The effect of bullying towards students grade IX learning achievement on mathematics

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Abstract. This research aims to identify the effect of bullying on students' grade IX Mathematics learning achievement. This research adopted a quantitative method and used a descriptive approach. The subjects of this research were students grade IX of SMP Negeri 2 Narmada in the academic year of 2019/2020 with the total number of 88 students. In collecting the data, there were two resources, namely primary and secondary data, which were obtained through a questionnaire and the students' Mathematics' scores. The questionnaire was given directly to the students, and their mathematics's score was collected from their report cards in grade VIII. The collected data was analyzed by using the Anova test. Based on the analysis of the data, the result shows that there are differences in students' Mathematics' achievement based on the intensity of them receiving the bullying. The students who have significant differences in their mathematics achievement are those who were almost never and were rarely got bullied. Furthermore, it is known that the students who were rarely get bullied have the best performance compared with those who have never get bullied and those who are often get bullied.

1. Introduction
Nowadays, the rise of violent cases in school-age children is very alarming. A school that is supposed to be a place for students to study becomes one of the places where violence or bullying often occurs. The ‘actors’ of this act of violence or bullying are students themselves. Male and female students can do the bullying. Bullying itself is dangerous not only for the victims but also for the doer of bullying. One of the factors causing bullying is lack of school supervision and lack of social relations between the students [1]. Bullying comes from the word bully, which in English means bluffing, harassing, tinkering, and bullying. Bullying is a situation where someone strong (whether physically or mentally) presses, corners, harasses, hurts someone weak intentionally and repeatedly to show her or his power [2].

There are various types of bullying done by students in schools, including verbal bullying, physical bullying, relational bullying, and cyberbullying [3]. Verbal bullying can be in the form of screaming, insulting, ridiculing, and teasing [3]. Physical bullying is the most visible and most easily identified type of bullying. The types of physical bullying are hitting, strangling, elbowing, punching, kicking, biting, and others. Other than that, there is a relational type of bullying, where it is difficult to detect. Relational bullying is carried out systematically through neglect, exclusion, exclusion, or avoidance. The gossiped students will most likely not hear that but will still feel the consequences. The last type of bullying is cyberbullying, which is done through the internet or social media such as Facebook, whatshap, or it also can be by texting [2].

After knowing the types of bullying, it is also necessary to know what factors influence the behavior or actions of the bullying. There are several factors that influence the occurrence of bullying. There are five factors that influence bullying behavior, namely: a) class differences (seniority), economy, religion, gender, ethnicity or racism; b) seniority tradition; c) non-harmonious families; d)
There are several bullying motives that occurred at school:

- Attention-seeking. For students who are seeking attention, they will do various ways to get the attention of the teacher and their friends. One of the ways they do is by bullying his friend.
- Fooling around. Some students sometimes tempt other students just to play without the desire to hurt. But sometimes the actions they do seem cruel.
- Being a follower. In every school, there must be a group of students who are considered cool by their peers. For this reason, the students' behavior and actions will be followed by the other students.
- Don't understand the meaning of differences. The victims of bullying are often someone who looks different from most people in general. The students often bully those who look different.
- The expression of feeling frustrated. One of the effects of bullying is to make the victims of bullying become one of the doers of bullying. Those who had experienced bullying could also become the bully themselves.

The impact felt by victims of bullying is not only a physical impact but also a psychological impact [2]. The victims of bullying will feel pressure, discomfort, and even extreme fear. The impact of bullying will be different for each victim. The effect depends on the character of the victim as well as the type of bullying they received. There are students who do not care about verbal bullying or physical bullying they experienced. However, there are also many of the students who feel stressed and frustrated with the bullying itself. The results showed that bullying can occur in men and women in verbal, physical, relational, and cyber forms [15]. Individual factors of being a bullying can vary. Bullying can arise from personal, work-related, and intimidation [16]

Bullying that occurs in schools will have an impact when victims grow up and work [5]. The difficulties in adjusting to the school environment can also be felt by the victims of bullying [2]. The students who are the victims of bullying will have the desire to transfer schools immediately. Even if the students stay at the school, usually, their academic performance will be disrupted [2]. This is closely related to the feelings of students (victims of bullying) who feel depressed and afraid of being in their school. For this reason, students will find it difficult to concentrate on the learning delivered by their teacher because fear is more dominant on the student.

