798
"Works the lesson with a certain group of students." (Q4)		0.589

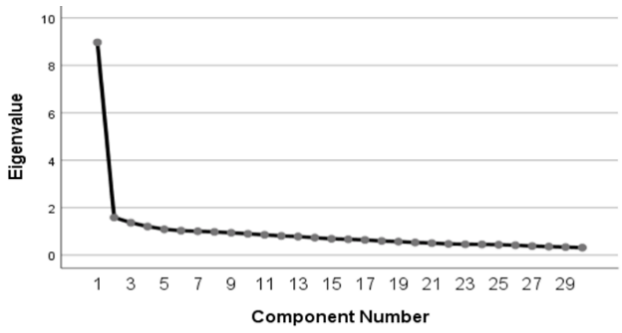
Table 1 shows the rotated factor loadings of the items under the two factors that emerged. According to the rotated factor analysis, the two components of the scales are related. While the first

component contains Q1, Q2, Q3, Q5, and Q8, the second component contains Q4, Q6, and Q7 items. In other words, questions Q1, Q2, Q3, Q5, and Q8 are related to each other as a separate group, and questions Q4, Q6, and Q7 as a separate group and should be evaluated separately. The items of Q1, Q2, Q3, Q5, and Q8 in the first five lines show the first group of items with high correlation. The items of Q7, Q6, and Q4 in the last three lines show the second group of items with a high correlation.

Factor Analysis of the Metacognition Levels of Students

The factor analysis of the metacognition levels of the fifth-grade students was performed. Two statistical measures can be used to help assess the suitability of data for factor analysis: the Barlett test and the Kaiser-Meyer-Olkin (KMO) sample adequacy measure. The Barlett test must be significant ($p<0.05$) for factor analysis to be considered appropriate. The KMO index ranges from 0 to 1, and 0.6 is recommended as the minimum value for a good factor analysis (Tabachnick & Fidell, 2013). Since $p=0.00<0.05$ in the Barlett test, factor analysis can be done for students' metacognition levels scale. Since the KMO index is $0.92>0.6$, a good factor analysis can be done. The scree plot in Figure 2 provides a criterion option to determine the number of factors to be extracted at the end of factor analysis. It provides homogeneity according to the Barlett sphericity index ($X2=2760.928$, $df=435$, $p=0.000$).

*Figure 2.*Scree Plot



According to Figure 2, between two points indicates a factor. The break between the first and second components in the slope chart is extremely high. It explains more variance than other components do. After the third item, the fracture decreases, and the slope becomes flat. Table 2 shows the factor analysis results of the students' metacognition levels scale. According to these results, the items were associated with six factors.

Table 2

Rotated Factor Analysis Results of the Metacognition Levels Scale

Items	**Factors**						
	1	2	3	4	5	6	7
"I try to find the main ideas in the exam questions." (Q30)	0.722						
"When I get confused, I stop and read it again." (Q24)	0.704						
"After solving a question, I ask myself if there is an easier solution." (Q28)	0.662						
"I am aware of how I think when answering questions in the exam." (Q26)	0.546						
"When I have finished studying, I try to see if I have learned as much as I can." (Q22)	0.503						
"I try to try more than one way to solve exam questions." (Q25)	0.445						
"I organize the information in my head in a way that I can remember easily." (Q3)		0.409					
"I know if I understand a subject or not." (Q5)		0.670					
"I know what strategies I use while studying." (Q7)		0.370					
"I know how well the strategies I use when learning a subject work." (Q11)		0.526					
"I know which way of thinking to use and when to use it." (Q8)		0.491					
"If I find it necessary in the exams, I change my ways of thinking and solutions." (Q9)			0.653				
"If I am wrong in doing something, I will go back and correct my mistake." (Q12)			-0.417				
"I know if a piece of information is important to me, I focus my attention on it." (Q21)			-0.320				
"When answering a question, I control how I'm doing." (Q1)				-0.750			
"When answering questions, I check if I'm doing it right." (Q2)				-0.789			
"I know the time required to answer the questions in the exams and I adjust myself accordingly." (Q6)				-0.310			
"I repeat what I do not fully understand."				-0.546			

(Q23)			
"When I complete a task, I ask how far I have achieved my goals." (Q13)	0.676		
"When I encounter a problem, I think of many solutions and choose the best one." (Q17)	0.570		
"I regularly ask myself how far I have achieved my goals." (Q29)	0.455		
"I am aware of what methods I use while working." (Q18)	0.387		
"I plan how much time I will need while learning a subject." (Q19)	0.335		
"I know what the teacher expects me to learn." (Q4)		-0.732	
"I think about the place of the subject I learned in my daily life." (Q14)		-0.519	
"Whether I learn better or not is up to me." (Q16)		-0.523	
"I use different learning paths depending on the situation." (Q27)		-0.505	
"Before I learn about a subject, I ask myself questions about it." (Q15)			0.582
"I can accurately predict my success in an exam." (Q20)			0.529
"I am aware that I use certain methods to solve questions in an exam." (Q10)			0.443

According to Figure 2, between two points indicates a factor. The break between the first and second components in the slope chart is extremely high. It explains more variance than other components do. After the third item, the fracture decreases, and the slope becomes flat. Table 2 shows the factor analysis results of the students' metacognition levels scale. According to these results, the items were associated with six factors.

