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CONNECTING TEACHER'S ACTIVITY AND STUDENTS' ACHIEVEMENT TOWARD NUMERACY COMPETENCY IN LEARNING MATHEMATICS

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Abstract

This research aims to connect the construction of teacher activities and student learning outcomes that support the numeracy competence of learners in mathematical learning activities. To support the achievement of this goal, classroom action research is an applied method. This research activity was carried out at SMPN 33 Makassar by involving not only teachers as many as 2 people, students 2 people, and students as many as 28 people as learning subjects. The research instruments used include tests, observation sheets, student worksheets, textbooks, and learning media. The results showed that the numeracy competence of SMPN 33 Makassar learners still requires special intervention, learning activities implemented by teachers have not been effective in helping students achieve the expected level of numeracy competence, students need learning activities that encourage them to understand phenomena and associate them with mathematical concepts, as well as solving problems involving numeracy ability.

Keywords: Analysis, Competency Level, Numeracy

A. Introduction

The challenge facing Indonesia's education system today is the low literacy and numeracy competence of learners. Especially for numeracy competencies, students are expected to develop it as it relates to productivity (Assessment and Learning Centre, 2020). The productivity intended in this case can be seen from their numeracy ability (Durrani & Tariq, 2012), as heilmann (2020) suggests that health-related decisions require numeracy skills. The extent to which individuals have the capacity to access, process, interpret, communicate, and act on numerical, quantitative, graph, biostatistics, and probabilistic health if not supported by those abilities. Huizinga et al. (2008) suggests that numeracy is a component of literacy needed as the ability to use numbers in everyday life.

For the needs of learners, numeracy competencies are needed to complement the knowledge and learning experience they have. The need for literacy is not only needed by adults, but including those who are classified as early age

learners also need it. Yulianti et al. (2019) placed role playing as an event to introduce numeracy literacy for learners at TK Twin Course Pasaman Barat. Fong Peng (2015) presented how the LINUS program initiated by the Ministry of Education in Malaysia can support learners to be able to read and write quickly. For the elementary school level, Dantes &Handayani (2021) carries out learning with a Blended Learning model that contributes to the improvement of students' numeracy literacy.

In terms of benefits, this numeracy competency can be developed through planned learning activities in such a way that it has an impact on improving other aspects (Effendi et al., 2020), such as problem-solving skills. Mahmud et al. (2019) explores unstructured problem-solving capabilities in number matter. The result is a variety of abilities that develop including analytical and interpretation skills, as well as predictive capabilities that are equipped with inferring based on what is done. If this review concerns how the development of numeracy competencies of students.

Related to media that support the development of numeracy competencies, Widiastuti & Kurniasih (2021) where numeracy literacy competence can be improved with the implementation of the Cabri 3D V2 Software-Assisted *Problem Based Learning* Model. Similar things that Marlena & Nugrheni (2019) did through the application of Cabri 3D can also support the improvement of the ability to understand mathematical concepts. In line with that, Pranawestu et al. (2012) also explained that Cabri 3D supports the acquisition of students' spatial abilities, not only that the study also touches on aspects of student character development. Although used is Cabri 3D and how this device is useful to support the formation of mathematical concept comprehension abilities and spatial abilities. In turn, Cabri 3D as a representation of technology has supported learners' numeracy literacy abilities.

For the classroom level of learning, the challenge lies in the learning activities designed by the teacher and what kind of activities students do so as to in turn direct them to improve numeracy competencies. As an emphasis, it is also intended by (Carroll, 1963) that student learning opportunities relate to inputs and processes aimed at supporting students to produce achievements from desired outcomes

(Elliott &Bartlett, 2021). Therefore, Hwang &Ham (2021) through research conducted shows how learning opportunities with procedural tasks affect improving students' math literacy directly. Learning opportunities in this regard are appropriate (Stevens, 1993) where influential factors are related to teacher teaching practices and student learning (Zulkardi & Putri, 2020), precisely the scope and emphasis of content (Hwang &Ham, 2021).

