MEDIATION OF MOTIVATION AND ENVIRONMENT ON EFFECT OF TEACHERS TECHNOLOGY CAPABILITIES ON THE   MATHEMATICS TEACHERS PERFORMANCE IN INDUSTRIAL ERA

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Abstract. This study aims to describe the effect of the ability of mathematics teachers on teacher performance which is mediated by work motivation and work environment variables. This research was quantitative research with a correlational approach. The population was all mathematics teachers in Pekanbaru City. The sample was partly mathematics teachers who are taken by accidental technique. The accidental technique was chosen because during the COVID-19 pandemic it was not possible to collect data directly. Data retrieval is done only with a Google form and filled in by teachers who can use technology well. Sampling only distributed the instrument in the Google form to a group of elementary school teachers in Pekanbaru City. Data analysis using the path analysis approach. The results of the analysis show that there is a significant effect of technological ability on teacher performance in the Industrial Revolution 4.0 era through work motivation and the teacher's work environment. The results of the analysis are evidenced by a T-value greater than 1.96.
Keywords: Technology Capability, Teachers' Performance

1. INTRODUCTION

Activities use technology in this era both education, economics, and others field have to use technology. Somebody wants to do the meeting, they don't need a face-to-face meeting in the meeting room because they can use zoom meeting, Google Meet, or other support platforms. Somebody wants to shop, they can use the online shop and everything can be acquired and arrived at home. If teachers want to teach students, they can upload the teaching material in Google Classroom or other platforms and they don't teach their students in the classroom.

In the education field, Technology needs a special ability where teachers or students must be able to operate computers [3]–[5]. This ability needs time to learn because operating a computer is something difficult for done. Teachers and students usually use the computer for writing a report, writing an article, or filling out the assessment to students every semester. This problem becomes a big problem if teachers don't want to upgrade or improve themselves because the challenge in revolution industrial is very complex.

Teachers can follow the current development or answer the current challenge by improving their ability on technology. With the high technology, ability teachers can make something

excellent such as attractive learning media based on technology and other products for increasing the teaching quality [6]. Technology ability will make teachers solve their tasks whenever and wherever [7]. Therefore teachers must have big motivation and a good work environment for doing something the best in their lives because motivation and a good work environment will support teachers to success in adapting to the revolution industrial [8]–[10]. For this reason, the research about the effect of teacher technology capabilities on the mathematics teachers' performance in the industrial revolution era, motivation, and environment as mediation.

2. RESEARCH METHOD

This research was quantitative research with a correlational statistics approach. The population was the mathematics teachers at Pekanbaru City. The sample was part of mathematics teachers at Pekanbaru City. The sampling technique in this research was the accidental sampling technique. The accidental sampling technique was used in this research because the data collecting can't take direction. After all, Pekanbaru City is still in the red zone of the COVID-19 Pandemic. Data collection used a questionnaire that was converted into Google Form. Data collection in this research by disseminating to teachers mathematics group each school at Pekanbaru City. Data analysis in this research uses the path analysis approach because path analysis will show where significant variables affected directly or indirectly mathematics teachers' performance in the 4.0 industrial revolution.

3. FINDINGS AND DISCUSSION

Normality assumption was important to check so that all regulations to analyze data with path analysis were fulfilled. Normality Assumption can be seen in Table 1

Table 1. Normality Assumption

Variables	Z Skewness	Decision	Z-Kurtosis	Decision	Conclusion
Technology Capability	2.06	Normal Moderate	-1.29	Normal	Normal
Motivation	0.10	Normal	-2.12	Moderate	Normal
Environment	1.41	Normal	-1.54	Moderate	normal
Teachers Performance	-0.38	Normal	-1.61	Moderat	Normal

From Table 1, it can be concluded that four variables were normally based on Z Skewness and Z kurtosis analysis so that the normality assumption has been fulfilled. The next assumption test was multicollinearity that can be seen in Table 2.

