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Slow learners' performance in solving mathematical problems in the inclusive classroom

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Abstract

Several studies have been carried out to uncover errors made by students in solving mathematical problems. However, there are few studies related to this kind of research specializing in students with special needs, in this case, slow learners, especially in Indonesia. In addition, the study did not classify the errors into the category of mathematical errors, so the location of the errors was not mapped. This study aimed to describe the performance of slow learners in solving mathematical problems, which are analyzed by the locations of errors based on the Newman procedure and categorized by Elbrink's classification. This study also aimed to reveal the causes of errors made by slow learners in solving mathematical problems by confirming the characteristics of slow learners. The subject of this research was two eighth-graders who are considered slow learners in an inclusive junior high school. The data were collected through written tasks and semi-structured interviews. The results showed that both subjects could perform the reading and comprehension stages. However, they faced difficulties performing the transformation, process skills, and encoding that led to errors. The error categories were calculation, procedural, and symbolic errors. These errors were caused by the limited cognitive abilities of slow learners, their poor memory and concentration skills, and less variety of teaching methods by the teacher. The results of this study can become a reference for mathematics teachers to determine alternative strategies for overcoming errors made by slow learners in solving mathematical problems.

Keywords: Elbrink classification; errors analysis; Newman procedure; slow learner

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Introduction

Slow learners have been referred to in many kinds of literature with various definitions, such as students at risk (Shaw, 2010), low achievers (Kaznowski, 2004), moderate learners (Pandey & Kurian, 2016), or students that have limited scope for achievement (Chauhan, 2011). Slow learners are also defined as children who have a slightly below-average intellectual potential but are not categorized as having mental disorders (The Ministry of Women's Empowerment and Child Protection of the Republic of Indonesia, 2011). More specifically, slow learners are identified as children who have IQs in the range of 70-85 (Kaznowski, 2004) or the range of 75-89 (Malik, Rehman, & Hanif, 2012), so it can be concluded that IQs of slow learners are in the range of 70-90 (Krishnakumar, Jisha, Sukumaran, & Nair, 2011). Therefore, it gives slow learners the inability to keep up with academic demands (Kaznowski, 2004) and encounter troubles in learning (Tran, Tuyen, Trinh, & Tai, 2019), thus leading to low achievements, which in turn does not make them well performed in their mathematics study skills (Tezer, Cumhur, & İldırımlı, 2020).

Furthermore, some studies stated that slow learners have difficulties learning related to reading, writing, and mathematics (Borah, 2013; Kaznowski, 2004; Krishnakumar et al., 2011; Levine & Barringer, 2008; Tran et al., 2019). Slow learners require more time to understand learning materials and repeated explanations (Aziz, Sugiman, & Prabowo, 2015; Shaw, 2010; Yusuf, 2018). Slow learners also have a poor memory (Chauhan, 2011; Pandey & Kurian, 2016), making them unable to store long-term memory (Kaznowski, 2004; Shaw, 2010). These learning limitations make slow learners have obstacles to learning, so slow learners generally have lower learning achievements than other students (Watson & Rangel, 1989; Winarsih, 2013; Yusuf, 2018).

Slow learners certainly have the right to take education in the same school as other regular students. Due to this condition, several schools in Indonesia have implemented learning with an inclusive education system that facilitates students with special needs, including slow learners, to receive the same education as other regular students (The Ministry of Education and Culture of the Republic of Indonesia, 2014; Yusuf, 2018). It has implications for the similarity of learning material obtained between slow learners and regular students, including mathematical learning. One of the domains of mathematics material studied in inclusive schools by slow learners is geometry. This material is one of the materials that students often find errors in solving mathematical problems related to geometry (Kadarisma, Fitriani, & Amelia, 2020). Many elementary school teachers have misconceptions about geometry (Leton, Djong, Uskono, Dosinaeng, & Lakapu, 2020). Thus, it allows slow learners to also make errors in solving mathematical problems related to geometry.

However, schools that implement inclusive education adapt their curriculum by adjusting teaching/learning material to the characteristics of students with special needs, including slow learners (Hasibuan, Syamsuri, Santosa, & Pamungkas, 2020; Yusuf, 2018). Adjustments of mathematical learning material for slow learners are considered in planning or conducting the learning process. One way to find the compatibility of the mathematical learning material for slow learner students is to find out the locations and types of errors made by slow learners in solving mathematical problems.