Learning achievement itself is the result obtained in the form of impressions that resulted in individual changes as a result of learning activities [6]. There are two kinds of factors that influence learning achievement, namely, internal factors and external factors.

1. Internal factors are factors that exist in individuals who are learning; these internal factors include:
   a. Physical factors, including health factors and body defects. Body defects can be blind, deaf, and fractures.
   b. Psychological Factors, including: 1) Intelligence, 2) Attention, 3) Interests, 4) Talent 5) Motivation, 6) Maturity 7) Readiness.
   c. Fatigue Factor. Fatigue can be divided into two kinds, namely physical fatigue and spiritual fatigue. Physical fatigue is when somebody looks weak, while spiritual fatigue can be seen if somebody is listless and bored.

2. External Factors
   a. Family situation. The family is the main environment in the learning process. The situation in the family has a great influence on the achievement of learning, for example, the way parents educate, family member relationships, home atmosphere, family economic conditions, understanding parents.
   b. School situation. The school environment is an environment in which students learn systematically. This condition includes teaching methods, curriculum, teacher relations with students, student relations with students, school discipline, learning tools, learning methods, and other supporting facilities.
   c. State of society. Students will be easily affected by the community's environment because of its presence in that environment. The activities in the community, mass media, socializing, and
neighborhood environment is things that can influence students so that a positive environment is needed to support student learning.

From the description above, we know that the impact of bullying is a factor that affects learning achievement. As we know, the effects of bullying are not only physical but also psychological. A person's physical and psychological state greatly influences learning achievement. Students with healthy physical conditions will be more easily to learn than students who are sick. Likewise, with the psychological condition, a student who is psychologically or psychologically disturbed cannot participate in the process of learning properly. This will affect the learning achievement. Based on the explanation of the facts and the urgency of the problem and the background above, the research related to differences in student achievement based on the intensity of the bullying received needs to be done.

2. Research Method

2.1. Participant
The participants of this research are 88 students in 9th grade at SMPN 2 Narmada, Lombok Barat. There are 40 females and 48 males students in the age of 14-15 years old.

2.2. Research design
The type of this research is quantitative research with a descriptive approach. Quantitative research is research based on the philosophy of positivism that is used to test populations or certain samples using statistical tests that have been made [7]. Quantitative research is a method to test certain theories by looking for relationships between variables. The variables are measured by research instruments so that the data obtained, which are in the form of numbers, then were analyzed based on the statistical procedures [8].

2.3. Data collection
The data used consists of primary data and secondary data. The primary data were obtained through the bullying intensity questionnaire results from the students. Meanwhile, their report cards in grade 8 were utilized as a secondary data resource. The research instrument was a questionnaire consisting of 9 statement items that were adapted from the questionnaire used by PISA to measure the students’ achievement based on the intensity of how often they get bullied. The questionnaire explains the type of bullying received by a 9th-grade student when he or she is in grade 8. The rating scale of the score is, if the student is on a score scale of 31 ≤ scores 36 then it means the student almost never gets bullied, if it is on a scale of 28 ≤ a score of 30 then it means the student rarely gets bullied or it can be said only a few times a year, whereas if the scale of the score is nine ≤ scores ≤ 27, then it is considered the student is a student who often gets bullied.

2.4. Data analysis
The collected data were analyzed by using quantitative analysis techniques by conducting an ANOVA test. Specifically, the analysis is using the Statistical Package for Social Sciences 25 (SPSS 25) program. Prior to ANOVA testing with SPSS 25. First assumption tests are performed, where the tested data must meet the three assumptions:

- Independent observations that can be obtained by taking random samples.
- Observation of independent variables, where each independent variable must be normally distributed.
- The variance of the population between groups must be the same (homogeneous)

The normality test for all groups can be done by Kolmogorov-Smirnov and Shapiro-Wilk tests. From the test by using SPSS 25, there will be output in the form of a Tests of Normality table. From this table, see the value of sig. for each independent variable in the Kolmogorov-Smirnov and Shapiro-Wilk columns. If the result is sig. of all independent variables> 0.05, it means that all groups were normally distributed.