In relation to numeracy competence, the National Assessment (NA) developed by the government in this case Pusmenjar is used to measure and classify their level of numeracy competence. NA content is oriented towards the development of learners' competencies in terms of reading literacy and numeracy or math literacy. NA is not the same as other subject-based assessments, but it is used to photograph the fundamental competencies necessary for success on a wide range of subjects. The assessment also called Minimum Competence Assessment (MCA) which is component concerns three aspects namely Content, Cognitive Level, and Context. Numeracy content contains four groups, namely Numbers, Measurement and Geometry, Data and Uncertainty, and Algebra. While the cognitive level for numeracy is concerned with understanding, application, and reasoning. Then the context on MCA concerns understanding, application, and reasoning (Assessment and Learning Center, 2020).

Although various obstacles such as need to pay attention to problems that can be used to improve the numeracy skills of learners in the classroom (Fiangga et al., 2019). Numeracy is inseparable from the challenges faced by learners, such as the optimal ability of students to use symbols or numbers in solving problems (Sri Hartatik, 2020). As well as Nasrullah (2015) argued that poorly developed math literacy resulted in students' mathematical knowledge also not developing well, therefore the ability of students to argue using their mathematical knowledge is still low.

The extent of the achievement of learners' numeracy competencies and what can develop with learning activities given to them are 2 interesting things that need to be explored. The answers to these two questions are at least useful for educators or others who aim to develop on those aspects. Therefore, this paper will show what the numeracy of learners looks like, what about the activities that

teachers apply to learning activities and what students need for learning outcomes as expected.

B. Method

This research was conducted by applying a type of classroom action research where the research team consists of teachers, students, involving lecturers and students as observers. Please note that students involved in this learning activity as many as 28 people who come from SMPN 33 Makassar. This research activity is carried out with the following stages:

1. Planning

   For this stage, teachers and students draw up a plan for the implementation of learning that will be carried out during 6 meetings in cycle 1, and 8 meetings in cycle II. In a number of these meetings, two meetings were conducted *pre-test* and *post-test*. To support the implementation of this research activity, there are 3 research instruments made, namely observation sheets, student worksheets, textbooks, and learning media.

2. Acting

   For the application of actions in the learning class, activities that have been designed are prepared for learning activities where cycle 1 contains learning materials about Revival and Partnership, while in cycle II given material on Geometric Transformation, Opportunity, and Statistics.

3. Observing

   For observation activities, this activity is carried out not only observing what is done by the teacher, but also what is done by students. Interesting things throughout the learning activity become the object of observation. The indicators are observed as follows:

Table1 Indicator of Learning Observation

observed Indicators
1. The activities provided attract the attention/interest of students
2. The activities provided trigger the motivation of students to learn
3. A given activity shares ideas/ideas/questions which excites students
4. The activities provided direct students to discuss

observed Indicators
5. The activities provided direct students to write down the results of the discussion
6. The activity provided directs students to explain the answers
7. The activities provided direct students 8. Get a response to an answer
9. The activities provided direct students 10. responding to an answer
11. The activities provided direct students to work given task
12. The activities provided direct students to collect given task
13. The activities provided direct students to submit conclusions
14. The activities provided direct students to convey What was gained at the meeting
15. The content provided follows basic competencies
16. The content provided supports learning objectives
17. Lesson content Contains context
18. The content of the lesson supports the provision of stimulus that develop student knowledge
19. Lesson content develops math skills
20. Content trains thinking skills
21. Content trains reasoning skills
22. Content trains the ability to communicate
23. Content exercises literacy skills
24. Content trains the ability to discuss
25. Content directs students to demonstrate the ability to work together
26. Content leads students to develop collaboration skills
27. Instruction given by the teacher invites the interest of students
28. instruction given by teachers triggers students' critical thinking
Instruction given by the teacher directs students to learn meaningfully

4. *Reflecting*

All achievements shown in each cycle will be discussed in this section. In addition, what is the material to be acted upon comes from information in reflection activities in the previous cycle.

