# Effect Of Tps Strategy With Portfolio Assessment And Learning Interest On Mathematical Learning Achievement

**Muhammad Noor Kholid, Riska Lail Agustin, Lingga Nico Pradana**

**Abstract**:Education is one of the human needs that must be fulfilled. In this globalization era, processes in the advancement of education can be interpreted as a measure of educational success. This study aims to analyze: (1) the effect of TPS (Think Pair Share) learning strategies based on portfolio assessment, TPS and expository on mathematics learning outcomes, (2) the effect of the level of interest in learners' learning on mathematics learning outcomes, (3) interaction between TPS learning strategies based on portfolio assessment, TPS and expository learning strategies and interest in learning about mathematics learning outcomes. This research is a quantitative with a quasi-experimental design. The population were all 7th grade in IT Junior High School (SMP IT) of Nur Hasan Boyolali Central Java Indonesia. The sampling technique used cluster random sampling. Data collected by some methods such as documentation, questionnaires, and test results. The data analysis technique uses two-way variance analysis with unequal cells. The results of the analysis with a significance level of 0.05 indicate that: (1) there are differences in the effect of TPS learning strategies based on portfolio valuation, TPS, and Expository on mathematics learning outcomes, (2) there is an influence on learner's level of interest in learning Mathematics learning outcomes, (3) there is no interaction between the three learning strategies with the level of interest in learner's learning towards mathematics learning outcomes.

**Index Terms**— think pair share, portopolio assessment,learning interest,mathematical learning achievement,

## 1 INTRODUCTION

Education is one of the human needs that must be fulfilled. Education is a minimum standard that must be fulfilled in the implementation of education in the world [1]. In the human life, education is very important. In this globalization era, processes in the advancement of education can be interpreted as a measure of educational success. Education has several components that support the success of education including learners, teachers and principals [2]. With these three components education will run properly. With the development of the educational age requires innovation to be able to compete in maintaining the quality of education itself [3]. Education is inseparable from everyday life as well as mathematics. The role of mathematics is very important for life to be one of the determinations in achieving the success of learners' learning. Mathematics learning outcomes are statements that describe the learners about the character they have, the skills they have and the abilities they have to apply after graduation [4]. Mathematics also a basic knowledge learned from basic education to tertiary level. In other words, mathematics plays an important role in the learning process [5] and the source of other knowledge is mathematics [6]. Therefore mathematics education not only finds results but has its own process compared to other subjects. Improving the quality of education can be seen from how high the learning outcomes of learners are. If you look at the quality of education in Indonesia compared to other countries, Indonesia is a country that has a low educational potential, especially in mathematics education. This can be seen in the Program for International Learner Assessment (PISA).


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PISA is an assessment conducted at the world level that aims to examine learner academics and to compare the achievements of children throughout the world. The results of the PISA showed that Indonesian mathematics scores are below from the average of 409 from several Asian countries. The survey conducted for 3 years by taking 15-year-old learners. The survey results put Indonesia in the last rank in Southeast Asia. In addition, Indonesia seated in 69th out of 72 countries worldwide. The quality of education that tends to be low is also experienced by learners at IT Junior High School Nur Hasan Senting Boyolali – Central Java - Indonesia. This can be seen from the learning outcomes of 7th grade learners in year 2018/2019. There were 25% of learners not fulfilling the Minimum Completion Criteria (KKM) that had been determined. The 2013 curriculum requires learners to make observations, reason and ask questions about the material presented. In other words, the 2013 curriculum requires learners to be active in learning and teachers as facilitators. This has not been done well because teachers and learners have not been able to apply it to the fullest. The results of observations at such school showed that the teacher still used the traditional learning method called expository. So that the teacher becomes the center of attention of the learners and it causes learners getting bored and make them lack of focus during learning. The situation illustrated that the teacher has tried to do a question and answer session with learners to restore their learning focus but learners pay less attention. In the learning process there must be achievements. There are several indicators of achievement, one of which is that learners are able to complete a variety of tests that can increase the value and understanding of learners in the learning. To improve learners' understanding in mathematics learning there needs to be a learning strategy that is in accordance with the conditions of the learners. One alternative to support learners' understanding is by applying the TPS strategy or commonly called thinking in pairs [7]. TPS is one effective method because learners become the center in the learning process and learners required to be active [7]. The implementation of the TPS strategy can create a fun learning environment where learners discussing, exchange of ideas and then grow a spirit of cooperation so that problem given can be