The locations of slow learners' errors in working on mathematical problems can be analyzed with the Newman Procedure. There are five sequential stages (hierarchy) of the Newman Procedure that students must pass in solving written mathematical problems (Clements, 1980; Prakitipong & Nakamura, 2006), namely (a) reading: students read the given problem, (b) comprehension: students can explain what is asked in the given problem, (c) transformation: students select appropriate mathematical operators and procedures to solve the given problem, (d) process skills: students perform the mathematical process, and (e) encoding: students write down the answer of the given problem appropriately. This procedure helps educators analyze obstacles and identify the location of errors that prevent slow learners from obtaining the correct answer (Prakitipong & Nakamura, 2006). Meanwhile, Elbrink classifies students' mathematical errors into three categories, namely: (a) calculation errors: which occur when students make mistakes in arithmetic operations, (b) procedural errors: which occur when students make mistakes in the problem-solving procedure, and (c) symbolic errors: occurs when students falsely relate mathematical problems that use similar symbols (Elbrink, 2008).

Therefore, it is necessary to know how the performance of slow learners in solving mathematical problems (Metikasari, Mardiyana, & Triyanto, 2019b; Sovia & Herman, 2019). Then, based on that performance, the location and category of the error can be identified. However, it is also necessary to know the causes of the error because the errors that slow learners make in solving mathematical problems naturally occur because of a reason. What can be done to reveal the causes of these errors is to refer to the characteristics of slow learners students that have been revealed in various studies (Borah, 2013; Chauhan, 2011; Dasaradhi, Rajeswari, & Badarinath, 2016; Malik et al., 2012; Shaw, 2010; Vasudevan, 2017). Another thing that can be done to reveal the causes of these errors is to analyze the mathematics learning process carried out by slow learners in an inclusive classroom, referring to the research conducted by Hasibuan et al. (2020). Knowing the location of the errors made by slow learners and their causes will make it easier for teachers to determine the proper treatment and interventions in their learning (Borah, 2013). Therefore, it is hoped it will minimize the errors of slow learners in solving mathematical problems, especially circle problems, which is one of the material topics in geometry.

Research that aims to analyze the errors made by slow learners in solving mathematical problems has been carried out by Novitasari et al. (2018) and Sovia and Herman (2019). However, both studies focused on problems related to numbers. In addition, the studies did not clearly state that the subjects are slow learners whom psychologists have diagnosed as students with special needs of slow learners. It is necessary to emphasize that the slow learners are students with special needs of slow learners (Hasibuan et al., 2020), not just students with low mathematical abilities, so that the causes of the errors can be confirmed through the characteristics of slow learners. On the other hand, the studies did not classify the errors into the category of mathematical errors, so the location of the errors was not mapped. Therefore, this study aimed to describe the performance of slow learners in solving mathematical problems that focused on geometry, which are analyzed by the locations of errors based on the Newman procedure and categorized by Elbrink's classification. This study also aimed to reveal the causes of errors made by slow learners in solving mathematical problems by confirming the characteristics of slow learners.

Methods

This research used the qualitative descriptive approach to identify and describe the location, types, and causes of errors made by slow learner students in dealing with mathematical problems, especially on the problems related to the circumference and area of a circle. The subjects of this research were two eighth-graders who are considered slow learners in an inclusive junior high school in Indonesia. Both of them were diagnosed by psychologists as slow learners. These subjects were selected based on a recommendation from two teachers who specifically teach special needs students in that school. These teachers have a background in mathematics education and special education. The selection of the two subjects was also based on a recommendation by the principal of that school, who has a background in special education. Furthermore, the subjects were selected based on their abilities to communicate, whether verbally or in writing, in order for the researchers to conduct the error analysis, both from the results of a written test or an interview.

The results were taken from a written test and a semi-structured interview given to the subjects. The written test contains five routine problems related to the circumference and area of a circle. The subjects studied these materials before the test was given. The researcher referred the instrument to five experts to check its validity. The five experts consits of two lecturers and researchers of mathematics education, a mathematics teacher who teaches the subjects class, a learning support teacher (special tutor who specifically handles special needs students) who helps the subjects' learning assistance, and the principal (where the research was conducted) who has a background in special education and are experienced in dealing with students with special needs. The suggestions of the five experts were used to improve or modify items that are not suitable for the research objectives. Thus, we obtained five questions related to the circle problems that have been validated, as shown in Tables 1-5.