Analysis of Metacognition Levels and Perceived Teacher Behaviors by Gender

It was analyzed whether the metacognition levels and perceived teacher behaviors of fifth-grade students differed significantly by gender. The related descriptive statistics are given in Table 3.

Table 3

Descriptive Statistics of the Scales

Scale	$\bar{x}$	Median	Mode	Std. Deviation	Skewness	Kurtosis
Perceived teacher behaviors	15.76	16.87	18	4.65	-2.35	5.57
Metacognition Levels	89.91	91.14	99	16.00	-1.02	3.06

In Table 3, the mean score of students' perceived teacher behavior is 15.76, while the mean score of students' metacognition levels is 89.91. On the other hand, these scales' skewness and kurtosis values are outside the range of +2 and -2. This shows that the data in these scales are generally not distributed. The Kolmogorov-Smirnov test was preferred because the sample size was more significant than 50 to evaluate whether the fifth-grade students' metacognition levels and scores of perceived teacher behaviors were normally distributed. Table 4 shows the descriptive statistics and tests of normality results by gender.

Table 4

Descriptive Statistics and Tests of Normality Results by Gender

Scale	Gender	$\bar{x}$	Std. Deviation	Statistics	*df*	*p*
Perceived teacher behaviors	Girl	15.9549	4.50566	0.234	133	0.000
	Boy	15.6038	4.77602	0.244	159	0.000
Students' metacognition levels	Girl	89.8647	18.38592	0.112	133	0.000
	Boy	89.9560	13.76261	0.073	159	0.036

Table 4 indicates that the sig. values of the Kolmogorov-Smirnov test results for both scales for gender were lower than 0.05. The data were not normally distributed according to gender. Therefore, non-parametric tests were preferred to determine whether these variables differed according to gender.

Table 5

Descriptive Statistics of Non-Parametric Test Results

Scale	Gender	N	Mean Rank
Students' metacognition levels	Girl	133	150.64
	Boy	159	143.04

The Kruskal-Wallis test was conducted to determine whether there was a significant mean difference between females and males regarding their perceived teacher behaviors and metacognition

levels. Table 5 shows the descriptive statistics of fifth-grade students' perceived teacher behaviors. The average rank of female students' metacognition levels is higher than that of males.

When the metacognition levels of the students were examined in terms of gender, no significant mean difference was found between females and males (U=10023; z=-0.766; p=0.443> 0.05). Fifth-grade students' metacognition levels do not differ by gender.

Examining the perceived teacher behaviors perceived by the fifth-grade students according to gender was done with the independent samples t-test. The Levene test of teacher behaviors perceived by students (F(290)= 0.643, p=0.423>0.05) provides homogeneity. The perceived teacher behaviors by the students do not differ between females and males (t(290)=0.642, p=0.521>0.05); the mean difference is 0.35111). There is a mean difference according to gender in the teacher behaviors the students perceived, but this difference does not constitute a statistically significant mean difference.

Analysis of Metacognition Levels and Perceived Teacher Behaviors by Age

An analysis was made of whether the metacognition levels and perceived teacher behaviors of fifth-grade students differed significantly by age. Table 6 shows the descriptive statistics and tests of normality results by age.

Table 6

Descriptive Statistics and Tests of Normality Results by Age

Scale	Age	N	$\bar{x}$	Std. Deviation	Kolmogorov-Smirnov			Shapiro-Wilk		
					Statistic	*df*	*p*	Statistic	*df*	*p*
Perceived teacher behaviors	10	156	15.98	4.54	0.258	156	0.000			
	11	115	15.74	4.43	0.225	115	0.000			
	12	13	14.30	6.84				0.782	13	0.004
Students' metacognition levels	10	156	90.12	17.91	0.098	156	0.001			
	11	115	90.60	13.44	0.057	115	0.200			
	12	13	83.76	13.56				0.909	13	0.180

In Table 6, the mean scores of the students' perceived teacher behaviors were 15.98 for 10-year-olds, 15.74 for 11-year-olds, and 14.3 for 12-year-olds. The mean scores of metacognition levels were 90.12 for 10-year-olds, 90.6 for 11-year-olds, and 83.76 for 12-year-olds. The mean scores of students in different age groups for both scales were close to each other.