To collect research data, the techniques are applied as follows:

1. Learning activities are planned in such a way as to implement the Learning Implementation Plan. In this learning implementation plan reviewing various

components including Basic Competencies and Competency Standards, Learning Objectives, Models, Learning Methods and Approaches, Learning Subject matter, Media, Tools and Materials, Learning Steps, Learning Resources, and Assessment.

2. Learning Outcomes Test prepared by assessment and learning center
3. Activity Observation Sheet whose indicator load as previously stated.

Once the collected data is available, to support these research activities. The data is analyzed by following the following stages:

1. The use of descriptive statistics that describes several statistics namely average, median, mode, standard deviation, variance, range, maximum value, minimum value, number results, and percentiles 25, 50, and 75.
2. Determination of the value of gain is done not only individually but also classically. The gain value used using the reference of categorization from Meltzer, interpretation of the effectiveness of Hake and category of numeracy competence according to Pusmenjar. For the category of numeracy competencies are divided into, 1) Special Intervention, it is characterized by limitations of mathematical knowledge, partial mastery of concepts and limited computational skills. 2) Basic which students have basic mathematical skills: basic computing in the form of direct equations, basic concepts related to geometry and statistics, and solving routine simple mathematical problems. 3) Competent where students are able to apply their mathematical knowledge in a more diverse context. 4) Proficient where students are able to reason to solve context and non-routine problems based on their mathematical concepts.
3. Search for potential learners based on the learning activities provided. For this section, the review to be used is the progress of student learning observed based on indicators of observation results.

C. Results And Discussion

In this section, there are two parts that are presented, namely results that contain information during research activities conducted, then the following part is Discussion. For the discussion section, the information obtained as a result will be fully parsed and compare it with theories related to this research. For more details, the explanation is presented as follows.

1. Student Achievement Based on Descriptive Statistics

Table 1 Student Achievement Based on Descriptive Statistics

		Early Tests	Final Test 1	Final Test 2
Number of Respondent	Involved	28	28	28
	Not involved	0	0	0
Mean		28.8596	50.7146	47.2054
Median		29.0300	50.0000	46.3800
Mode		22.58[a]	48.33	42.03[a]
Standard Deviation		9.41919	8.01819	6.81375
Variance		88.721	64.291	46.427
Range		48.39	35.00	28.99
Minimum		.00	31.67	30.43
Maximum		48.39	66.67	59.42
Sum		808.07	1420.01	1321.75
Percentile	25	22.9825	47.0850	42.3925
	50	29.0300	50.0000	46.3800
	75	36.6950	56.2525	51.8075

From the statistical description shown above, participants in this learning activity as many as 28 people. Classically, the achievements shown by students vary as seen during the pre-test, the average student score reached 28.86 with a standard deviation of 9.42. Then after students participated in learning activities and were given post-tests, the average score changed to 50.71 with a standard deviation of 8.02. A different thing happens when after learning in cycle II where students are again given post-test II, what happens is the average score becomes 47.20 with a standard deviation of 6,814. Of the three test results, starting from the pre-test, final test 1, and final test 2, the lowest distribution of scores was a score of 46,427 (post-test 2), followed by a score of 64.29 (final test 1), and score 88.72 (pre-test). Then the lowest scoring range occurs at 28.99 (final test 2), followed by the numbers 35.00 (post 1), and 48.39 (pre-test).

As a consideration of the progress of student learning outcomes based on statistics shown by descriptive statistics. When the initial test is given, the grades achieved by the student start from the number 0 and the highest is 48.39. After participating in learning activities and following the provision of tests after learning, the student score starts from 31.67 and the best score that can be achieved is 66.67. There was a slight decrease during cycle II, the lowest score of students so that the

final test 2 started with a score of 30.43 and the highest was achieved with a score of 59.42. In addition, the number of student scores before the implementation of the action was only under 1000, exactly 808.07. After participating in cycle I learning activities, the number of student scores became 1420.01. Although then there was a decrease in cycle II where the number of student scores only reached 1321.75. Using the percentile, during the initial test, the 25th percentile was at a score of 22.98 meaning 25% of students had a score below the 22.98 mark. Being on a score of 29.03 means that 50% of students' achievement scores shown are still below. Lastly, the percentile was 75, the student score was still below 36.69.

