

Use Of Cross-Line Method In Helping To Master Basic Multiplication Skills For Students With Learning Disabilities



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ABSTRACT: Mathematics is an essential subject for students with learning disabilities in order to meet their special educational needs. This subject emphasizes numerical skills and skills in operations such as addition, subtraction, multiplication, and division. This allows them to manage their money and time and know how to do the measurement so that they can apply their mathematical skills in various contexts. However, many students with learning disabilities face a variety of difficulties when learning mathematics, particularly when it comes to multiplication operations. Hence, this study aims to investigate the use of the cross-line method in helping pupils with learning disabilities improve their ability to solve multiplication operation questions. This is a qualitative case study designed for five pupils with learning disabilities, aided by a special education teacher. The study was conducted in Chinese vernacular schools located in Kinta Utara, Perak. The study used document analysis and interviews for data collection. Overall, the findings of the study showed that the pupils with learning disabilities faced three basic problems in multiplication. The problems consist of their understanding of the concept of multiplication, memorizing multiplication facts, and using ineffective techniques in solving multiplication operation questions. The Cross-Line method was used to assist students with learning disabilities in improving their basic multiplication skills. In addition, the findings of the study also showed that the use of the Cross-Line method was able to improve the positive behaviors among the pupils while studying multiplication topics in the classroom. The Cross-Line Method was also able to help the pupils with learning disabilities master multiplication skills with ease. In conclusion, the study shows that the use of the Cross-Line method will be able to help pupils with learning disabilities master basic multiplication, and it can be used as an alternative method for mathematics teachers to teach the topic of multiplication operations more effectively to the pupils with learning disabilities.

KEYWORDS: Cross-Line method, basic multiplication skills, students with learning disabilities

1. INTRODUCTION

Mathematics subjects are introduced to students with special educational needs who have learning problems from Year 1 to Year 6. These subjects focus on prenumbers, numbers, operational skills including addition, subtraction, multiplication, and division, money, and time, as well as measurements and a syllabus that enable students to understand concepts and apply math skills in various contexts. Multiplication is one of the mathematical operations that students with learning disabilities need to master in mathematics. However, there are many students with learning disabilities who face challenges while studying mathematics. According to Bashir Abu-Hamour (2020), most of the students with learning disabilities feel the topic of multiplication is an obstacle in their mathematics learning.

Students with learning disabilities use an inaccurate calculation method in solving the problem of multiplication operations and encounter problems in memorizing multiplication tables. The weakness of the basic facts of mathematics and memorizing multiplication tables reduces the interest of pupils in mathematics (Rosnee Ahad et al., 2018). In addition, the lack of effective techniques or ways to solve mathematical operation questions, whether it is addition, subtraction, multiplication, or division operations, is also a problem faced by students with learning disabilities in learning multiplication skills. According to Bouck et al. (2018), students with learning disabilities experience various challenges in mathematics, including organizing, problem solving, long-term memory, reading, place values, and calculations. Poor memory among students with learning disabilities also affected their skills at memorizing the multiplication table and their mastery of multiplication skills. According to Yasir Alsamiri (2018), poor memory is one of the characteristics of students with learning disabilities. This phenomenon has resulted in MBPK being unable to solve the multiplication operation questions quickly and effectively.

The problem of mastering these basic multiplication skills has caused students with learning disabilities to feel phobic and easily give up when answering multiplication questions. They also show negative behaviors such as self-harm or disrupting others in

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the classroom while learning the topic of multiplication. Because of the difficulty in mastering basic multiplication skills, students with learning disabilities are unable to learn more complex mathematical skills. According to Van Esselstine (2021), special education students who are unable to master basic mathematical skills will become frustrated and anxious when confronted with more complex skills that are beyond their abilities. The students will give up on their learning.

As a result, this study was conducted to investigate the effectiveness of using the Cross-Line method in assisting students with learning disabilities to improve their mastery of multiplication skills. In addition, it can also be used as a guide or an alternative method for mathematics teachers to teach multiplication skills to students with learning disabilities.

2. LITERATURE REVIEW

Multiplication is a difficult topic to master, and it involves a lot of mental calculation in pupils (Mohd Khairi Hadzwan Johari et al., 2021). However, research on multiplication operations mastery in students with learning disabilities was severely lacking. There are also studies carried out to overcome the problem of basic multiplication skills among typical students abroad. The concept of crossed lines was used to solve the problem of pupil multiplication. Other researchers have used the concept of intersecting lines to solve a variety of operational problems under various approach names such as the "cross method," "intersection point method," "cross-line method," and "Garismatika method."

