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Evaluation of E-Module Assisted Tai Cooperative Learning Model in Improving Student's Mathematics Literature

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Abstract

The purpose of this study was to evaluate, identify and categorize the level of mathematical literacy of class VII students at MTs Husnul Khotimah 2 Kuningan before and after the implementation of the Team Assisted Individualization (TAI) learning model assisted by e-modules. This research method is quantitative with One Group Pretest-Posttest design. The data collection technique used a mathematical literacy test for pretest and posttest with number content. While the data analysis technique used the average difference test (Paired Sample T-Test) and the Gain test. The results showed that based on the results of the average difference test, there were differences in scores before and after the application of the Team Assisted Individualization (TAI) model with the help of e-modules and the application of the TAI model could also improve mathematical literacy with an average score of each before and after the application of the model is 47.07 and 70.33 with categorization of improvement based on the Gain test after the application of the TAI model assisted by e-modules, namely 7 students of low improvement, 18 students of moderate improvement, and 5 students of high improvement and the average increase of students after the application of the model TAI assisted by e-module is 0.481 and is included in the moderate criteria. Thus, one way to improve students' mathematical literacy is to use the TAI learning model.

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INTRODUCTION

Indonesia as a large nation must be able to develop a literacy culture as a prerequisite for skills in the 21st century. The main gate to develop the nation's literacy culture is the provision of reading materials to increase reading interest. Literacy in this case is not just a nation free from illiteracy, but further than that, how the nation has the life skills to compete and co-exist with other nations in creating world welfare. In other words, a nation with high literacy shows the nation's ability to collaborate, think creatively, critically and communicatively, then it can win competition in the global era.

Literacy is not just reading, because literacy itself consists of several types, including: literacy, scientific literacy, cultural literacy, and others. From the various types of literacy, there is mathematical literacy that may still be unfamiliar. Mathematical literacy is different from the mathematics curriculum in schools. However, the assessment cannot be separated from the existing curriculum and teaching, because students' knowledge and abilities depend on what and how students learn at school and how that learning is evaluated.

The demands in improving students' abilities in mathematics are not only in their numeracy skills, but also emphasize logical and critical reasoning abilities as well as problem solving. Solving this problem is not only in the form of routine practice questions, but rather problems that exist in everyday life. This is where the importance of mathematical literacy, because according to Masjaya and Wardono (2018) that someone who is literate in mathematics does not only understand mathematics, but is also able to use it in solving problems in their daily lives. According to Astuti (2018), Yusupova and Skudareva (2020) mathematical literacy is the ability of each individual to formulate, apply and interpret mathematics into various contexts such as reasoning mathematically and using concepts, procedures and facts as illustrations to explain or predict an event. Some of the competencies developed in mathematical literacy include problem-solving skills, decision-making abilities, reasoning abilities, the ability to interpret information, and the ability to use technology and apply it. Correspondingly, Haara et al., (2017), Sari and Wijaya (2017) explained that someone who is literate in mathematics not only understands mathematical problems but can also think logically and critically in solving problems in daily life.

Based on the definition of mathematical literacy above, there are three important things that are the subject of the concept of mathematical literacy. These three things are: (1) the ability to formulate, apply, and interpret mathematics into various contexts; (2) the involvement of mathematical reasoning and the use of mathematical concepts, procedures, facts, and figures to describe, explain, and predict an event; and (3) the benefits of mathematical literacy, namely helping someone to think logically and critically in applying mathematics to everyday problems.

The solution in improving students' mathematical literacy is to carry out appropriate, effective and fun learning innovations for students. Cooperative learning model is one of the learning models that can improve students' mathematical literacy. There are many types of cooperative learning models, that is the Team Assisted Individualization (TAI) model. According to Tabrani et al., (2018), Hwang and Chan (2020) the TAI learning model is a cooperative learning model that trains students to think critically, creatively, and effectively. TAI designs a group learning by dividing students into study groups and being responsible for regular arrangements and checking, helping each other in solving math problems and encouraging each other to excel. Meanwhile, according to Wulandari et al., (2020) the TAI learning model aims to improve abilities, knowledge, and minimize ineffective individual teaching. The essence of TAI is to

adapt teaching to individual differences in relation to students' abilities and achievements. The TAI learning model is intended to overcome the problems of individual student learning difficulties.