In particular, post-cycle I and cycle II percentiles. For a percentile of 25, 25% of students are below a score of 47.08 (cycle I) and below a score of 42.39 (cycle II). For a 50 percentile, 50% of students are below a score of 50 (cycle I) and below a score of 46.38 (cycle II). Lastly the 75th percentile, 75% of students were below the score of 56.25 (cycle I) and the score of 51.80 (cycle II).

2. Student Achievement Based on Gain Grades

To measure the value of gain in this study, there are two ways that are done, namely categorizing the value of gain test results using categorization techniques according to Meltzer and interpretation of effectiveness according to Hake.

1) Meltzer Criteria

After the N-gain of the learner's test result score is obtained, then the representation of the score is shown into the diagram as follows.

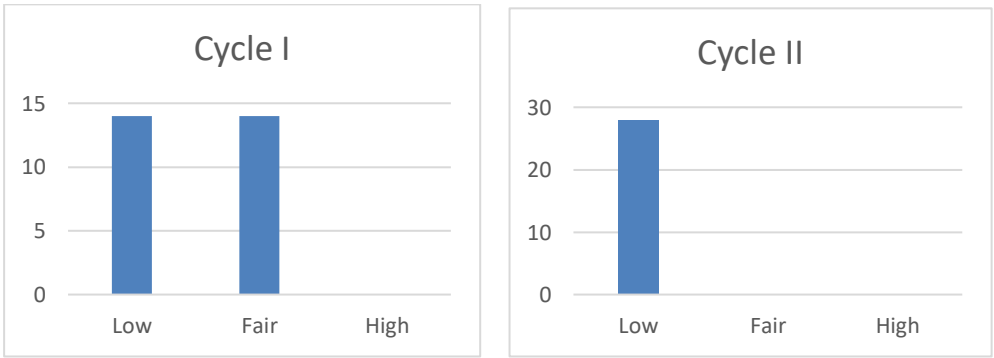

Figure 1Meltzer Categorization Toward Achievement of Learner

Figure 5 shows the achievements obtained by students in cycle I and cycle II. From the data in the image, the results of the cycle I test are grouped into 2 parts, namely the Low group and the moderate group. The number of those belonging to

both groups is equally large, which is 14 people. Unlike what happens in cycle II, there is only one group based on the results of the learner's test, namely the low group. In other words, after learning in cycle II, all students are only able to obtain low-categorized achievement scores.