Based on a study conducted by Sriyanti Mustafa et al. (2021), the use of the Cross-Line method has shown positive changes in the ability of pupils to solve multiplication questions. This study was conducted on 23 third-grade respondents from SD Negeri, 9 Tanrutedong, South Sulawesi, Indonesia. The results demonstrated that using the Cross Line method can improve students' ability to solve multiplication problems. The average score of the ability to solve questions in the pre- and post-test was increased from 67.39 to 92.00 after the intervention was implemented. In addition, the achievement of pupils' learning outcomes has increased from 65.22% to 100%. Finally, the percentage of average pupil participation in the learning process has increased from 77.78% to 94.68%.

Based on the study of Sudirman Sudirman and Siti Soleha (2021), a study related to the method of drawing lines in the distribution has been introduced to 15 students at an elementary school in Sukadana village. The results of these studies have shown that the line method is easier and more effective for students to use and is able to develop students' cognitive abilities. In addition, through the line method, he was able to improve the ability of students to solve the problems of multiplication.

In their study, Nur Ulwiyah and Mega Novela Ragelia (2020) showed that the skill of counting multiplication operational questions in mathematics subjects can be improved through the Garismatika method. This study is an action study based on the Kemmis model involving 31 students from MI Miftahul Ulum Lengkong Mojoanyar Mojokerto. The results showed that respondents achieved an average score of 62.25 before the intervention was implemented. After the intervention was implemented, the average score increased by 96.77. It was concluded that learning mathematics using the Garismatika method can improve the students' skill in solving multiplication questions.

In addition, the study by Anis Fuadah Zuhri et al. (2019) showed that the Cross-Line technique carries a moderate influence on pupils' mathematical representation skills in multiplication. This is a quasi-experimental study with a pre-post-group test approach that was used on 45 students from Al-Zahra Indonesia Class 3 Primary School. The results showed that the mean score of the post-test in the experimental group was higher at 80.57 compared to the control group's score of 70.05. In addition, the value in the effect size test is 0.561, and it shows the influence of the Cross-Line method on the mathematical representation skills of pupils in multiplication at a moderate level based on the Cohen formula.

Besides, the Garismatika method was introduced to improve the understanding of the concept by grade 3 pupils in the study of Destri Paramita et al. (2018). The study involved 26 grade 3 students studying at the West Palimanan 3rd Class Primary School, Cirebon, and 6 students were involved as respondents to the study. This research is a study of classroom action in quantitative and qualitative form. The results showed that the Garismatika method improved pupils' understanding of the concept of multiplication, with the mean value of 26 pupils increasing from 52.7 to 87.88, and the mean value of six study subjects increasing from 59 to 92.5. The results of the interview between the teacher and the pupil are in line with giving positive feedback on the Garismatika method.

Overall, based on the past studies that have been carried out, it can give a clear impression that the Cross-Line method, also known as the Garismatika method, which involves the use of crossed lines in the solution of multiplication questions, can have a positive effect on pupils' learning of multiplication topics by increasing their mastery of problem-solving skills, increasing their involvement in the classroom, and increasing their confidence in solving the question of the multiplication operation.

3. METHODOLOGY

This study uses a qualitative approach with a case study design. According to Creswell and Poth (2017), qualitative research is an activity that places researchers in problem situations and contains a set of interpretations and implementation materials that allow the

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problem to be studied more clearly and fully. According to Yin (2014), a "case study" is defined as an empirical inquiry that examines the phenomenon now through an approach in a real-world context. As a result, using a qualitative study design and a case study strategy, researchers can thoroughly investigate the use of the Cross-Line method against the mastery of multiplication skills of students with learning disabilities. The sampling method was used in this study, and a total of five students with learning disabilities who studied at a primary school that provides the Integration Special Education Program in the North Kinta district were selected as study respondents. In this study, respondents were known as M1, M2, M3, M4, and M5. The data collection methods used in this study were interviews and document analysis of the multiplication assessment. All the collected data is analyzed narratively and divided into several themes and sub-themes.