Both subjects did the test while a tutor was accompanying each with a specialty in handling students with special needs. The researchers did the semi-structured interview with the subjects while they were working on the test simultaneously by doing a pull-out system in the source room (Hasibuan et al., 2020). The following is a guideline for questions used during the semi-structured interview (Clements, 1980; Prakitipong & Nakamura, 2006; Zakaria, Ibrahim, & Maat, 2010): i) can you read the problem? (reading stage); ii) what does the question want you to find? (comprehension stage); iii) tell me, what is the right formula you use to solve the problem? (transformation level); iv) how did you solve the problem? (process skills stage); and v) tell me, what is your final answer? (encoding stage).

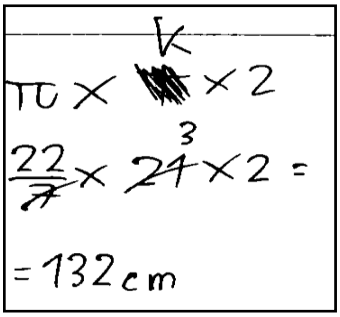
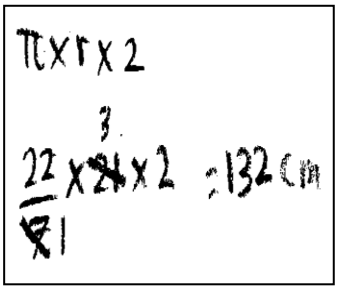
The semi-structured interview was done to directly gather the information regarding the five stages of the Newman Procedure. Therefore, the location of the errors made by both subjects could be identified. The performance of the subjects on both the written test and the semi-structured interview was then analyzed to identify the types of errors made by the subjects based on the three types of errors that were put forward by Elbrink (Elbrink, 2008). Data reduction, presentation, conclusion, and verification were conducted through the data analysis technique.

Results

This section presents the performance of the slow learners, S1, and S2, on completing five written problems regarding the circumference and area of a circle. The performance of S1 and S2 and their location and errors can be seen in Tables 1-5.

In the first problem (reported in Table 1), both S1 and S2 can pass the reading stage flawlessly. They were able to read the problems perfectly without making any errors. Both S1 and S2 were also capable of passing the comprehension stage flawlessly. In the transformation stage, S2 was able to identify and write the correct formula to solve the problem regarding the circumference of a circle, as can be seen in Figure 2. On the other hand, S1 made an error in the transformation stage by writing the symbol "K" to represent the length of the radius of the circle, while the correct representation should be "r", as shown in Figure 1. The students in Indonesia are taught to use the symbol "K" to represent a circumference and the symbol "r" to represent the radius of a circle.

Table 1. Slow learners' performance (question number 1)

Q1: A father buys a circular clock. The radius of the clock is 21cm. What is the circumference of the clock?				
	Student's Answer	**Completed Stages**	**Error Stages**	**Categories of Errors**
S1	 **Figure 1.** S1's Answer of Q1	Reading Comprehension Process skills Encoding	Transformation	Symbolic error
S2	 **Figure 2.** S2's Answer of Q1	Reading Comprehension Transformation Process skills Encoding		

Based on Table 1, both S1 and S2 could read the problems perfectly without making any errors. They were also capable of passing the comprehension stage flawlessly. In the transformation stage, S2 was able to identify and write the correct formula to solve the problem regarding the circumference of a circle, as can be seen in Figure 2. On the other hand, S1 made an error in the transformation stage by writing the symbol "K" to represent the length of the radius of the circle, while the correct representation should be "r", as shown in Figure 1. The students in Indonesia are taught to use the symbol "K" to represent a circumference and the symbol "r" to represent the radius of a circle.

The following interview transcripts were translated from Indonesian language.

(R – Researcher, S1 – Subject number 1)

R : What does this question want you to find?
S1: It's about the circumference of the clock. I actually forget a bit about this, but I'm using my own way to solve it.
R : Tell me how you did it.
S1: So, this is how I did it. I multiply K by Pi, the K refers to the circumference, and then I multiply it by 2. I use 22/7 as Pi since there is number 21, which can be divided by 7.
R : What does 21 refer to?
S1: It is for the K.
R : What does K refer to?
S1: The circumference.
R : Oh, so the circumference is 21?
S1: Yes.
R : And then what does 132 refer to?
S1: It's the answer of question number 1, the circumference.