addressed easily [8]. The learning process by using TPS application can improve learners' understanding and can improve learning outcomes. According to Slavin, each learning strategy must have advantages and disadvantages, the TPS strategy has the following advantages: a) improve the thinking power of learners, b) the time given is long enough to make learners longer to think, c) facilitate learners in the learning process because learners help each other in solving problems, and d) teacher supervision of groups is easier and more comprehensive because it only consists of two people [9,10]. In addition, to support the success of learners in that school we need an assessment model to be applied. Appropriate assessment models for existing problems, namely portfolio valuation models [11]. With the assessment of portfolios of active learners in carrying out the task, learners will not be depressed by the task because the assessment of this portfolio can collaborate with other learners so that it will lead to interaction between learners. Slavin said that learning strategies require the incorporation of other methods so that learning strategies can get maximum results [10]. Slavin also explained that in the process of learning mathematics learners are required to solve problems and can apply them in daily life [10,12]. In other words, learners are required to be active in the learning process and not dependent on a teacher. This makes the teacher need the right learning strategy so that learners can receive learning well. Regarding the results of learning, interest in learning influences a learner to do a thing. In other words, interest affects learners in getting good learning outcomes. One that determines the success of learners in learning and other activities is the interest in learning of the learners themselves [13]. Kate explained that the interest take a part in encouraging learners to learn consciously and according to their will [12]. Therefore the interest in learning of learners is very important for improving the learning outcomes of learners themselves.

## 2 Research Methods

The type of research that will be carried out in this study uses a quantitative approach. The research design was in the form of quasi-experiential research. The quasi experiential design was a development from experimental with quasi-experiential design that included a control class, although in reality it could not control other variables that influenced experimental research. In this study, there is a dependent variable that is the mathematics learning outcomes (symbolized by "Y") whose data is interval. As well as independent variables , namely portfolio-based TPS learning strategy (symbolized by X1.1), TPS learning strategy (symbolized by X1.2), and Expository learning strategy (symbolized by X1.3) whose data is nominal and the learning interest of learners (symbolized by X2) whose data interval is changed to nominal. For the implementation of this study, researchers used 4 classes, namely class I for experiments on learners with TPS strategy treatment based on assessment of portfolio, class II with treatment of learners using TPS strategies, and class III as a control class with treatment of participants learners use expository strategies. Whereas class IV as a trial class of questionnaire interest in learning. Before the implementation of this study, researchers tested the initial abilities of learners in the experimental class I, experiment II and control class using one-way variance analysis with unequal cells. For the end of this study, researchers tested the three experimental classes with the same instrument to find out and measure the mathematics learning outcomes obtained by learners. Then the mathematics learning outcomes obtained by the learners were analyzed using a two-way-variance analysis of variance with the same cell to find out the differences that get each class with different learning strategies.

## 3 Results

The results of this study will be presented with relevance to several previous studies. After the prerequisite test is fulfilled, an analysis test is carried out. The analysis of the test was carried out by a two-way-variance analysis with the different cell by 5% significance level. The calculation result presented by

***Table 1.***

**Table 1.**Summary of Two-Way-Variance Analysis with Different Cell

| Source | JK | dK | RK | $F_{obs}$ | $F_{table}$ | Decision |
|---|---|---|---|---|---|---|
| Learning Strategy (A) | 1298.20 | 2 | 649.10 | 6.60 | 3.12 | $H_0$ is rejected |
| Interest in Learning (B) | 20805.92 | 2 | 10402.96 | 105.83 | 3.12 | $H_0$ is rejected |
| Interaction (AB) | 655.57 | 4 | 163.89 | 1,67 | 2.50 | $H_0$ is accepted |
| Error (G) | 6880.33 | 70 | 98.29 | | | |
| Total (T) | 29640.03 | 78 | | | | |

Based on the calculation results in Table 1 it can be concluded that the test between lines (A) obtained Fobs = 6.60 > Ftable = 3.12 means that H0 is rejected. This shows that there is an effect of using TPS learning strategies based on portfolio, TPS, and Expository on mathematics learning outcomes. Furthermore, the inter-column test (B) obtained $F_{obs}$ = 105.83 > $F_{table}$ = 3.12 means that H0 is rejected. This shows that there is an influence of the level of interest in learning on the learning outcomes of mathematics. In interaction tests (AB) acquired $F_{obs}$ =1.67 < $F_{table}$ = 2.50 means H0 accepted. This shows that there is no interaction between learning strategies and interest in learning towards mathematics learning outcomes. Based on the results of the two-way cell analysis of variance, it was found that $H_{0A}$ and $H_{0B}$ were rejected. Therefore, further testing is needed. The further test used in this study aims to determine the mean differences between rows and columns. Because there are three categories of learning strategies, it is necessary to do a comparative test between lines to find out which learning strategies are better. The results of the comparative test between lines are presented in the

***Table 2.***

**Table 2** Summary of Inter-Line Mean Comparison Tests

| $H_0$ | $F_{OBS}$ | $F_{table}$ | Decision |
|---|---|---|---|
| $\mu_{TPS+Porto} = \mu_{TPS}$ | 2.52 | 6.25 | accepted |
| $\mu_{TPS+Porto} = \mu_{Expo}$ | 5.55 | 6.25 | rejected |
| $\mu_{TPS} = \mu_{Expo}$ | 0.71 | 6.25 | rejected |

