Analysis of TPS Learning (Think, Pair, Share) Based on Differentiation Process on Students' Numeration Abilities

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Abstract
Numeracy is a skiil in applying number concepts, artihmetic operations skiils and solving mathematical problems in various contexts related to real life. So cooperative learning type TPS (Think, Pair, Share) based on process differentiation is learning that is able to adapt to the needs and level of understanding of each student and has the potential to improve students' numeracy abilities. This research aims to find out if there is a difference in increasing the numeracy skills of the low group, the middle group and the high group before and after treatment and aims to evaluate students' numeracy abilities in cooperative learning type TPS (Think, Pair, Share) based on process differentiation. The research method used is One Group Pretest-posttest. The subjects in this research were students in class VIII-B of SMP Plus Arroudhoh with a total of 32 students. The data collection techique uses a pretest-posttest of data content and uncertainty in the event material, involving a total of 6 descriptive questions. Based on the research results, there were differences in the increase in numeracy skills of the low group, middle group, and high group before and after treathment. This is based on the results of the One-Way Anova test analysis of the N-Gain Score of the pretest-posttest data for the three group showing that the Sig. equal to 0.004 < 0.05 then H0 s rejected. As well as the average posttest score for each group, it can be seen that the indicator most mastered by students is the 1st indicator and the indicator less mastered by students is the 3rd indicator.
Keywords: Think Pair Share, Process Differentiation Approach, Numeracy Ability

Introduction

Education plays a very important role for every individual by providing the knowledge and skills needed in real life. The ability to learn knowledge and skills requires a process of analyzing and solving problems, where in this process students need to identify information and develop concepts to gain deeper insight and be able to implement these concepts in more focused and effective problem solving. The process of analyzing and solving problems is closely related to numeracy skills (Arends, R.I., 2012). Numeracy ability is an important skill that includes the application of arithmetic operations and number concepts in everyday life and involves the ability to analyze, reason, develop formulations, solve problems, and interpret mathematical problems in various situations (Han et al., 2017; Hartatik & Nafiah, 2020; Qasim et al, 2015).

Based on the 2022 PISA (Program for International Student Assessment) results released by the OECD (The Organization for Economic Cooperation and Development),

Indonesia's numeracy literacy level is at 69 out of 81 countries (Nolmeter.com, 2023). These results indicate that the level of numeracy literacy in Indonesia is experiencing a serious crisis and needs to be addressed seriously and gradually, so that students have a strong understanding of the concept so they can improve their numeracy skills.

Overall, the 2022 PISA results show that Indonesia's numeracy score is among the lowest, comparable to the results obtained in 2003. Although there was an increase in several previous assessments compared to earlier years, this trend has reversed with a decline that began in 2015. One of the things that It is worrying that only 18% of Indonesian students have achieved a minimum numeracy level of level 2, while information about the remaining 82% is not available. Level 2 indicates the student's ability to interpret and understand how simple situations can be represented mathematically without direct instruction. In addition, almost no Indonesian students aged 15 years have achieved a high level of achievement in numeracy skills (level 5 or 6), where the OECD average for this level is 9%. The low scores and fluctuations in Indonesian students' results on the PISA assessment indicate that students' numeracy skills have not been managed optimally.

Indonesia government policy regarding increasing numeracy literacy is regulated in regulation Number 57 of 2021 concerning National Education Standards. This regulation focuses on character development in accordance with National values as well as literacy and numeracy competencies for students. However, in its implementation teachers encountered many obstacles, one of which was the diversity of student characteristics. This diversity includes students' different learning needs, cognitive abilities, learning styles, learning conditions, and learning readiness. Teachers can improve numeracy skills by adjusting the learning needs of each student. However, teachers often do not pay enough attention to the diversity of student characteristics in the classroom and tend to assume that all students have a uniform level of learning needs. In this case, if the learning needs of each student are met, then the learning goals can be achieved by each student (Tomlinson, C. A.,2001).

To accommodate or adapt students' characteristics and needs to appropriate learning. The most appropriate approach is to use an differentiated learning is a learning process carried out in stages where teachers learn about student characteristics and adjust learning based on student needs, so that students can get the opportunity to maximize learning success in the classroom (Mumpuniarti et al, 2023; Marlina, 2020; Andini, 2016).