If the sample size of the group whose normal distribution is n<50, the Shapiro-Wilk Test and if n>50, Kolmogorov-Smirnov normality tests are recommended (Büyüköztürk, 2007). Table 6 indicates that the sig. values of the Kolmogorov-Smirnov test results for students' perceived teacher behaviors was lower than 0.05 for the age. On the other hand, the Kolmogorov-Smirnov test and

Shapiro-Wilk values were higher than 0.05, except for the 10-year-old students' metacognition levels. According to these results, while the data on the students' metacognition levels is typically distributed, the data on the perceived teacher behaviors is not. That is, while the parametric test is used to analyze whether the metacognition levels of the students change according to age, whether the perceived teacher behaviors change according to age should be analyzed with the non-parametric test.

The results of the Levene statistics for the age variable of the mean difference between the students' perceived teacher behaviors and metacognition levels were examined. $F(3, 287)=2.082$) for the students' perceived teacher behavior scale; ($p=0.103>0.05$) and the students' metacognition levels scale ($F(3, 287)=2.009$, $p=0.113>0.05$) were found. Both surveys show that there is a mean difference between age groups. These results are remarkably close to the homogeneity limit; statistically, this mean difference can be ignored. In other words, there is a mean difference between age groups for both surveys, but this mean difference is not statistically significant.

Since the teachers' perceived teacher behavior scale had a Kruskal-Wallis significance value ($p=0.256>0.05$), age was not significant. The students' metacognition levels scale was not substantial in terms of age since it had a significance value ($p=0.379>0.05$); that is, it did not differ according to age.

The Relationship Between Fifth-grade Students' Perceived Teacher Behaviors and Metacognition Levels

This study analyzed the relationship between the perceived teacher behaviors of fifth-grade students and their metacognition levels. In Table 4, the data from the scale of students' perceived teacher behaviors according to the Kolmogorov-Smirnov normality test show a normal distribution. In contrast, the data obtained from the students' metacognition levels scale does not offer a normal distribution. Therefore, Spearman rank-difference correlation was used for two scales when at least one of the variables was of the ordinal data type or to determine the relationship between the variables datasets. Spearman rank-differences correlation coefficient is used when at least one of the variables is in the ordinal data type or when the variables are measured with an interval/ratio scale. Still, their scores are generally not distributed (Bursal, 2019). Since the Spearman correlation between students' perceived teacher behaviors and metacognition levels was $p=0.208$, there was no statistically significant relationship between students' perceived teacher behaviors and metacognition levels. The metacognition levels of the students do not make any sense in terms of seeing teacher behaviors as positive or negative.

DISCUSSION AND CONCLUSION

This study, which was conducted to investigate the effect of fifth-grade students' metacognition levels on perceived teacher behaviors, investigated whether the effect of the metacognition levels of middle school fifth-grade students on perceived teacher behaviors differed in terms of gender. The levels of metacognition did not change according to gender (Ataalkın, 2012; Oluk & Başöncül, 2009). The same metacognition levels did not change according to gender. However, İflazoğlu Saban and Saban (2008) found that female students had higher metacognitive awareness in their study. They explained that female students' higher cognitive awareness scores were more persistent in problem-solving than males. This situation can be associated with possible conditions such as female students being more focused, working regularly, and having high external motivation.

When metacognition levels were examined according to age, metacognitive awareness did not differ according to age. However, they concluded that metacognition levels increase with age (Irak et al., 2015). Since the education level was also examined along with age in this study, there is a possibility that the change in education levels may affect the increase in age. For our research, the assumption that the age range at the same grade level is not very variable and the education level is the same may not have created a difference in the metacognitive differences of the students according to age.

The difference between the students' perceived teacher behaviors according to gender was not statistically significant. These results show us that male and female fifth-grade students perceive teacher behaviors in the same way. Özdemir (2012) found that the teacher behaviors perceived by the fifth-grade students did not differ according to gender. Çelik (2011), on the other hand, stated that the perceived teacher behavior of fifth-grade students differs according to gender. Female students have a higher perception than male students' perceived teacher behavior levels. This can be explained by their efforts to be more emotional and to establish a closer relationship with their teachers.

In this study, in which students' perceived teacher behaviors were examined according to age, it was emphasized that students' metacognitive levels should be high in order for students to evaluate their perceived teacher behaviors correctly. When the relationship between the students' metacognition levels scale and their perceived teacher behavior scale was examined, the correlation coefficient was low, and how they perceived teacher behaviors and their high metacognition levels were not related.

Recommendations

• This research was conducted on fifth-grade students in a single school with a significant research sample. The same study can be repeated in different schools.

• It can be applied to fifth-grade students and students at other levels of middle school.

• The study could be expanded to different primary, secondary and high school schools.

• Data collection was conducted in September-October. The researcher ignored that the students might not have been able to evaluate the teacher's behavior correctly since it was the beginning of the academic year. It would be more appropriate to do it at the end of the academic year.

Author(s) Contribution Rate

The authors equally took part in all processes of the article.

Ethical Considerations

The Ethics Committee approval was obtained from Erciyes University Social and Human Sciences Ethics Committee to conduct the research with the number 78 on 27 May 2020.

Conflict of Interest Statement

The authors declare no competing interest.

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