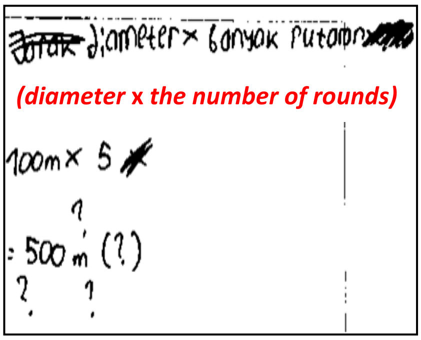
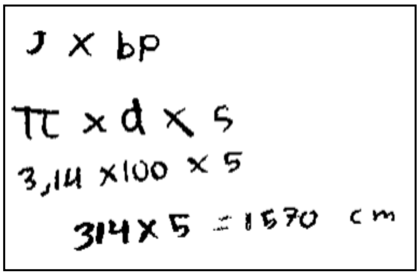
Based on the interview transcript, it can be concluded that S1 made an error during the transformation stage by implying 21cm as the circumference of the circle instead of its radius. It shows that S1 has made a symbolic error during the transformation stage. This error is caused by S1's inability to remember the correct formula to find the circumference of a circle, as mentioned by S1 during the interview. Even so, during the problem-solving section, S1 wrote the radius of the circle as 21cm, according to the given information in the problem. It shows that the process skills stage can be passed well by S1 because of S1's ability to write the correct procedure to solve Q1. Then, during the encoding stage, S1 can also write and state that 132cm is the circumference of the circle, which is also the correct answer to Q1. Both mentioned stages are also passed well by S2 without making any errors.

Both subjects passed the reading stage in the second problem (reported in Table 2). Both subjects also passed the comprehension stage without any errors. The transformation stage was also passed well by S2, as the subject wrote the correct formula to find the solution to the second problem, as can be seen in Figure 4. However, S1 applied the wrong formula to find the solution to the second problem during the transformation stage, as shown in Figure 3.

R : What does this question want you to find?
S1: The distance that passed by Anto.
R : Okay. And then what formula do you use to solve this number?

S1 : So, the formula is the number of lap multiplied by the diameter of the field. The diameter is 100m. It means the distance of one lap is 100m. So, 100 multiplied by 5, the result is 500. So, the distance of track that passed by Anto is 500m.

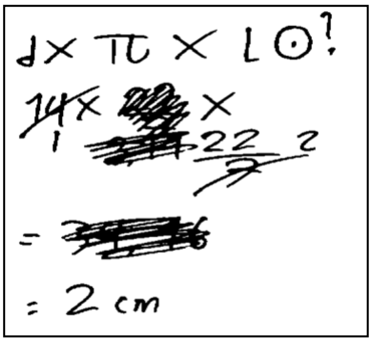
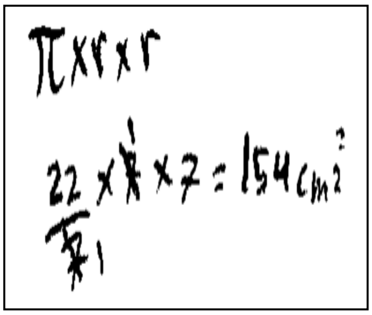
Table 2. Slow learners' performance (question number 2)

Q2: The diameter of a circular sports field is 100m. If Anto runs for 5 rounds on the sports field, then how far does Anto run?				
	Student's Answer	**Completed Stages**	**Error Stages**	**Categories of Errors**
S1	 **Figure 3.** S1's Answer of Q2	Reading Comprehension	Transformation Process skills Encoding	Procedural error
S2	 **Figure 4.** S2's Answer of Q2	Reading Comprehension Transformation Process skills	Encoding	Symbolic error

According to the interview transcript, it can be concluded that S1 has made an error in the transformation stage by mentioning the diameter, 100m, as the distance traveled to run the whole track. It shows that S1 has made an error in interpreting the diameter, which causes an error in the problem-solving procedure to find a solution to the second question. It shows that S1 has no understanding of the diameters in the transformation stage, which leads to errors in the process skills and encoding stages, resulting in a procedural error. Meanwhile, S2 passed the process skills stage well without making any errors. However, S2 made an error during the encoding stage by adding the unit of cm instead of m in the final answer, even though the written number as the final answer was correct. It shows that S2 has made a symbolic error as the subject wrote the incorrect unit of distance.