The diversity of students' numeracy abilities definitely requires a learning model that is not only communicative but also responsive to each student's level of learning readiness. Apart from covering cognitive aspects, numeracy abilities also involve interactions between individuals. The learning model that is designed to be effective in building and encouraging students to establish good cooperative relationships is the TPS (Think, Pair,Share) learning model. TPS learning is very effective to be implemented in classes with diverse student abilities. This strategy allows all students, both high and low ability, to contribute to and learn from each other. The following is how to implement TPS in class 1. Think, the teacher gives questions or assignments to students, then gives them time to think independently. At this stage, students with high abilities can study the questions in depth, while students with low abilities can start with a basic understanding without pressure from other friends. 2. Pair, Students work in pairs, ideally paired heterogeneously (high ability students with medium/low ability students). Students can exchange opinions, provide understanding to their partners, or discuss solutions. Heterogeneous pairs allow lower ability students to receive guidance from their peers, while more able students can hone their explanation skills. 3. Share, pairs of students present the results of the discussion to small groups or the whole class. Teachers can choose partners from different ability levels to provide diverse perspectives. It also increases the self-confidence of students with low abilities when their opinions are valued (Lie, 2010).

Furthermore, when this learning model is combined with differentiation process, the learning approach is adjusted to the needs and level of understanding of each student. So this learning model and approach is appropriate and has good potential for improving students' numeracy skills. Based on previous research regarding the impact of students' numeracy abilities on the differentiation learning in the TPS approach, research findings show the influence of this approach and model on students' numeracy abilities (Wiguna, Putu Yuda (2023). This indicates that understanding of the material can be more easily accepted by students when the teacher provides a differentiated approach, besides that students do not feel burdened because the activities presented by the teacher are adjusted to students' learning needs, so that each student can achieve learning goals.

Method

To compare numeracy abilities before and after implementing TPS learning, this research uses a One Group Pretest-Posttest design. The subjects of this research were 32 students grade VIII, who would be the pre-experiment group, which is the group given treatment without a comparison group. Subjects will be given a numeracy test before and after being given treatment. The numeracy test includes three indicators, that is:

Table 1. Indicators of Students' Numeracy Ability

No.	Indicators of Students' Numeracy Ability
1.	Able to apply various symbols and numbers related to basic mathematics in solving daily life problems
2.	Able to carry out analysis of the information displayed in it various forms (graphs, tables, charts, diagrams, and so on).
3.	Able to interpret the results of the analysis for predict and make decisions.

Source: Han, et al (2017)

Each indicator consists of 2 questions, where the score for each question is adjusted to the level of difficulty of the questions given. The pretest-post test scores will be analyzed using the N-Gain Score test from the formula below:

$$N\ Gain = \frac{Posttest\ Score - Pretest\ Score}{Ideal\ Score - Pretest\ Score}$$

In the table below, the N-Gain Score acquisition categories are presented in percent (%)

Table 2. Categories of N-Gain Score

Percentage (%)	Category
< 40	Ineffective
40 – 55	Less Effective
56 – 75	Quite Effective
>76	Effective

Source: (Arikunto, 1999)

Next, One-Way Anova test is carried out, if there are differences then Post-Hoc test is carried out to identify more specific differences. Anova analysis was used to compare differences in low, middle, and high group.

Results and Discussion

Before giving the pretest, researchers gave students a cognitive diagnostic assessment sheet to determine students' learning readiness in class VIII-B by categorizing

students' level of learning readiness into three groups: low group, middle group, and high group. Next, a pretest-posttest was carried out before and after the treatment. The average N-gain score obtained for the low group was 52% in the less effective category, the middle group was 70% in the quite effective category, and the high group was 85.5% in the effective category. Furthermore, this analysis will test the normality of the data and test the uniformity of the N-Gain Score data. In this research the normality test was carried out using Shapiro Wilk with SPSS 25, with the following analysis results.

Table 3. N-Gain Score Data Normality Test Results

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Kelompok	Statistic	df	Sig.	Statistic	df	Sig.
NGain_Persen	Low group	.183	12	.200*	.893	12	.127
	Middle group	.153	11	.200*	.932	11	.436
	High group	.229	9	.192	.906	9	.289

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

In table 3, it is shown that the Sig value. more than 0.05 then the hypothesis H0 is accepted, so it can be concluded that the data is normally distributed.