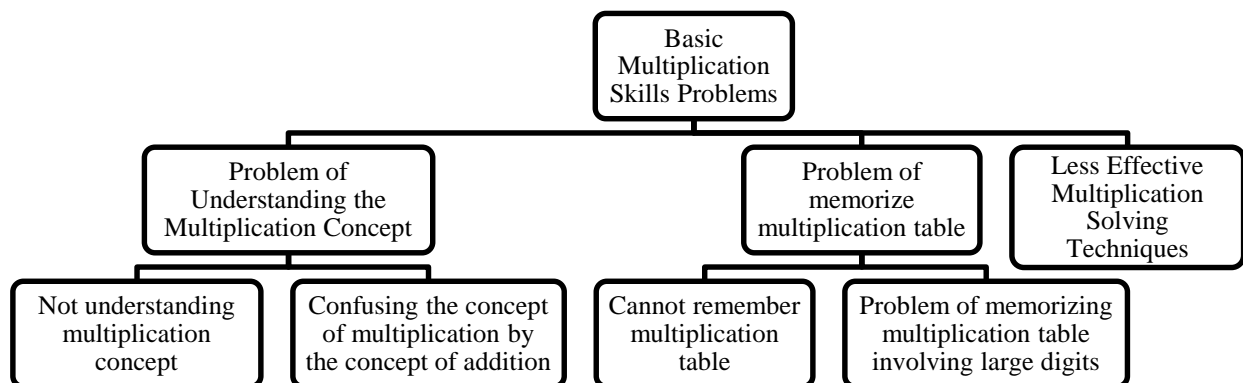
Research Questions	Instruments	Activity
What are the basic multiplication skills problems faced by students with learning disabilities?	i. Document Analysis -Multiplication Assessment ii. Interview Protocols	Reviewing the number of questions answered correctly by the study respondents and the methods used by respondents to solve the multiplication questions. Conduct interviews with teacher, produce transcripts, analyze the problems faced by the respondent while solving the question of multiplication.
Will the use of the Cross-Line method help improve the basic skills of multiplication for students with learning disabilities?	i. Document Analysis Multiplication Assessment	Review and analyze the number of questions answered correctly by the respondents and work on increment percentage of respondent scores for the test.
How can the use of the Cross-Line method help students with learning disabilities master the basic skills of multiplication?	Interview Protocols	Conducting interview with teacher, producing transcripts, analyzing changes in terms of respondents' behavior and emotions and respondents' achievements after the intervention was implemented.

4. FINDINGS

The findings presented in this study are intended to answer the three questions of the constructed study: (i) What are the basic multiplication skills problems faced by students with learning disabilities? (ii) Will the use of the Cross-Line method help improve the basic skills of multiplication for students with learning disabilities? (iii) How can the use of the Cross-Line method help students with learning disabilities master the basic skills of multiplication?

4.1 Basic Multiplication Skills Problems Faced by The Students with Learning Disabilities

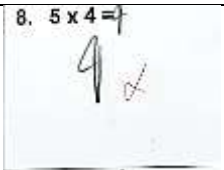
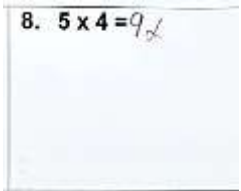
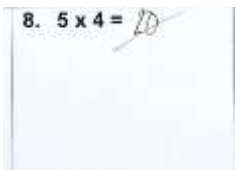

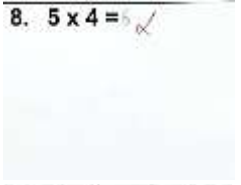
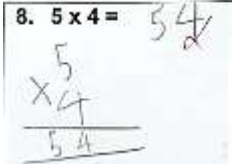
Based on the data, the problem of multiplication skills faced by the respondents can be divided into several themes and sub-themes.



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a. The Problem of Understanding the Multiplication Concept

Based on the data found in the multiplication assessment and interviews with a math teacher, the researcher found that all five respondents experienced problems understanding the concept of multiplying. They have trouble either not understanding the concept of multiplying or confusing the concept of multiplication with the concept of addition. M1, M2, and M3 experience confusion between the concepts of multiply and plus. They solve the multiplication question by adding both numbers to the question to get an answer. M4 and M5 faced trouble because they did not understand the concept of multiplication. M4 and M5 do not understand the concept of multiplying either in terms of groups and members, the repetitive add-on process, or number lines, rows, and columns. They give incorrect answers when solving multiplication questions.