In the third problem (reported in Table 3), both subjects were able to pass the reading stage well. During the comprehension stage, S1 only mentioned "area" when asked about the problem given in the third problem. The transformation stage was passed well by S2 as the subject wrote the correct methods and formula to find the area of a circle and find the solution to the third problem, as shown in Figure 6. However, as S2 started to work on solving the third problem, S1 chose not to find the solution to the third problem as the subject was unable to remember the formula to find the area of a circle. Moments later, S1 decided to try solving the problem by applying a formula that the subject remembered, which was the formula to find the area of a circle, as shown in Figure 5.

Table 3. Slow learners' performance (question number 3)

Q3: The diameter of a circular playground is 14 m. What is the area of the playground?				
	Student's Answer	**Completed Stages**	**Error Stages**	**Categories of Errors**
S1	 **Figure 5.** S1's Answer of Q3	Reading Comprehension	Transformation Process skills Encoding	Procedural error Calculation Error
S2	 **Figure 6.** S2's Answer of Q3	Reading Comprehension Transformation Process skills	Encoding	Symbolic error

R : What does this question want you to find?
S1: The area.
(S1 was reluctant to do question number 3.)
R : Why don't you try to solve the problem in this question?
S1: I just forget how to do it.
(After R reassured S1, then he wanted to do question number 3.)
S1: If I'm not mistaken, the formula is Pi multiplied by D (for the diameter), and then I don't know anymore.
(S1 then wrote down the unknown symbol which is shown in Figure 5. The symbol means the area of a circle.)
S1: So, Pi multiplied by D and then multiplied by LO. Since LO was unknown, then 22/7 multiplied by 14, and the result is 2. So, it means 2 multiplied by 1 and then the result is 2.

According to the interview transcript, it can be concluded that S1 has made an error in the transformation stage by writing the incorrect formula to solve the area of a circle as it is the solution to the third problem. It is caused by S1's inability to remember the formula to find the area of a circle. This error causes more errors for the after steps, which are process skills and encoding. It is categorized as a procedural error. Furthermore, S1 also made an error in calculating, as shown in Figure 5 and the interview transcript, categorized as a calculation error.

On the other hand, S2 passed the process skills stage well without encountering errors. However, S2 has made an error in the encoding stage by writing the unit of cm^2 instead of m^2 in the final answer, even though the number written as the final answer is correct. It shows that S2 has made a symbolic error as the subject wrote the incorrect unit of distance of the playground's area.

In the fourth problem (reported in Table 4), both subjects were able to pass the reading and comprehension stages well. They were both able to mention the problem in the fourth problem. However, in the following stages, which are the transformation and process skills stages, only S2 was able to pass those stages well, as shown in Figure 8. On the other hand, S1 chose not to fill the answer sheet for the fourth problem, as shown in Figure 7.

Table 4. Slow learners' performance (question number 4)

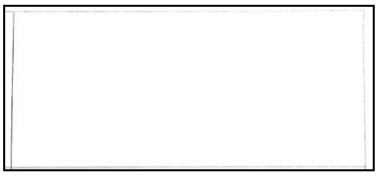
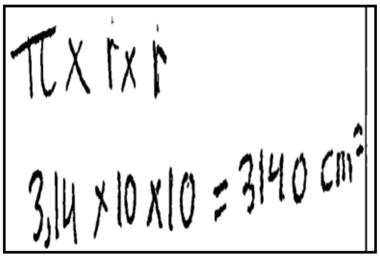
<table>
<tr><td colspan="5">Q4: Rani has a circular pocket mirror. The diameter of the pocket mirror is 20cm. What is the area of the pocket mirror?</td></tr>
<tr><th></th><th>Student's Answer</th><th>Completed Stages</th><th>Error Stages</th><th>Categories of Errors</th></tr>
<tr><td>S1</td><td>
Figure 7. S1's Answer of Q4</td><td>Reading
Comprehension</td><td>Transformation</td><td>(no answer)</td></tr>
<tr><td>S2</td><td>

Figure 8. S2's Answer of Q4</td><td>Reading
Comprehension
Transformation</td><td>Process skills
Encoding</td><td>Calculation error</td></tr>
</table>

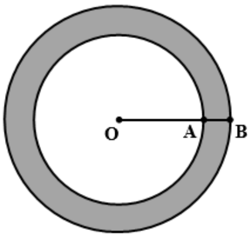
R : S1, read the question, please.
S1: Rani has a circular pocket mirror. The diameter of the pocket mirror is 20 cm. What is the area of the pocket mirror?
R : What does this question want you to find?
S1: The area of the pocket mirror.
(S1 was reluctant to do question number 4.)
R : What is the right formula?
S1: What is it?
R : You want to determine the area, don't you?
S1: Yes.
R : What is the shape of the pocket mirror?
S1: Circle.