Based on Table 2 can be concluded that: in the first comparison obtained by $F_{TPS + Porto-TPS}$ = 2.52 < $F_{table}$ = 6.25 so that it can be concluded that H0 is received. This means that there is no influence of TPS-based learning strategy use of portofolio assessment and strategy TPS to mathematics learning outcomes. While in the second comparison obtained $F_{TPS+Porto-Expo}$ = 5.55 > $F_{table}$ = 6.25 so that it can be concluded that H0 is rejected. This means that there is the influence of the use of TPS learning strategies based on portofolio

assessment and expository learning strategies on mathematics learning outcomes. Also in the third comparison obtained $F_{TPS\text{-}Expo}$ = 0.71 > $F_{table}$ = 6.25 so that it can be concluded that $H_0$ is rejected. This means that there is influence of the use of expository and TPS learning strategies toward mathematics learning outcomes. Because there are three categories of interest in learning (high/H, medium/M, and low/L), it is necessary to do a comparison test between columns to determine which level of interest in learning is better. The calculation presented in

***Table 3.***

**Table 3.**Summary of the Comparison Tests among Two Columns

| $H_0$ | $F_{obs}$ | $F_{table}$ | Decision |
|---|---|---|---|
| $\mu_H = \mu_M$ | 28.43 | 6,25 | Rejected |
| $\mu_H = \mu_L$ | 51.92 | 6,25 | Rejected |
| $\mu_M = \mu_L$ | 12.87 | 6,25 | Rejected |

Conclusions obtained from the results of multiple comparisons between the columns above are as follows. In the first comparison obtained $F_{HM}$ = 28.43 > $F_{table}$ = 6.25 so that it can be concluded that $H_0$ is rejected. This means that there are influences of learners who have a high level of interest in learning and learners who have a moderate level of interest in learning towards the mathematics learning outcomes. Later in the second comparison obtained $F_{HL}$ = 51.92 > $F_{table}$ = 6.25 so that it can be concluded that H0 is rejected. This means that there are influences of learners who have a high level of interest in learning and learners who have a low level of interest in learning about mathematics learning outcomes. While In the third comparison obtained $F_{ML}$ = 12.87 > $F_{table}$ = 6.25 so that it can be concluded that H0 is rejected. This means that there are influences of learners who have a moderate level of interest in learning and learners who have a low level of interest in learning about mathematics learning outcomes. Before discussing further, the researcher presents a summary of mean between cells and marginal averages in

***Table 4.***

**Table 4.**Inter-Cell Average and Marginal Average Summary

| Learning strategies | Interest to learn | | | Marginal mean |
|---|---|---|---|---|
| | High | Middle | Low | |
| TPS + Portfolio | 95 | 75 | 55 | 75 |
| TPS | 83 | 68.94 | 60 | 70,64 |
| Expository | 79.16 | 63.84 | 62.14 | 68.38 |
| Marginal mean | 8572 | 69.26 | 59.04 | |

In the first comparison $H_0$ is accepted. This means that there is no effect of TPS learning strategies based on Portfolio Assessment and TPS learning strategies on mathematics learning outcomes. So it can be concluded that the TPS-based portfolio assessment learning strategy has the same effect as the TPS learning strategy. In the second and third comparative $H_0$ is rejected. This means that there is an influence of learning strategies TPS based on portfolio assessment, TPS and Expository on mathematics learning outcomes. To find out a better learning strategy, it is enough to compare the marginal mean. A better learning model is a higher average learning model. The marginal mean of the TPS learning model based on portfolio assessment was 75 more than the marginal mean of TPS learning strategy of 70.64 and the marginal mean of the Expository learning strategy was 62.38. So it can be concluded that the TPS-based learning model portfolio assessment is better than TPS and Expository learning strategies.The following is the work of learners which shows that the TPS based portfolio assessment learning strategy has different effects from Expository. Before discussing further, the researcher presents Figure 1 and Figure 2 as follows. The size of <POQ = 72 o and the length of radius OP = 20 cm. Calculate the arc length of PQ and the area of POQ!

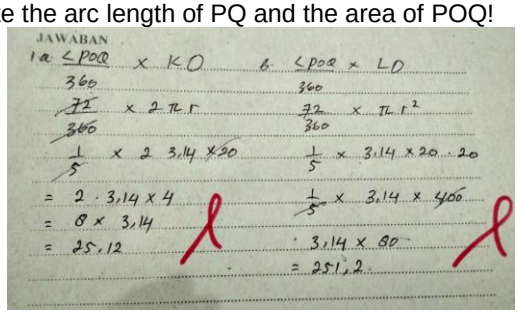


***Figure 1.*** *The Answer of Student Treated with TPS Based Portofolio Assessment*

Likewise with the research conducted by Schaefer et.al. which provides a conclusion that there is a difference in influence between portfolio learning models and cooperative think pair share (TPS) in increasing mathematics learning achievement [14]. In addition, TPS learning strategies can help learners improve and understand math lessons and encourage learners to be better in one direction in their interest in learning.