2) Hake Criteria

For categorization this time which N-gain is interpreted to see

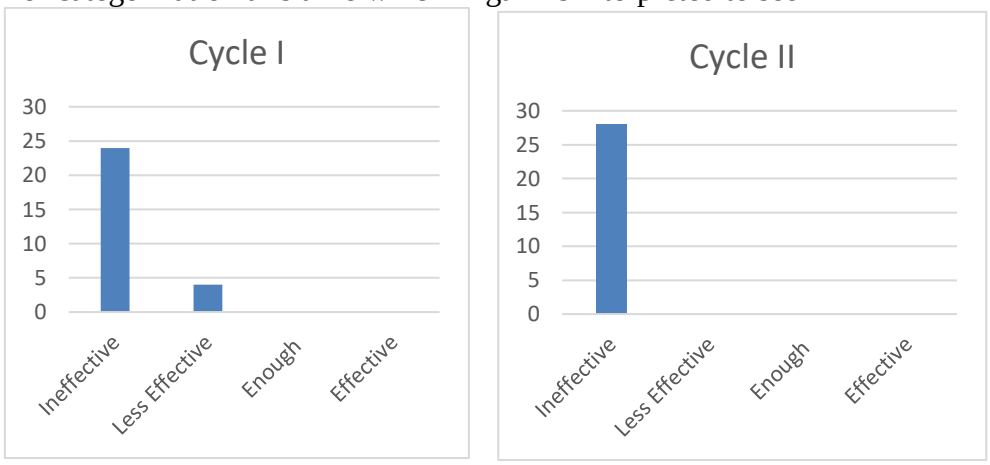

Figure 2 Hake Categorization Toward Achievement of Learner

Figure 6 shows student achievement calculated using the concept of N-gain and interpreted based on Hake effectiveness criteria. The results showed that what students showed in cycle II was no better than what they did in cycle I. The reasons that support it where cycle I, there are 2 categories that show that the given action gives some people effects, even though it is less effective. When compared to actions in cycle II, everything is considered ineffective.

3. Categorization of Numeracy Competencies Based on Pusmenjar

To see the potential of learners based on the application of class actions given. The numeracy competence of learners is also reviewed in this regard. The review was conducted using the categories specified by Pusmenjar (2020). The results are obtained as shown through the diagram below.

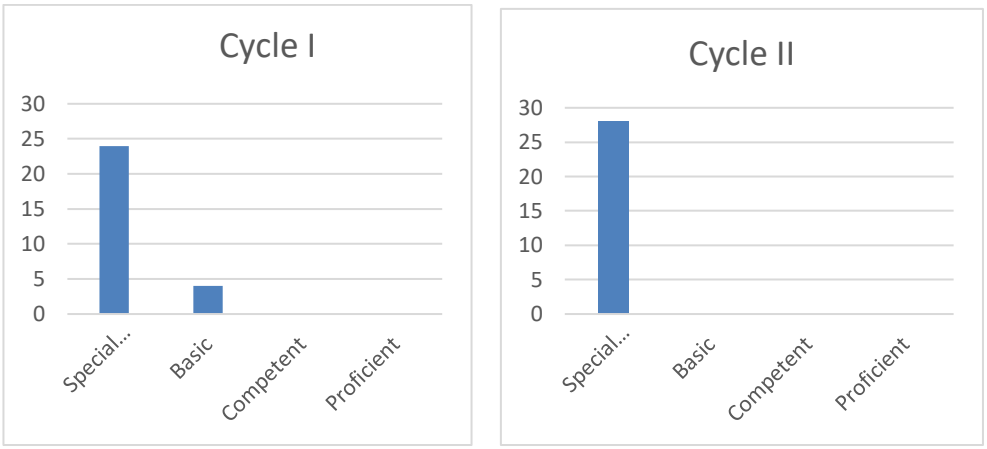

Figure3 Classification of Literacy competence and Numeracy of Learners

In figure 7, two groups of students are formed that show their level of competence, namely special interventions, and basic. In other words, not all students should be considered necessary to be granted special interventions because some of them have reached a basic level. However, in cycle II changes in test results that can be achieved by learners show all students belong to the group that needs to be given special intervention.

4. Observation of Learning Activities

Observation of learning activities is done by looking at 4 aspects as follows:

1) Learning Opportunities

For observation of this section, the data is presented into the following images:

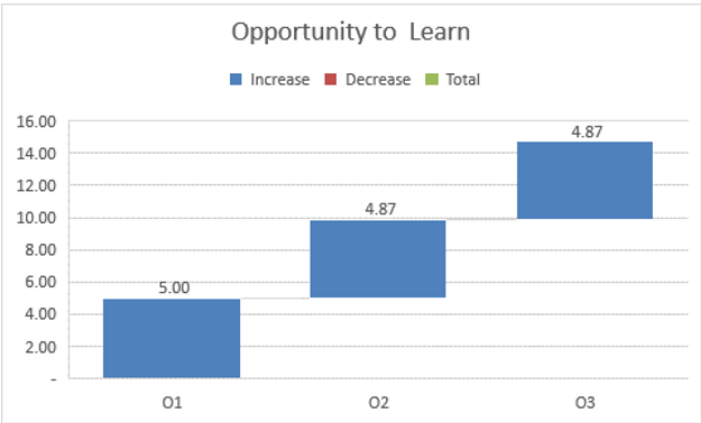

Figure 4 Learning Opportunities for Learners

From figure 8, it shows that learning activities facilitated by teachers are considered to be very supportive of the indicators of learning opportunities observed. Three observers were involved to observe learning activities, one of