Essential thing in learning good mathematics is learning that can achieve learning objectives, in achieving learning objectives can be assisted by technology as a learning medium which is expected to optimize learning materials in achieving their goals and creating online learning. Therefore, it is necessary to have electronic teaching materials that can improve students' mathematical literacy. This is in accordance with the TAI learning model suggested by Marsaulina et al., (2019), there is the TAI learning model must be facilitated with the help of learning media in the form of teaching materials or other media, then learning seems more interesting and makes students more active.

One way to answer students' mathematical literacy problems and utilize technology and create student learning motivation is to use e-module teaching materials. According to Rahayu and Sukardi (2020), e-module is a learning tool that contains material, methods, limitations, ways of evaluating and assessing that are designed in an orderly and attractive manner to achieve competence according to the level of complexity electronically. Agreed with Utami (2018) and Lin et al., (2017) that the e-module learning media is able to and improve students' basic skills, Miftakhudin et al., (2019) and El-Sabagh (2021) said that e-modules can make it easier for students to learn because students can find mathematical concepts in different ways. In addition, the use of a scientific approach in the revised 2013 curriculum helps students in developing their attitudes, skills, and knowledge. Therefore, the use of e-modules must be supported by appropriate technology so that learning objectives can be achieved.

The learning process in the TAI model assisted by e-modules begins with the division of groups based on the results of the pretest, where the division of groups is heterogeneous consisting of 4-5 students in which there is one student who is superior (clever). TAI learning activities assisted by e-modules are (1) each group is notified to access e-modules that are used as individual and group learning resources; (2) each group is given a problem sheet in the e-module; (3) in doing the task, each group is required to create a situation where individual success is determined or influenced by the group's success; (4) students discuss with their group members, where each student will share and exchange answers with the help of smart students and the teacher only helps students individually for those in need; (5) The results of group work are uploaded via e-modules to be assessed and the teacher will give awards to groups that excel or successfully complete the task well; (6) The teacher gives the material briefly and continues by giving individual tests to students via e-modules; and (7) learning activities end with giving a summary. Based on the results of the discussion, students will find out how students solve the problems, the solutions used, and the difficulties experienced by students in working on the questions. These activities aim to familiarize students with learning individually or in groups to discuss and work on mathematical literacy tasks as given. At the end of the meeting, there will be a posttest of mathematical literacy to find out how much the increase in mathematical literacy of each student is and whether the results are different from the results of the mathematical literacy pretest.

From the problems explained above, this study will evaluate between the Team Assisted Individualization (TAI) learning model and e-modules to improve students' mathematical literacy.

METHODS

This type of research was a quantitative research using the One Group Pretest-Posttest design. This research was conducted at MTs

Husnul Khotimah 2 Kuningan with the research sample used was Class VII C, totaling 30 students. The data collection technique in this study was to use a mathematical literacy test at the pretest and posttest whose assessments included 7 basic mathematical literacy skills. According to Mahiuddin et al. (2019), the categorization of students' mathematical literacy here in Table 1.

Table 1. Categories of Mathematical Literacy

Mathematical Literacy Score Range	Category
Score < 60	Low
60 ≤ Score < 80	Middle
Score ≥ 80	High

Before implementing TAI learning model assisted by e-modules, students were given a pretest to determine the initial ability of students' mathematical literacy. Next will be given treatment in the form of a TAI learning model assisted by e-modules in four meetings to improve students' mathematical literacy and find out whether there was an increase in students' mathematical literacy after being given a posttest at the end of the meeting. The material in this study was taken from one of the content of mathematical literacy based on the PISA 2021 framework in the OECD (2018), that was numbers. Furthermore, several tests will be carried out, including:

Normality Test

This test aims to determine the data of the initial and final state of the sample is normally distributed or not. The hypothesis to be tested below.