Furthermore, the variable homogeneity test was performed with the Lavane test. The testing step with SPSS 25 is carried out jointly with the analysis process at ANAVA. From the test by using SPSS 25, the output is obtained in the form of a Test of Homogeneity of variances table. The conclusion of
homogeneity can be seen from the value of sig. in the table. If the value of sig. > from a significant level (0.05), the variance between groups is considered to be homogeneous. On the other hand, if sig. obtained <0.05, the variance between groups is said to be heterogeneous.

After the three assumptions are met, it can proceed to the ANOVA test. Before doing the test by using SPPS, there are research hypotheses prepared, namely:

Ho: The mean learning achievement of all groups is the same
H1: there is at least one pair of the group that has a mean difference.

Furthermore, the testing is done by using SPSS 25. From the test, it obtained an ANOVA table as the output. From the table, the value of sig will be obtained. If the value of sig. > 0.05, then H0 is accepted, and vice versa. If sig. <0.05, then H0 is rejected. So that interpretation is: if H0 is accepted, then the average learning achievement of all groups is the same. On the other hand, if H0 is rejected, then there is at least one pair of groups that have a mean difference. When H0 is rejected (there is an average difference), a further test must be conducted, which is the Post Hoc Test.

Post Hoc Test is conducted to find out which variable has a significant difference. To determine which one is the next used, it needs to see the Test of Homogeneity of Variances table, if the test results show the same variants, the next test used is the Bonferroni test. But if the test results show the variance is not the same, then the next test done is the Games-Howell test. From the Post Hoc Test table, it will be seen which group has a significant difference. This can be seen from the Mean Difference, where the data marked with an asterisk "*" is a pair of groups that have significant differences. Another way to look at the groups that have significant differences is to look at the value of sig. in the post hoc table — the group with sig. <0.05 is a group that has a significant difference. Conversely, the group that has sig. > 0.05 is a group that does not have a mean difference.

3. Result and Discussion

As explained above, the purpose of this study is to see whether there are differences in the performance of 8th-grade students in various countries based on the bullying they get. Bullying behavior often occurs at school. Schools that are supposed to be places of learning and processing turn out to be frightening for most students. This is caused by the bullying behavior that occurs at school. This bullying behavior has become a problem in various countries. Based on the various impacts of bullying that occur as explained in the introduction, the following results will be presented in the study of differences in student achievement based on the intensity of the bullying they experienced.

After the process of data collection and data analysis, the researcher will explain the findings. The process of analyzing data in this study uses the Statistical Package for Social Sciences 25 (SPSS 25) program. This is in accordance with the character of the data and the problem being studied. The test statistic used is the one-way ANOVA test. Before conducting the ANOVA test, there are several assumptions that must be met, namely: independent observation, observations on the dependent variable must be normal, and the variance between groups must be the same/homogeneous [9].

3.1. Assumption Test

3.1.1. Independent Observation

Independent observations were obtained by taking random samples. In this data, the samples were taken from 8th-grade students of SMP Negeri 2 Narmada randomly with the total number of 88 students.

3.1.2. Normality test

The observation of the dependent variable in each group must be normally distributed. The results of the data analysis with the normality test are presented as follows. A normality test is used to see whether or not the data is normal for each group of the population of data. Data normality is seen from the Sig value, which is more than the significance level so that the data is considered as normal data.
Table 3.1 : Normality test

| Bullying intensity | Statistic | Df | Sig. | Statistic | df | Sig. |
|-------------------|-----------|----|------|-----------|----|------|
| Mathematics’s Score |          |    |      |           |    |      |
| Almost Never      | .208      | 33 | .001 | .885      | 33 | .002 |
| Rarely            | .116      | 26 | .200*| .965      | 26 | .491 |
| Often             | .113      | 29 | .200*| .922      | 29 | .035 |

The hypothesis of this normality test is Ho: Data are normally distributed and H1: Data are not normally distributed. Where the decision criteria are H0 will be rejected if Sig. <0.05. After analysis, the value of Sig. different for the three groups. The value of sig. for groups almost never and often is <0.05 (Sig. Value can be seen in the table above). Then H0 is rejected. So, the conclusion is that the data is not normally distributed. As for the data in the group rarely has a sig value> 0.05 (Sig value can be seen in the table above). Then Ho is accepted. So, the conclusion is that group data is rarely normally distributed.

Aside from looking at the significant values, the data distribution can also be seen based on the Q-Q plot. The following figures are presenting the Q-Q plot to see the distribution of data of the three groups.