R : So, how do you determine the area of a circle?
S1 : I forget how to do it.
(After being assured by R, S1 still did not want to answer question number 4.)

According to the interview transcript, it can be concluded that S1 had made an error during the transformation stage. It is caused by S1's inability to remember the formula to find the area of a circle, exactly like the previous problem. It is just that S1 insists on not filling the answer sheet for the fourth problem instead of trying to solve the problem by applying the formula that the subject remembered to do on the third problem. On the other hand, S2 has made an error in the process skills step as the subject did an incorrect fraction multiplication. It shows that S2 has made a calculating error during the process skills stage that leads to an incorrect answer during the encoding stage.

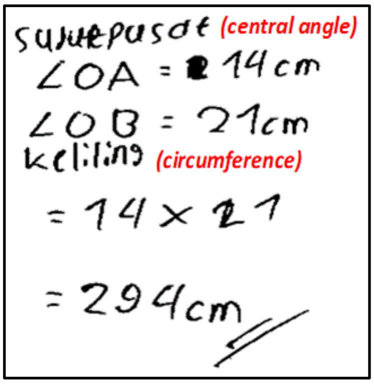
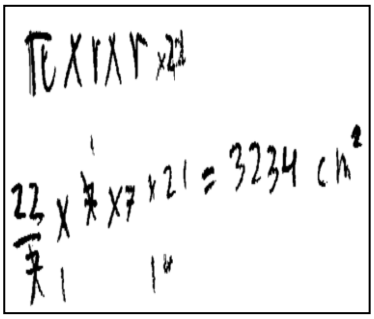
Table 5. Slow learners' performance (question number 5)

Q5



If the length of OA is 14 cm and OB is 21 cm, then what is the area of the shaded region in the given picture?

Figure 9. Figure of Question Number 5

	Student's Answer	Completed Stages	Error Stages	Categories of Errors
S1	 **Figure 10.** S1's Answer of Q5	Reading Comprehension	Transformation Process skills Encoding	Symbolic error Procedural error
S2	 **Figure 11.** S2's Answer of Q5	Reading Comprehension	Transformation Process skills Encoding	Procedural error

In the fifth problem (reported in Table 5), both subjects were able to pass the reading and comprehension stages well. They were both able to determine the problem in the fifth problem. However, during the transformation stage, both subjects made an error by writing and mentioning the incorrect formula to solve the fifth problem.

R : How many circles are there?
S1 : There is 1… and 2.
R : So, how are you going to solve the problem?
(S1 remained silent.)
R : So tell me how to do it.
S1 : So, the OA is 14 cm, the OB is 21 cm. So, the formula is 21 multiplied by 14 and the result is 294.
R : So, that's how you solve the problem?
S1 : Yes.
(R points at the symbol "∠")
R : What symbol is that?
S1 : The angle.
R : Oh, do you mean the angle of OA?
S1 : I don't know. That's the central angle and this one is the circumference (pointing at the shaded region).
R : So, do you mean the formula is the circumference multiplied by the central angle?
S1 : Yes.

(S2 – Subject number 2)
R : So, how are you going to solve the problem? What formula do you use to solve this problem? The formula of circumference or area?
S2 : "r" multiplied by Pi and then multiplied by "r". Since the question is the area of the shaded region. I don't understand how to solve this problem because this is the first time I'm working on this problem.
R : What is the shape of the shaded region area?
S2 : Mmm.. Circle.
R : So, you use the formula of determining area of a circle to solve the problem?
S2 : Yes, but I'm looking for the area of the shaded region. I'm not sure whether it's correct or not.
R : So, how are you going to solve it?
S2 : 7 multiplied by 22/7 and then multiplied by 7 and the result multiplied by 21.
R : How did you get 7?
S2 : I got it from 14 divided by 2.
R : And then you multiplied the result by 21?
S2 : Yes, because of this (pointing at the shaded region). Well, I'm not sure about it.