Table 4. Results of the N-Gain Score Data Homogeneity Test

Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
NGain_Persen	Based on Mean	3.570	2	29	.041
	Based on Median	3.242	2	29	.054
	Based on Median and with adjusted df	3.242	2	24.986	.056
	Based on trimmed mean	3.544	2	29	.042

In table 4, the Sig value is shown is 0.041 less than 0.05, then the hypothesis H0 is rejected, so it can be concluded that the data is not homogeneous. After fulfilling the prerequisite test, namely normal distribution of data, and to support the analysis results of the N-gain score test, a One-Way Anova test was carried out to analyze whether there was a difference in the average score of the increase in the pre-test and post-test numeracy ability scores of the three groups based on the level of learning readiness of low group,

middle group, and high group. The results of the One-Way Anova test carried out are as follows.

Table 5. One-Way Anova test results

ANOVA

NGain_Persen

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5922.143	2	2961.071	6.897	.004
Within Groups	12450.521	29	429.328		
Total	18372.664	31			

In table 5. there is a Sig value. 0.004 is less than 0.05, which means that H0 is rejected, so it can be concluded that there is a significant difference in average values. To identify more specific differences and the homogeneity test results show that the variants are not homogeneous or uniform, the data analysis will be continued with a Post-Hoc Test using the Games-Howell test method. The results of the Games-Howell test carried out are as follows.

Table 6. Games-Howell test results.

Multiple Comparisons

Dependent Variable:
NGain_PersenGames-Howell

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Low Group	Middle Group	-18.00514	9.29889	.158	-41.8085	5.7982
	High Group	-33.66870*	9.26821	.006	-57.4659	-9.8715
Middle Group	Low Group	18.00514	9.29889	.158	-5.7982	41.8085
	High Group	-15.66355	6.52178	.067	-32.3223	.9952
High Group	Low Group	33.66870*	9.26821	.006	9.8715	57.4659
	Middle Group	15.66355	6.52178	.067	-.9952	32.3223

*.The mean difference is significant at the 0.05 level.

In table 6, the results of the post-hoc test show that a significant difference was only found between the high group and the low group of 33.66870, this has an asterisk (*) in the mean difference (I-J). This shows that although there was an increase in all groups, the increase experienced by the high group and the low group was significantly different.

However, the increase between the middle group and other groups did not show a significant difference.

The results of the One-Way Anova test showed that there was a significant difference in the pretest-posttest improvement scores after being given treatment. There is a significant difference in pretest-posttest improvement scores between the high group and the low group, amounting to 33.66870. This is because students with low learning readiness start with an initial condition that is far behind when compared to the high group so that students in the low group need more time to understand, analyze and understand numeracy questions. So, on average, students are not successful in solving the questions completely, precisely in the 3rd indicator. This can happen because students face obstacles when asked to understand data presented in graphical form, so students have difficulty determining a solution strategy. to solve problems.

The results of this research are in accordance with the results of research conducted by Ate & Lede (2022) that students have difficulty understanding data and choosing strategies to use in making decisions. This finding is also similar to research findings examined by Wiganti Trinil (2020) which shows that students with low abilities require a lot of time and face difficulties in solving questions related to aspects of mathematizing, representation, and reasoning and argument. Based on the N- Gain Score, the average student experienced an increase in pretest and posttest results after being given process differentiation-based learning. These findings are in line with the results of research conducted by Septyana, E., et al., (2023) which concluded that mathematics learning outcomes can be improved with differentiated learning strategies.

Apart from that, the results of the research that has been carried out show that the application of the TPS learning model is effective in improving students' numeracy skills. The results of this research are in line with the results of research conducted by Meinalufi, Y., et al., (2021) which indicates that mathematics learning achievement can increase when taught using the TPS model by 35.5% compared to using the conventional learning model.

Conclusion and Suggestion

From the results of this study, it can be concluded that there are differences in scores for increasing numeracy abilities in the low group, middle group and high group before and after treatment. This is based on the results of the one-way anova test analysis from N-Gain score data for the pretest and posttest values of the three groups which shows

that the Sig. equal to 0.004 < 0.05, then H0 is rejected, so it can be concluded that there is a significant difference in the average improvement scores of the three groups.

To improve optimal numeracy skills, teachers need to apply differentiated learning more often so that each student can achieve increased learning outcomes in accordance with their abilities and potential and give students practice on numeracy questions more often so that students are used to and able to understand the questions well and are able to solve problems appropriately.

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