Respondent	Picture of the Multiplication Assessment	Description
M1		Respondent solved the question by adding both numbers in the question.
M2		Respondent solved the question by adding both numbers in the question.
M3	 	Respondents were able to solve questions involving small numbers by memorizing the multiplication table. When answering questions involving large numbers, respondent added both digits.
M4		Respondents gave incorrect answers and wrote numbers at will to answer questions.
M5		Respondents can write multiplication questions in common form. But respondent direct write the question numbers as answers.

In addition, interviews with a special education math teacher (G1) also showed that all five study respondents experienced problems understanding the concept of multiplication. G1 states that M1 and M2 confuse the concept of multiplication with the concept of addition. When asked about the concept of multiplication, they stated the concept of multiplication, which is plus. while M3 understands the concept of multiplying and is able to use the multiplication table to solve the questions involving small numbers. But when it comes to large numbers, M3 starts to get confused with the concept of multiplication and solves the question by adding both numbers of the question. M4 and M5 do not understand or have any knowledge related to the concept of multiplying. They had no concept of multiplying and could not express the definition of time correctly.

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"M1 and M2 confused the concept of multiplying and adding... During Math class, when I ask them what is multiplication, they're going to say that is a plus. M1 and M2 will add both numbers of the question to get answers..."(G1)

"... M3 understands a little bit of the concept of multiplying and can memorize multiplication table to answer simple questions. But when he answers a difficult question, he'll get confused and add both numbers." (G1)

"... M4 and M5 have no idea what it is multiplying at all. They look like blurs when they see the multiply symbol. They kept quiet when they were asked what it was. When they solve multiple questions, they keep waiting for me to give me an answer. Sometimes they also fill in the answers incorrectly when I don't have time to guide them...."(G1)

b. Multiplication Table Memorization Problems

Based on data obtained from an interview with G1, the researcher found that one of the problems with the basic skills of multiplication for students with learning disabilities is the problem of memorizing the multiplication table. The problem of memorizing multiplication tables can be broken down into two sub-themes, which include those who cannot remember multiplication tables and those who face the problem of memorizing multiplication tables involving large digits. M1, M2, M4, and M5 have problems with multiplication skills because they are unable to remember the multiplication table. They find it difficult to remember the multiplication table, even if it involves a small digit. On the other hand, M3 faced problems in multiplying skills due to confusion in memorizing a multiplication table involving large digits.

"... M1, M2, M4 and M5 can't answer multiple questions because they can't remember the multiplication table... When I told them to memorize the multiplication table of 2 in front of the class, the M4 and M5 stood there alone and kept silent. M1 and M2 also faced problem when memorizing multiplication table. They only know repeat the question like 2 times 2 is equal to... They stopped and couldn't give me the answer." (G1)

"... M3 can solve a simple multiplication question because he can memorize multiplication table of 2,3,4,5,6,7 and 8 that involve only front numbers such as 1x3, 2x3, 3x3. But the numbers become bigger like 8x3 and 9x3, he'll be blur and give the wrong answer...."(G1)

c. Less Effective Multiplication Solving Techniques

Based on an interview with G1, it was found that the less effective multiplication solving technique is one of the problems faced by students with learning disabilities in basic multiplication skills. G1 had used the drawing method and the repeated addition method to help all five respondents master multiplication skills. However, all five study respondents did not understand how the method worked and were unable to apply it when solving multiplication questions independently. They had to rely on their teachers and needed full help from them to apply the technique in the calculation of multiplication questions.

"... I used to teach them to add repeatedly and draw circles.... to find the answer of the question, but they don't seem to understand the method and can't use it independently... They need my full guidance and I have to teach them step by step to use the method while solving multiplication question..." (G1)