Table 2. Multicolinierity Assumption

Variables	Technology_Ability	Motivation	Evnironment	Performance
Technology Ability	1	.869[**]	.796[**]	.853[**]
Motivation	.869[**]	1	.794[**]	.870[**]
Environment	.796[**]	.794[**]	1	.793[**]
Performance	.853[**]	.870[**]	.793[**]	1

From Table 2, correlation analysis showed that the correlation between every variable was not perfect. Gozali & Fuad (2008) stated that multicollinearity will be fulfilled if every variable had coefficient correlation was not perfect (0.9-1). Because the normality and multicollinearity tests have been met, the path analysis can be analyzed and interpreted. The path analysis results can be seen in Table 3.

Table 3. Direct Effect of Variable Endogenous to Exogenous

Variables	Standardized	T-Value	Conclusion
Technology Capability*Performance	0.22	5.07	Significant
Motivation*Performance	0.45	7.23	Significant
Environment*Performance	0.19	3.66	Significant
Technology Capability*Motivation	0.65	12.87	Significant
Technology Capability*Environment	0.80	20.07	Significant

Table 3 showed that there was a significant effect variable technology capability of teachers with teachers' performance at industrial revolution with T-value 5.07. There was a significant effect of variable motivation of teachers with teachers' performance at industrial revolution with T-value of 7.23. There was a significant effect variable environment with teachers' performance at industrial revolution with T-value of 3.66. There was a significant effect variable technology capability of teachers with motivation faced industrial revolution with T-value 12.87. There was a significant effect variable technology capability of teachers with the environment with a T-value of 20.07.

Table 4. Indirect Effect of Endogenous to Exogenous Variable

Variables	Standardized	Error	Conclusion
Technology Capability*Motivation*Performance	0.61	0.22	Significant
Technology Capability*Environment*Performance	0.47	0.37	Significant
Environment*Motivation*Performance	0.503	0.19	Significant

Table 4 showed the indirect effect of variable motivation and environment as mediation on variable technology capability with teachers' performance. The results showed that motivation and environment were significant mediation on technology capability with teachers' performance. The motivation was a significant mediation variable on the environment with teachers' performance.

The technology capability of teachers gave a significant effect on Teachers' Performance in industrial revolution 4.0. Technology capability will help the teachers to design the learning media to give the learning interest to students [2]. Teachers can do more for developing the learning media or instrument so that students can have a good experience in the classroom [12]. Teachers' motivation gives a significant effect on teachers' performance. Teachers' motivation will support teachers to do something the best for themselves and the institution. Teachers' motivation will direct the teachers to work with achievement goals [13]. Teachers' motivation will enable teachers to think about all contributions to their institution so that their institution to be the best in serving the students [10]. The learning environment gave a significant effect on teachers' performance in facing the industrial revolution 4.0. The learning environment was a condition where teachers and their friends in the office that affect teachers' performance. The best friend in the offices will advise, motivate and evaluate other teachers to do the best in their work

[12]. The work environment will support the teacher because psychologically the teacher will get peace with the work environment so that the teacher can work optimally.

4. CONCLUSIONS

Teachers' technology capability affected teachers' performance in facing the industrial revolution 4.0 with a T-value of 5.07. Teachers' motivation affected teachers' performance in facing the industrial revolution 4.0 with a T-value of 7.23. Environment affected teachers' performance in facing the industrial revolution 4.0 with a T-value of 3.66. Teachers' technology capability affected teachers' motivation with a T-value of 12.87. Teachers' technology capability affected teachers' motivation with a T-value of 20.07. Motivation and environment can be mediation significantly on effect teachers' capability on teachers' performance in facing the industrial revolution 4.0

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THE EFFECTIVENESS OF LEARNING MATHEMATICS AT ISLAMIC BOARDING SCHOOLS IN SIAK HULU DISTRICT DURING THE COVID-19 PANDEMIC