H_0 : The pre-test/post-test data of mathematical literacy were normally distributed.

H_1 : Literacy pre-test/post-test data were not normally distributed.

By using SPSS 23, the test criteria can use a significance level of 5%. Acceptance if *sig* > 5% meant literacy data *pre-test/pos-test* literasi comes from a normally distributed population (Sukestiyarno, 2020).

Homogenity Test

This test aims to determine the variance of the pre-test and posttest data of homogeneous or heterogeneous mathematical literacy. The hypothesis to be tested.

H_0: $\sigma_1^2 = \sigma_2^2$ (The vbelowariance of the mathematical literacy pre-test and posttest data was the same after the e-module assisted TAI model was carried out).

H_1 : $\sigma_1^2 \neq \sigma_2^2$ (The variance of the mathematical literacy pret-est and post-test data is not the same after the e-module assisted TAI model is carried out).

This study tested homogeneity with the Levene Test using the SPSS 23 program. The hypothesis testing criteria, namely H0 was accepted if sig > 5%, meaning that the variance of the data group was homogeneous (Sukestiyarno, 2020).

Different Average Test

This test is used to determine the difference in the average mathematical literacy of students on the results of the pretest and posttest. The hypothesis used below.

H_0 : $\mu_1 = \mu_2$ (There is no significant difference related to the average pre-test and post-test scores of students' mathematical literacy before and after using the TAI model assisted by e-modules).

H_1 : $\mu_1 \neq \mu_2$ (There are significant differences related to the average pre-test and post-test scores of students' mathematical literacy before and after using the TAI model assisted by e-modules).

This study tested the average difference with the Paired Sample T-Test using the SPSS 23 program. The hypothesis testing criteria, there was H0 is accepted if sig > 5%, meaning that the variance of the data group is homogeneous (Sukestiyarno, 2020).

Gain Test

This test was conducted to determine the extent to which the increase in mathematical literacy before and after learning. According to Hake as written in

Solikha et al. (2020) the normalized gain can be calculated by the following formula.

$$g = \frac{\text{Pottest score} - \text{Pretest score}}{\text{Ideal max score} - \text{Pretest score}}$$

The gain index criteria according to Hake can be seen in Table 2 below.

Table 2. Gain Index Criteria

Indeks Gain	Criteria
$g \geq 0.7$	High
$0.3 \leq g < 0.7$	Middle
$g < 0.3$	Low

RESULTS AND DISCUSSION

Pre-test and post-test data on mathematical literacy, before and after the application of the e-module-assisted Team Assisted Individualization (TAI) learning model on number content. The summary of the data from the pretest and posttest results of mathematical literacy was presented in Table 3.

Table 3. Data of Pretest and Posttest Results of Mathematical Literacy

Aspect	Pre-test Data	Posttest Data
Average score	47.07	70.33
Maximum score	76	100
Minimum score	21	42
Variance	271.65	285.75
Standard deviation	16.48	16.90

The categorization of students' mathematical literacy at pre-test and post-test is below in Table 4.

Table 4. Categories of Mathematical Literacy

Category	Pre-test	Post-test
Low	22	8
Midlle	8	13
High	0	9

Then the prerequisite tests were carried out including the normality test using the Kolmogorov-Smirnov test and the homogeneity test using the Levene's Test with the help of SPSS 23. The results of the analysis prerequisite test were presented below.

Normality Test

The results of normality testing using SPSS 23 are presented in Table 5.

Table 5. Result Normality Test

Data	Sig	Remark
Pre-test	0.170	Normal
Post-test	0.200	Normal

From Table 5 it can be seen that the significance value for the normality of the pretest and posttest data is > 5% then it is stated H_o accepted. This showed that the pre-test and post-test data of mathematical literacy were normally distributed.