4.2 The Use of Cross-Line Method Help Improve the Multiplication Skill of Students with Learning Disabilities

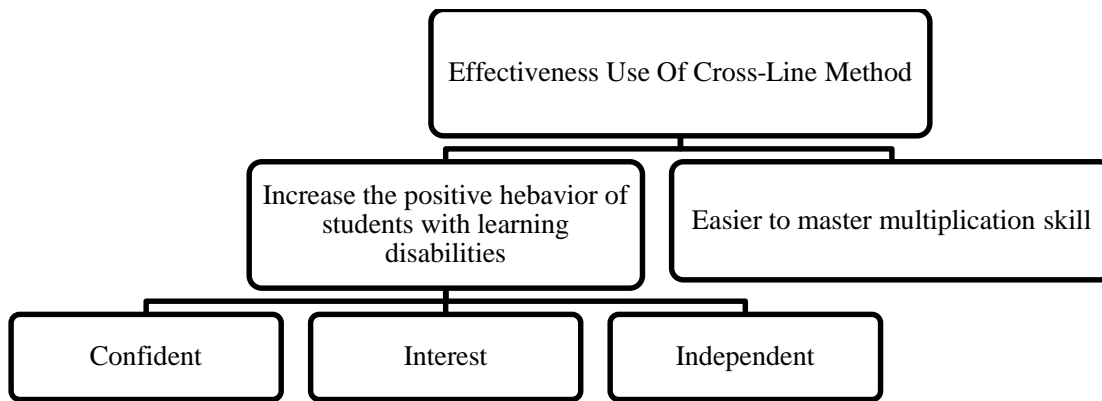
To answer the second question, the researcher used the method of analyzing the multiplication assessment documents to identify the improvement in the achievement of the basic multiplication skills of the respondents. Based on the data obtained, all five respondents showed improved achievement after using the cross-line method to solve multiplication questions. Respondents were able to answer more questions correctly after the intervention was implemented. M1 showed an increase of 76%, M2 showed an increase of 88%, M3 showed an increase of 32%, M4 showed an increase of 84%, and M5 showed an increase of 68%.

Respondent	Before Intervension	After Intervension	Percentage Of Improvement
M1	3/25	22/25	76%
M2	0/25	22/25	88%
M3	13/25	21/25	32%
M4	0/25	21/25	84%
M5	0/25	17/25	68%

4.3 Effectiveness Use of Cross-Line Method for Students with Learning Disabilities.

To answer the third question, the researcher used the interview method to collect data on the effectiveness of the Cross-Line method in assisting students with learning disabilities with basic multiplication skills. Based on the data collected, the effectiveness of the use of the cross-line method can be divided into several themes and sub-themes.

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a. Improving Positive Behavior of Students with Learning Disabilities

Based on an interview with G1, it was found that the Cross-Line method is able to improve the positive behavior of students with learning disabilities in the classroom during mathematics sessions on multiplication topics. G1 noted that the respondents showed positive changes in confidence after the intervention was implemented. The cross-line method was able to increase the confidence of respondents either in the learning process of mathematics in the classroom or in answering multiplication questions. They no longer feel fear when they are asked to solve the questions or are skeptical of the answers given. They do not have to wait for the teacher to give them an answer.

"... The difference I see is that they are more confident in answering the questions in class. Before that, they kept quiet and waited for me to give me an answer. But now they can come out and answer the questions in class." (G1)

".... They can calculate well and double-check with the answer through Cross-Line method." (G1)

In addition, the use of the cross-line method also increased the interest of the respondents in mathematics. Based on an interview with G1, she noted that after using the cross-line method, all five respondents became more active in the classroom. Their involvement in classroom activities increased. Furthermore, after using the Cross-Line method, their negative behavior decreased and they were able to actively participate in the learning process.

"Before the intervention, M1, M2, M3, M4 and M5 seemed dispirited and bored in class. They sit still and don't want to take part in any class activities... M5 looks stiff and quick-tempered and knocks on its own head while answering questions." (G1)

"After the intervention, they seemed happy. They are able to follow well in class and start discuss with friends to finish the questions. Their negative behaviors are reducing." (G1)

Furthermore, according to an interview with G1, it was found that the use of the cross-line method was able to help respondents answer the questions of multiplication independently. All five respondents can apply the cross-line method to solve the multiplication questions and find answers independently without the guidance of the teacher. They no longer show negative behaviors such as filling in answers at will, waiting for the teacher to give an answer, or imitating a friend's answer.

".... They no longer have to wait for me to give guidance. Before that, they'll s answer copy the answer od their friends or leave it blank to wait for me to teach them. After the intervention, they are no longer wait for me and can find that answer independently." (G1)

b. Easier to Master Multiplication Skills

Based on an interview with G1, it was found that *the* Cross-Line method is able to help students with learning disabilities master multiplication skills easier. G1 noted that all five study respondents better understood the concept of multiplication with the use of the cross-line method, which converts number symbols into visual lines. Moreover, according to G1, the Cross-Line method is easy for respondents to remember, and they quickly master the method and apply it when solving multiplication questions.