whom gave a score of 5, while the other two observers gave a score of 4.87. In other words, if the overall score can be reached in full by 15, the opportunity to learn to students is slightly below the best score.

2) Cognitive Activity

For observation of this section, the data is presented into the following images:

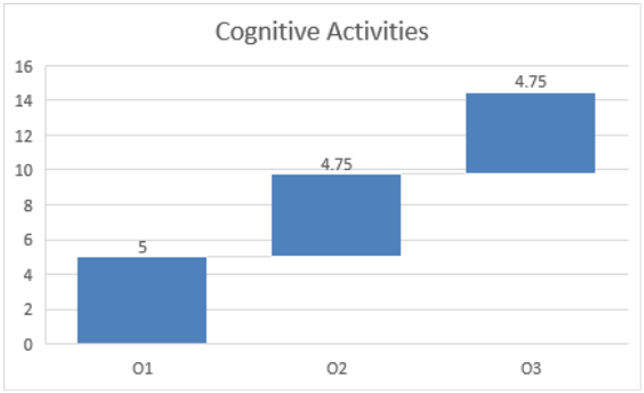

Figure 5 Cognitive Activity

From figure 9, it shows that learning activities facilitated by teachers are considered to be very supportive of planned kognitf activities. Three observers were involved to observe learning activities, one of whom gave a score of 5, while the other two observers gave a score of 4.75. In other words, if the overall score that can be reached in full is 15, the cognitive activity carried out by the teacher a little more achieves the best score.

3) Psychomotor Activity

For observation of this section, the data is presented into the following images:

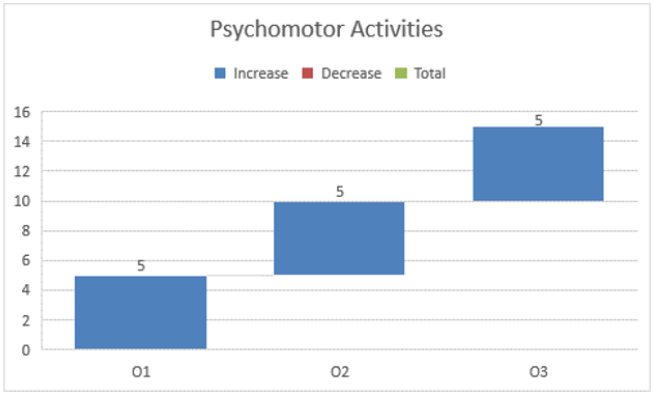

Figure 6 Psychomotor Activities

From figure 10 this shows that learning activities facilitated by teachers are considered very supportive of planned psychomotor activities. Three observers involved to observe learning activities, all observers agreed to give a score of 5. In other words, the material of psychomotor activity carried out by teachers achieves the best score.

4) Affective Activity

For observation of this section, the data is presented into the following images:

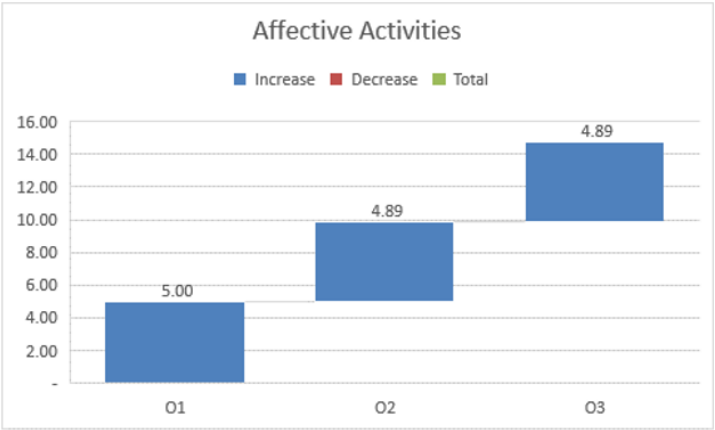

Figure 7 Affective Activity

From figure 11, it shows that learning activities facilitated by teachers are considered to be very supportive of planned affective activities. Three observers were involved to observe learning activities, one of which gave a score of 5, while the other two observers gave a score of 4.89. In other words, if the overall score that can be reached in full is 15, the affective activity carried out by the teacher slightly more achieves the best score.

Based on the description of the results of the above research, learners who engage in learning activities are applied using scientific learning approaches, *discovery* learning models, and use discussion, question and answer, and assignment methods. When viewed from what students achieve in learning activities both from cycle I and cycle II does not show good progress. The score achieved during the initial test did not start with an encouraging score. However, there was progress after students followed learning activities in cycles with an average increase in scores from 28.86 to 50.71. Although after participating in cycle II learning activities, the score decreased slightly to 47.20.

When viewed from what the teacher is given and does, the results of observations show that the learning activities applied strongly support students to achieve better scores. This review is based on observations of cognitive, affective, psychomotor, and learning opportunities. Almost all scores that mark the teacher's achievement in learning activities are close to the best score, except psychomotor activities that are rated by observers with the best score.

Using descriptive statistical reviews, students' learning progress is not only seen from the average score they achieve. If also reviewed from how much score students collected in the class, the change from the initial test to the first final test, quite well the change shown almost reached 50%. Although students who took the second final test instead showed a decrease, but there were some technical obstacles that learners experienced when they took the second final test.

Based on Meltzer's N-gain grades, overall what the student indicates has not reached the expected numeracy level. From the results of the test obtained, although formed two groups as a result of cycle I learning activities, namely low and moderate. After the implementation of learning activities in cycle II with similar learning scenarios, but different learning materials, the achievement of N-gain students can only be categorized as low for all students. It is no different if the technique of categorizing N-gain based on Hake, in cycle I the scores achieved by students can be grouped into two parts, ineffective and less effective. After tests to look at students' achievements in cycle II, the results showed they were entirely ineffective.

Therefore, the scores that students are able to meet in this learning activity show that they are still at the level of special intervention, namely limited mathematical knowledge, partial mastery of concepts and limited computational skills. Indeed (Setiawati et al., 2017) in the study conducted has explained that to be able to solve type problems such as MCA requires mathematical literacy skills supported by prior knowledge, although sometimes that knowledge is not necessarily relevant to the question given. One that needs to be addressed by learners is the ability to argue using mathematical knowledge and this is also not well developed due to low mathematical literacy. As stated by (Maryati et al., 2021), the ability of mathematical literacy requires a person to communicate and

explain phenomena with mathematical concepts. Therefore, the ability of mathematical literacy is not only related to mastery of matter, but also includes the use of mathematical reasoning, concepts, facts, and devices utilized in solving everyday problems. Thus, teachers need to involve other innovative activities that are well mastered and related to learning activities that will be carried out. As done by Wardono et al. (2016) where the PMRI approach applied can support learning that targets improving students' math literacy skills. As we all know that PMRI emphasizes the use of learning context so that learners will always be directed to understand phenomena and associate them with mathematical concepts.

D. Conclusion

Based on the explanation above, some conclusions that can be formulated as follows: 1) Numeracy competence of SMPN 33 Makassar learners still requires special intervention. 2) Learning activities carried out by teachers have not been effective in helping students achieve the expected level of numeracy competence. 3) Students need learning activities that encourage them to understand phenomena and associate them with mathematical concepts, as well as solve problems involving numeracy skills.

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