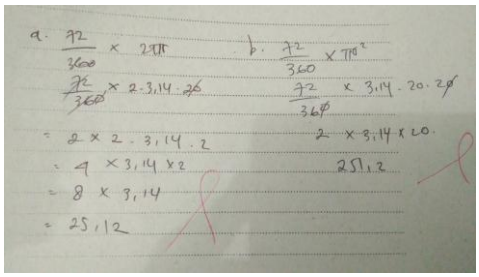


***Figure 2.*** *The Answer of Student Treated with Expository*

The results of this study are supported by the conditions of the learners in the field when the learning process takes place by using TPS strategies based on portfolio assessment on circle material. Learners learn more about the material taught and active in discussions. The use of the TPS learning strategy implemented is also effective and learners are active in discussing. Whereas at the moment the Expository learning strategy is less effective because some smarter learners are more focused on paying attention than learners who are less focused. Based on the description above, it can be concluded that the TPS-based learning strategy Portfolio and TPS assessment is better than the Expository learning strategy because learners can work together in understanding the material and helping people to be active in learning. Based on Table 3 the results of the average comparative test between columns are obtained that, (1) there is an influence of learning mathematics between learners who have a high level of interest in learning and learners who have a moderate level of interest in learning , (2) there are influences between mathematics learning outcomes learners who have a high

level of interest in learning and learnerswho have a low level of interest in learning, (3) there are effects of mathematics learning outcomes between learners who have a moderate level of interest in learning and learners who have a low interest in learning . This condition is supported in the field that learners with a high interest in learning can understand the material being taught. While learners who are interested in learning have the need for a long time to understand the material being taught, while learners who have low interest in learning tend to be old to understand the material being taught. So that learners with high learning interest are better than learners who have moderate and low learning interest because learners who have a high interest in learning tend to receive material faster than moderate and low learning interests.This was also concluded by Bamiro et.al that with increasing interest in learning learners can improve learner learning outcomes as well [7]. It was suggested that the learning had a positive effect on learner learning outcomes and with the interest in learning to make learners more enthusiastic in learning [8,14]. Based on the results of the two-way cell variance analysis not the same as the 5% significance level obtained FAB = 1.66 < F table = 2.50 then H 0AB accepted. This means that there is no interaction between learning strategies and interest in learning towards mathematics learning outcomes. This shows that in each TPS learning strategy based on portfolio assessment, TPS learning strategies, and Expository learning strategies, mathematics learning outcomes with a high level of interest in learning are better than learners with moderate and low levels of learning interest, as well as learners with levels interest in learning is better than learners with low interest in learning. In the category of high, medium and low learning interest, TPS learning strategies based on portfolio valuation apply as well as TPS learning strategies while TPS learning strategies based on portfolio assessment and TPS learning strategies are better than expository learning. Strategy learning and interest in learning shows that there is no interaction between learning strategy and the level of interest of learners towards learning outcomes due to several factors, both internal and external factors. Internal factors such as individual physical, psychological and maturity [9,13]. While external factors such as family, school and community factors These factors both separately and together give a certain influence on the learning outcomes achieved by learners [13,15]. In addition, due to the limited time of the study so that researchers cannot reach various factors that influence the learning outcomes of mathematics.

## 5 Conclusion

Based on the results of the analysis and discussion, it can be concluded as follows. There are differences in the effect of TPS learning strategies based on portfolio assessment, TPS learning strategies, and expository learning strategies on mathematics learning outcomes . TPS-based learning strategy Portfolio assessment is as good as TPS. While the TPS-based learning strategy Portfolio assessment is better than expository and TPS is better than expository. There are differences in the influence of the level of learning interest of the learners on the learning outcomes of mathematics. It was concluded that the learning outcomes of learners with a high level of interest in learning were better than the interests of moderate learning and interest in learning was low, while the level of interest in learning learners was better than the interest in learning is low. There is no interaction between learning strategies and the level of interest in learning towards mathematics learning outcomes. This shows that in each learning strategy based TPS learning strategy Portfolio assessment, TPS learning strategies, and Expository learning strategies, learning outcomes of learners the level of interest in learning is better interest in moderate learning and low learning interest, while the level of learning interest in learners being better than low interest in learning. In the category of high, medium and low level of interest in learning, learning strategies based on TPS learning strategies apply. Portfolio assessment is as good as TPS. While the TPS-based learning strategy Portfolio assessment is better than expectations and TPS is better than expository.

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