"... Cross-Line method are easy to understand. Pupils just draw vertical and horizontal lines and calculate the intersection points to get answers. I see them learning quickly and apply it to answer multiple questions. Students easily understand the concept of multiplying by using lines..."(G1)

5. DISCUSSION AND CONCLUSION

This section goes over the results of each study question. The first question is, "What are the problems with basic multiplication skills faced by students with learning disabilities?" The results showed that the multiplication skills problems faced by students with learning disabilities were a lack of understanding of the concept of multiplication, a problem of memorizing the multiplication table, and less

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effective multiplication solving techniques. This is supported by the research of Norshafariza Mamat and Muhammad Nubli Abdul Wahab (2022), who discovered that mastery of basic mathematical concepts is one of the main causes of primary school students' math learning problems. The results of this study are also supported by the study conducted by May Nisa Istiqomah and Sufyani Prabawanto (2019), which found that pupils are always confused between the concepts of addition and multiplication. One of the concepts that students struggle with is the concept of operation mathematics, particularly the concept of multiplying (Ahmad, 2010; bin Syed Ismail, 2010; Drews et al., 2005; Kilian et al., 1980; Tanujaya et al., 2017; Unlu & Ertekin, 2012 in Heris Hendriana et al., 2019).

The second question in the study is "Will the use of the Cross-Line method help improve the basic skills of multiplication in students with learning disabilities?" Through the studies carried out, the results showed that the use of the cross-line method was implemented to help students with learning disabilities master the basic skills of multiplication. The Cross-Line method was able to help students with learning disabilities improve their basic multiplication skills by improving their ability to solve operation questions. This is supported in the study carried out by Sriyanti Mustafa et al. (2021), which found that the ability of pupils to solve multiplication questions shows a positive improvement by using the cross-line method. A study conducted by Sudirman Sudirman and Siti Soleha in 2021, which deals with the line method in multiplication, shows that the line method is capable of improving the ability of pupils to solve multiplication questions.

The third question is, "How can the use of the cross-line methods help students with learning disabilities master the basic skills of multiplication?" The results showed that the use of visual lines in the Cross-Line method helps to improve the understanding of the multiplication concept and facilitates the mastery of multiplication skills by students with learning disabilities. It is consistent with Piaget's Cognitive Learning Theory (1964). In addition, the Cross-Line method is able to improve the positive behavior of students with learning disabilities by increasing their interest and confidence in learning multiplication topics. Students with learning disabilities are able to answer multiplication questions independently using the cross-line method. This is supported in the study of Aulia Nuranifah and Fitriani Anis Fuadah (2022) that shows that with the use of Cross-Line, students do not need to memories multiplication tables in order to solve the question, and the use of visual lines in the Cross-Line method facilitates the understanding of pupils. This method requires only the calculation skills of students.

The Ministry of Education Malaysia (MOE) should better understand the basic multiplication skills problems faced by students with learning disabilities and provide appropriate specialized modules to help students with learning disabilities master the multiplication skills, according to the findings of this study. In addition, MOE can conduct innovation competitions, workshops, or trainings for special education mathematics teachers to explore more effective methods for helping students with learning disabilities master multiplication skills more effectively.

In addition, this study can also be used as an alternative method or a reference for the teacher of mathematics in special education when teaching the topic of multiplication. Based on the findings of the study, the use of the cross-line method showed a positive effect on the multiplication skills of students with learning disabilities. Therefore, it can be used as one of the alternative methods by the teacher when teaching the topic of multiplication. Special education teachers of Mathematics can apply the Cross-Line method to help students with learning disabilities who are unable to memorize multiplication table to solve questions. In addition, the cross-line method can increase their confidence and interest in learning mathematics. This can assist teachers in creating a more comfortable learning environment so that students can participate in the classroom learning process.

In summary, this study answered the research question on the problem of the basic skills of multiplication of students with learning disabilities and explored the effectiveness of the use of the Cross-Line method in helping to improve the skill of solving the multiplication questions of students with learning disabilities. Several suggestions were made for researchers who will conduct studies on the basic skills of multiplication of students with learning disabilities, such as the diversity of students with learning disabilities categories, a broader range of operational questions, and more special education schools involved in future studies. A future study is suggested to improve and expand the implementation of the Cross-Line method on the multiplication skills of students with learning disabilities, as well as to address the problems encountered by those learning the multiplication topic in schools.

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