Figure 3.3 : Normal Q-Q Plot of Mathematics’s value for intensitas often

From the Q-Q plot of the three data groups, it appears that all of the data are either around the normal line or close to the normal line. Based on this, it can be concluded that the three data groups are normally distributed. This is because the condition of normally distributed data is when the points on the plot approach or are around the normal line.

3.1.3 Homogeneity Test

The variance of population between groups must be the same. Homogeneity variance test is used to see whether the data is homogeneous between data in each group or population. Homogeneity of the data can be seen if Sig value is more than the significance level so that the data is said to be homogeneous variance data.
Table 3.2: Homogeneity Test

|                  | Statistic | df1 | df2 | Sig   |
|------------------|-----------|-----|-----|-------|
| Mathematics’s    | Based on Mean | .104 | 2   | 85    | .901  |
|                  | Based on Median | .226 | 2   | 85    | .798  |
|                  | Based on Median and with adjusted df | .226 | 2   | 81.476 | .798  |
|                  | Based on trimmed mean | .173 | 2   | 85    | .841  |

The hypothesis of the homogeneity test is $H_0: \sigma_1^2 = \sigma_2^2 = \sigma_3^2$ (all groups have the same variance) and $H_1: \exists \sigma_l^2 = \sigma^2_{i’}, i \neq i’, i = 1, 2, 3$ (there is a minimum of 1 group that has different variances). Then the decision criteria are that $H_0$ is rejected if Sig. < 0.05. After being analyzed with SPSS 25, it was obtained that sig. > from 0.05 i.e. sig. = 0.901. Because of the value of Sig. > 0.05 (Sig. = 0.901), then $H_0$ is accepted. Thus it can be concluded that all groups have the same or homogeneous variance.

3.2. ANOVA Test

After the three assumptions are fulfilled, the ANOVA hypothesis test can be continued. The hypothesis is $H_0: \mu_1 = \mu_2 = \mu_3$ (average learning achievement of all groups is the same) and $H_1: \exists \mu_i \neq \mu_{i’}, i \neq i’, i = 1, 2, 3$ (there is at least one group with a different mean learning achievement). The significant level used is $\alpha = 0.05$; this is because the problem in this study is a social problem.

The test of statistic used is the F Test (Anova) because what will be found out is the difference in learning achievement. An experiment/research that is designed with only one factor involved with several significant levels of treatment is called a one-factor experiment/research. The one-factor experiment/research was tested by the F test (ANOVA). Furthermore, the decision criteria are rejected $H_0$ if sig < 0.05 (with SPSS) or if $F_{\text{count}} > F_{\alpha;v_1;v_2}$ (manual calculation). From testing with SPSS, we get the estimated results in the table.

Table 3.3: Anova Test

|                  | Sum of Squares | Df  | Mean Square | F     | Sig   |
|------------------|----------------|-----|-------------|-------|-------|
| Between Groups   | 385.089        | 2   | 192.545     | 5.025 | .009  |
| Within Groups    | 3256.729       | 85  | 38.314      |       |       |
| Total            | 3641.818       | 87  |             |       |       |

Based on the table, the obtained value is Sig = 0.009, then, Sig (SPSS) = 0.009 < Sig 0.05. So, Ho is rejected. Because Ho is rejected, it means that there is at least one group that has a difference in mean of student achievement in terms of the intensity of the bullying received. ( $\exists \mu_l \neq \mu_{l’}, i \neq i’, i = 1, 2, 3$).

Since Ho is rejected, it must be continued with a test that is (Post Hoc Test). Post Hoc Test is conducted to find out which variable has a significant difference. In determining which one as the next test, then again, we see the Test of Homogeneity of Variances table, if the test results show the same variants, then the next test is the Bonferroni test. But if the test results show the variance is not the same, then the next test used is the Games-Howell test. Furthermore, from the Test of Homogeneity, it is found that the variants of the three groups are the same, then the further test (Post Hoc Test) used is the Bonferroni Test.