According to the interview transcript, it can be concluded that both subjects encountered an error in the transformation stage. This is because both subjects do not know the correct method to determine the area of the shaded region provided in the fifth problem (Figure 9). However, both subjects still tried to solve the fifth problem using formulas that they were familiar with. Meanwhile, S1 made a symbolic error by adding the symbol "∠" to OA and OB S1 assumed OA and OB as angles, OA was even assumed to be a central angle by S1, as shown in Figure 10. Furthermore, although S1 was able to determine the problem of the Q5 in the comprehension stage, S1 assumed the shaded region as the circumference instead of the area.

S2 also made the mistake of writing an incorrect formula because of a lack of understanding in determining the right method for solving Q5 problem, as can be seen in Figure 11. The errors made by both subjects in the transformation stage are categorized as procedural errors which caused further errors in the next stages, which are the process skills and encoding stages. This was because both subjects applied the incorrect mathematical concept in trying to solve the fifth problem.

Table 6. Slow learners' errors on circle problems

	S1	S2
	Stages on Newman Procedure	
Reading	-	-
Comprehension	-	-
Transformation	Q1, Q2, Q3, Q4, Q5	Q5
Process Skills	Q2, Q3, Q4 (no answer), Q5	Q4, Q5
Encoding	Q2, Q3, Q4 (no answer), Q5	Q2, Q3, Q4, Q5
	Categories on Elbrink Classifications	
Calculation	Q3, Q4 (no answer)	Q4
Symbolic	Q1, Q4 (no answer), Q5	Q2, Q3
Procedural	Q2, Q3, Q4 (no answer), Q5	Q5

Based on the results of completed tasks and interviews with the subjects, the errors made by S1 and S2 are presented in Table 6. Therefore, this research identified three locations of errors and three types of errors made by slow learners in solving circle problems. The three locations of errors based on the Newman Procedure are transformation, process skills, and encoding. In contrast, the three categories of errors based on the Elbrink classifications are calculation, symbolic, and procedural errors.

Discussion

Based on the results of slow learners' performance in solving circle problems, both completed stages and errors stages. It shows that both subjects can pass the reading stage well. They can read out all the problems (Q1-Q5) properly without making any errors in reading words, symbols, or descriptions in the image provided, which can be identified through semi-structured interviews. Furthermore, both subjects are also able to pass the comprehension stage well. During the interview, they could comprehend what the problems asked them to find.

However, although both subjects were able to read and comprehend the problems well, the weakness of both subjects lies in the third, fourth, and fifth stages of the Newman Procedure. One of the subjects made errors in the transformation and process skills stages of almost all the given problems. This error occurs because the subject could not use the correct formula in solving problems (Hidayah, Sa'dijah, Subanji, & Sudirman, 2020) related to the circumference and area of a circle due to the subject's inability to remember the formula. Lack of ability to store memory in the long term is one of the characteristics of slow learners (Chauhan, 2011;

Kaznowski, 2004; Pandey & Kurian, 2016; Tran et al., 2019), makes it difficult for the subject to remember the formula, thus allowing them to have doubts in answering questions which then leads to the inability to solve the given problem (Faradillah & Fadhilah, 2021). Moreover, the limited cognitive abilities of the slow learners make it difficult for the subject to relate to and apply the concepts taught to new situations (Chauhan, 2011; Shaw, 2010; Tran et al., 2019).

Besides, the limited cognitive abilities of slow learners also cause both subjects to have difficulty solving the problem of Q5, where one of the subjects mentioned in the interview that the problem was new (unfamiliar) to the subject. The subject assumed that the question had never been asked by the teacher before, even though the concept used in solving this problem had been given by their teacher, where the difference lies only in the presentation of the image, which is related to the formula for the area of a circle. However, the first subject could not relate the concept of a circle area, and the second subject could not determine the right strategy to solve the problem even though it had used the concept of a circle area. They have not performed well in their mathematics study skills which causes them to be unable to apply the right strategy (Arifin, Zulkardi, Putri, & Hartono, 2021; Tezer et al., 2020).

It indicates that the limitations of the slow learners' cognitive abilities make it difficult for them to relate the concept of the circle area to solve the Q5 question that is unfamiliar to them. This condition also shows that slow learners have difficulty solving problems that have never been given or exemplified before. It is because slow learners can perform familiar problems but have difficulty working on new situations (modified problems) even though both problems have similar concepts in their completion process (Metikasari, Mardiyana, & Triyanto, 2019a). They have difficulty comprehending abstract problems (Dasaradhi et al., 2016) and thinking abstractly (Borah, 2013).