Homogenity Test

The results of the data homogeneity test using SPSS 23 are presented in Table 6.

Table 6. Result Homogenity Test

		Levene's Test for Equality Variances Significance
Data Posttest	Pretest-	0.880

From Table 6 it can be seen that the significance value for homogeneity is 0.880 = 88% > 5% then it is stated H_o accepted. This showed that the variance of the mathematical literacy pre-test data was the same as the mathematical literacy post-test data variance after learning with the e-module assisted Team Assisted Individualization (TAI) model.

Next, hypothesis testing was carried out including the average difference test using the Paired Sample T-Test test with the help of SPSS 23 and the Gain test categorizing the increase in students' mathematical literacy. The results of the analysis prerequisite test were presented below.

Average Different Test

This test was conducted to determine whether there was a difference in the average mathematical literacy and which one is better between the average mathematical literacy pretest and the posttest average mathematical literacy after learning with the Team Assisted Individualization (TAI) model assisted by e-modules. The results of the t-test calculations were presented in Table 7.

Tabel 7. Result different average test of mathematic literacy

		Sig.
Pair 1	pretest – posttest	0.000

The results of Sig. (2-tailed) = 0.000 then H_0 rejected and accepted H_1, it means that there was a significant difference related to the average pre-test and post-test scores of students' mathematical literacy before and after using the TAI model assisted by e-modules. Because based on Table 3, the average pre-test mathematical literacy = 47.07 < posttest average mathematical literacy = 70.33, the average mathematical literacy will be better if using the TAI learning model assisted by e-modules.

Gain Test

The normalized gain criterion is used to measure the increase in students' mathematical literacy using the e-module assisted Team Assisted Individualization (TAI) model. The average increase in students' mathematical literacy in classes with the Team Assisted Individualization (TAI) model assisted by e-modules is 0.481 and includes moderate criteria with details of the increase in each student presented in Table 8.

Table 8. Criteria for Improving Mathematical Literacy

Criteria	Total of Students	Percentage
Low	7	23.33
Middle	18	60
High	5	16.67

The research conducted at MTs Husnul Khotimah 2 Kuningan aimed to determine the improvement of students' mathematical literacy by applying the TAI learning model assisted by e-modules.

From this study, it was found that the average increase in students' mathematical literacy after the application of the TAI learning model assisted by e-modules was 0.481 and included the medium criteria. This was in accordance with research conducted by Lestari et al., (2019), Rajabalee and Santally (2021) which said that the TAI cooperative learning model can be used as an alternative learning to improve mathematical literacy. According to Octaviani et al., (2019), Novitasari and Mediatati (2021), online cooperative learning such as e-modules can improve learning outcomes and be more effective.

This research is also supported by previous research conducted by Neka (2018), Novalinda et al., (2020), Kwant et al., (2015) and Siregar et al., (2018) which explained that the e-module-assisted cooperative learning model can improve mathematics learning achievement, one of which is problem solving abilities which are included in the basic skills of mathematical literacy.

The increase in students' mathematical literacy was caused by several factors. One of them was by using the right cooperative learning model. TAI learning model that focuses on students, opens students' minds in solving math problems by discussing with other students. Technology-based learning also using e-modules can improve student understanding individually, because students can find out for themselves what information is needed in studying the material.

CONCLUSION

Based on the research results gained, it can be concluded that the application of the TAI model assisted by e-modules can improve mathematical literacy in number content in class VII MTs Husnul Khotimah 2 Kuningan.

This increase can be seen in the average score of students before the application of the e-module assisted TAI model (pre-test) which was 47.07 while the average value after the application of the e-module assisted TAI model (posttest) has increased to 70.33 with details 7 students of low improvement, 18 students of moderate improvement, and 5 students of high improvement and the average increase in students after the application of the TAI model assisted by e-modules was 0.481 and included in the medium criteria. Thus, the TAI model can improve students' mathematical literacy, both in the low, medium and high categories.

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