Table 3.4: Post Hoc Test

|                | Bullying intensity | Bullying intensity | Mean Difference (I-J) | Std. Error | Sig. | Lower Bound | Upper Bound |
|----------------|-------------------|-------------------|-----------------------|------------|------|-------------|-------------|
| Bonferroni     | Almost Never       | Rarely            | -5.04779              | 1.62317    | .008 | -9.0120     | -1.0836     |
|                |                   | Often             | -1.35946              | 1.57551    | 1.000| -5.2073     | 2.4884      |
|                | Rarely            | Almost Never      | -5.04779              | 1.62317    | .008 | 1.0836      | 9.0120      |
|                |                   | Often             | 3.68833               | 1.67177    | .090 | -3.946      | 7.7713      |
|                | Rarely            | Almost Never      | -1.35946              | 1.57551    | 1.000| -2.4884     | 5.2073      |
|                |                   | Rarely            | 3.68833               | 1.67177    | .090 | -7.7713     | 3.946       |
From the Post Hoc Test table above, to determine which group has a significant difference can be seen from the Mean Difference column. The group that has a difference is the group that is marked with an “*” or can be seen from the sig column. The pair of groups with a sig value < 0.05 has a significant difference in achievement; meanwhile, those who have a sig value > 0.05 they do not have a difference in their learning achievement. Based on the description, it can be seen in the table that groups which show the differences in mean achievement (marked with an asterisk “*”) are the group of "Almost never" and the group of "Rarely". While the pair of "almost never" with "often" and the pair of "rarely" with "often" did not have a significant difference in achievement.

Furthermore, if looking at the Mean Difference values, compared to the group of “almost never,” the group of “rarely” has better learning achievement. This can be seen from the Mean Difference (MD) value which shows a negative sign when the MD of “almost never” is reduced by the MD of “rarely”. As for learning achievement among students who often get bullied with those who almost never got bullied are also similar to those who rarely get bullied, where students who almost never get bullied have lower achievement compared to those who often get bullied. Furthermore, for the achievement of the students who rarely and often get bullied, looking at the MD of the students’ grades who rarely get bullied have better performance with students who often get bullied.

So, based on these three things and the student questionnaire data and the math scores, it is known that students who have the best performances are those who rarely get bullied and followed by those who often get bullied. The students who never get bullied has the lowest learning achievement. The result of this research is slightly different from some other studies. The students who almost never get bullied have lower achievement compared to those who rarely and often get bullied. Based on the observations and teaching experiences at the concerned school, it is known that students who have never experienced bullying are mostly students who have poor behavior records. Some of them did not even follow the lessons well.

This research shows that the intensity of the bullying received can affect the students’ achievement, especially for the students who often experienced bullying with students who have almost never experienced bullying. This can be seen based on the factors that influence learning achievement. As we know, there are two kinds of factors that influence learning achievement, namely internal factors, and external factors. When looking at the internal and external factors that influence learning achievement, these factors are the effects of bullying behavior felt by the victims of bullying. As we know, the impact of bullying is not only physical, but the victims also feel the psychological effects.

The results of this study are also in line with research [2] where the results show that children as victims of bullying will experience obstacles in actualizing themselves because the bullying behavior will not provide a sense of security and comfort, it will even make the victims of bullying feel scared, depressed, inferior and worthless. So, for this reason, students as victims of bullying find it difficult to concentrate on the learning that takes place. In addition, the impact of bullying will also make students quiet and less able to socialize with their school environment.

When students experience the physical impact of bullying behavior, the student may often not be able to enter school, due to their unhealthy physical condition like other students. This will also affect students’ learning achievement. The bullying behavior experienced by students does not only occur at school but also can occur outside of school. The impact of bullying and sexual harassment on six health outcomes among middle school girls were compared to these outcomes among high school girls [16]. The results of [9] show that 43% of students experience bullying behavior at school, and the rest are outside of the school. The impact of bullying itself can cause victims to experience stress and will even cause prolonged trauma. Being bullied during school can also affect the victims when they grew up and entered the workforce. This statement is supported by the results of [10], which stated that the experience of being a victim of bullying would affect the psychological and social conditions when they work.

This bullying behavior has a negative impact not only on victims of bullying but also on the doer of the bullying itself. For the doer who commits these despicable acts, they will later get punishment from the school for their actions. In addition, the doer of bullying will also get social penalties from the school environment and surroundings. The doer will usually be shunned by their school friends and friends of their age and even the community due to the despicable deeds they have done. The
hardest impact that will be experienced by the doer of the bullying is a punishment that comes from a legal entity. Outrageous bullying can make the doer must be confined in the cell bars. Bullying behavior involves three components that influence each other, namely fight, victim and audience. All three contributed to the realization of bullying behavior [11].