The limited cognitive ability of slow learners makes them need examples in solving mathematical problems so they can reduce their mental workload and cognitive load while working on problems that have been exemplified before (Santosa, Prabawanto, & Marethi, 2019; Santosa, Suryadi, Prabawanto, & Syamsuri, 2018). Providing step-by-step examples in solving mathematical problems is also needed by slow learners to reduce their cognitive load on the acquisition process in solving mathematical problems (Irwansyah & Retnowati, 2019). Another thing that slow learners also need is an assessment in the form of redo tests (Borah, 2013). It is due to one of the characteristics of slow learners that require more time (Malik et al., 2012) and repetition to comprehend a problem (Aziz et al., 2015; Shaw, 2010).

Besides, the inability of subjects to solve circle problems correctly can also be caused by the less variety in the teaching methods used by teachers on subjects, as revealed in Hasibuan et al. (2020). It leads to a lack of exploration activities and then leads to the subject's lack of understanding of the concepts (Dasaradhi et al., 2016) so that subjects cannot solve various problems (Sari, Yaniawati, Darhim, & Kartasasmita, 2019). Furthermore, this less varied learning method also allows students to carry out activities that are not following their needs (Mumpuniarti, Handoyo, Pinrupitanza, & Barotuttaqiyah, 2020). It will cause a higher extraneous cognitive load on students (Santosa et al., 2019, 2018; Sweller, 2010), especially for slow learners who have different characteristics from regular students. Therefore, it is necessary to carry out various learning processes and activities that support the characteristics of slow learners to become more conducive to them. It is expected to reduce extraneous cognitive load and increase the slow learners' germane load (Sweller, 2010). It may be overcome by increasing exploration and learning activities in groups and endeavoring to do groupings with patient partners (Borah, 2013). Group learning allows regular students who have higher abilities to share, help, encourage, and facilitate slow learners so that later they can improve their mathematical performance (Hobri, Dafik, & Hossain, 2018).

Furthermore, all subjects performed symbolic errors and calculating errors, both in the process skills or encoding stage, which showed that they lacked concentration while working on the problems. As shown by several studies, slow learners' poor concentration skills (Kaznowski, 2004; Pandey & Kurian, 2016; Tran et al., 2019) has an impact on errors in the process skills and encoding stages (Metikasari et al., 2019a; Novitasari, Lukito, & Ekawati, 2018; Sovia & Herman, 2019). This poor concentration skill leads them to make mistakes in writing symbols, doing calculations, and writing final answers that lead to errors in solving mathematical problems, especially in circle problems.

Conclusion

Both subjects were capable of performing the first and second stages of the Newman Procedure, namely reading and comprehension. Nevertheless, they faced difficulties in performing the third to fifth stages of the Newman Procedure that led to errors, which are transformation, process skills, and encoding. Furthermore, these errors can be categorized as calculation errors, procedural errors, and symbolic errors, based on students' mathematical errors categories by Elbrink. The cause of the errors made by slow learners is their difficulty in remembering the formula of circumference and area of a circle due to their poor memory. The difficulty in identifying symbols related to circle problems also causes slow learners to apply incorrect formulas, causing them to apply incorrect procedures. Another cause is their carelessness in carrying out the counting, which leads them to calculation errors. So it can be concluded that the errors made by slow learners in solving circle problems are caused by their limited cognitive abilities, their poor memories, and their lack of concentration skills. Besides, the teacher's less variety of teaching methods can also be the cause of errors made by slow learners in solving mathematical problems, especially circle problems.

The results of this study can be used as a reference by mathematics teachers, especially those who teach in inclusive classes, to determine alternative strategies for overcoming errors made by slow learners in solving circle problems. However, unfortunately, the stage of cognitive development and cognitive load of the subjects of this study has not been measured, so the cause of errors due to one of the characteristics of slow learners, in this case, low cognitive abilities, cannot be studied further. Therefore, further research is needed that focuses on Piaget's stages of cognitive development of slow learners so that later it will be revealed at which stage they are at. Furthermore, the following research can be carried out to measure the mental efforts of slow learners in solving mathematical problems so that later cognitive load of the slow learners will be revealed, both intrinsic, extraneous, and germane cognitive load.

Conflicts of Interest

The authors declare that no conflict of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely by the authors.

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