Another prolonged impact for victims of bullying is that it does not rule out the possibility that one day the victims of bullying will become the bully. This is in line with research conducted by [2], which revealed one of the motives of bullying that occurred at school; namely, the expression of frustration felt by victims of bullying will make victims of bullying become the bully. Many of those who had experienced bullying can be the bully in the future. It is not surprising, the doer of bullying are children who often experience stress, pressure, and have been becoming the victims of bullying behavior. Those who often mock are actually children who are less happy or less attentive. More often, they seek happiness and attention in the wrong way as, for instance, do the bullying. They are wrong in expressing feelings of stress and frustration and unhappiness. However, apart from that, bullying behavior is not only those who have experienced bullying but also those who have power or strength both physically and materially.

Another cause of students bullying is the teacher behavior that is sometimes unfair to students. Some students sometimes feel jealous of other students because the teacher at the school pays attention to that specific student - that's all. This is in line with research conducted by [12], which states that perceived teacher injustice is positively related to bullying, and this relationship is partly mediated by the attestation of instrumental goals. Another factor that causes bullying is the lack of school supervision and the lack of social relations between students [1]. When teachers are lacking in supervising their students and punishment, bullying behavior will continue. Handling bullying in schools will also affect the intensity of bullying that occurs. This agrees with the research conducted by [13], who found out that lower levels of bullying occurred when teachers tend to discipline bullies and showed higher levels of intimidation when teachers tend not to discipline the bully.

Students who experience bullying often find the school as a scary place. Even they will not feel comfortable to linger in school. This will cause the victims of bullying to not focus on the learning process, which will also affect the learning achievement — different from the case with students who have almost never experienced bullying. Students who have almost never experienced bullying will feel school as it should. The student will still consider the school a comfortable, a safe place, and a place to study well so that it will not interfere with the learning process. Bullying was associated with anxiety and intent to leave the organization, and negatively associated with job satisfaction and performance [17].

The bullied students will have self-esteem issues that can cause major obstacles in their personal lives, including social life, schooling, as well as their future careers [3]. The bullied students will feel doubtfull and afraid to take action and will often feel anxious and unsure. The problem and the impact of bullying is fatal for the victims and the doers of bullying itself. There are several serious impacts caused by bullying behavior, these impacts include: 1) depressed children; 2) low self-confidence/inferiority; 3) timid and reclusive, and 4) lowering academic achievement. When a student is depressed, he/she will have difficulty to focus on their learning. Whereas, when a student is shy and a loner, he will be embarrassed to ask the teacher or his friends when there are lessons or material that is poorly understood. So, from this, the students will continue not to understand the related material [2].

Based on these various descriptions, it is very clear that bullying behavior can affect students’ achievement. So that there will be differences in student learning achievement who often experience bullying with students who have never experienced bullying, as explained earlier, students who often experience bullying will feel the pressure to be in school and find it difficult to focus on ongoing learning. On the other hand, students who have almost never experienced bullying will be able to undergo learning as educational goals.

4. Conclusions and Suggestions
This study was conducted to determine whether there are differences in students' mathematics learning achievement based on the bullying they experienced. Based on the data analysis and the description of the results and discussion, it can be concluded that the difference in student achievement based on the bullying behavior they experienced. The difference in achievement was
found in the 9th-grade students who almost never get bullied with 9th-grade students who rarely get bullied. This happens based on the factors that affect the learning achievement itself. The conclusions obtained in this research are consistent with the objectives of this study. So, based on the three things, student questionnaire data and math scores, it is known that students who have the best performance are those who rarely get bullied, then followed by those who often get bullied and lastly, those who have poor mathematical achievements are those who almost never get bullied. This result is slightly different from some other studies where students who almost never get bullied have lower achievement compared to those who rarely and often get bullied.

The suggestions offered by the researcher based on one of the causes of bullying is that schools must give more supervision for the students so that bullying behavior can be avoided. In addition, for parents, it is better to take the time to listen to the complaints of their children about the things they encounter at school. The follow up needed from this research is the existence of further research on how the differences in mathematics learning achievement of the students are more significant. In addition, knowledge about how much influence the bullying behavior has on students' mathematics learning achievement also needs to be studied more deeply.

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