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Abstract. This study aims to describe quantitatively the learning of mathematics that was carried out online and offline at Islamic Boarding Schools in the Kampar Regency. This research is quantitative research with an ex-post fact approach. The population of this research was all students in Islamic boarding schools in Kampar Regency. The sample was students at al-Ikhsan boarding schools in the Siak Hulu sub-district, Kampar district. The data collection technique used is the documentation of student learning outcomes from offline and online mathematics learning. Data analysis used quantitative descriptive and T-test. The results of the analysis show that of the 27 students who take online or online learning, 78% of students pass minimum passing criteria with a score above 75. Of 27 students who take online learning, 61.71% pass the minimum passing criteria with a score of 75. The results of the t-test analysis show that there are differences in learning that were carried out online and offline where offline learning is more effective at al-Ikhsan Islamic Boarding School, Siak Hulu District.
Keywords: *Learning Effectiveness, Mathematics, COVID-19 Pandemics.*

1. INTRODUCTION

The effectiveness of education is determined by bad or good learning. Learning carried out in the classroom has a huge impact on the quality of education. The interactions that occur between students and teachers will shape students' personalities. Good learning will produce a good student personality, otherwise, bad learning will produce a bad student personality. Therefore, the government and every element of education must pay attention to learning by evaluating learning processes and outcomes

The environment or condition of the country determines learning quality. Now, Indonesia is one of the counties that get the pandemic covid-19 so the Indonesian government makes regulations a social distancing and this regulation for interaction between teachers and students too. This regulation forces every school in Indonesia must make a social distancing policy. Every school in Indonesia makes a learning alternative by using the learning online. Every school can use online tools or software to implement the teaching and learning process such as zoom meeting, google meet, google classroom, and others.

Islamic boarding schools at Kampar District use two models to implement the teaching and learning process namely online and offline learning. This policy is done by schools of Islamic boarding schools at Kampar District because some of students parents are afraid their children to schools on the other hand the parent are happy their children learn at schools because their children can focus on learning. This policy makes schools give a choice to parents for following the offline learning in the schools or online from their home. This condition makes it difficult for teachers in teaching students because teachers don't control students maximally so that students' abilities don't the same between students who get offline learning and online learning. Therefore, this research is very important to know the quality of the teaching and learning process between two conditions (offline and online teaching).

2. RESEARCH METHOD

This research was quantitative research with an ex post facto approach. The population in this research was students at Islamic boarding schools in the Kampar district while the sample was students at Al-Ihsan Boarding Schools at Siak Hulu City. The selection Al-Ihsan Boarding school became a sample in this research because Al-Ihsan Islamic Boarding Schools had uniqueness in classroom management during the COVID-19 pandemic era. The data collecting technique was documentation from the evaluation process of teaching and learning in the classroom in one semester. Data analysis used in this study was descriptive quantitative and t-test. The evaluation result of the teaching and learning process in the form score will be compared between online learning and offline learning. The score got from the evaluation will be checked who passes the maximal passing criteria and who does not.

3. RESULTS

Table 1. Descriptive of Evaluation Results That Passed The Maximal Passing Criteria

No	Online learning	Conclusion	Offline Learning	Conclusion
1	88	Pass	88	Pass
2	71	not pass	90	Pass
3	86	Pass	74	not pass
4	65	not pass	89	Pass
5	65	not pass	81	Pass
6	81	Pass	86	Pass
7	69	not pass	87	Pass
8	60	not pass	80	Pass
9	83	Pass	83	Pass
10	78	Pass	84	Pass
11	71	not pass	87	Pass
12	79	Pass	79	Pass

No	Online learning	Conclusion	Offline Learning	Conclusion
13	75	Pass	82	Pass
14	85	Pass	79	Pass
15	70	not pass	74	not pass
16	76	Pass	77	Pass
17	84	Pass	74	not pass
18	81	Pass	81	Pass
19	89	Pass	65	not pass
20	78	Pass	80	Pass
21	74	not pass	82	Pass
22	88	Pass	90	Pass
23	78	Pass	88	Pass
24	71	not pass	86	Pass
25	71	not pass	85	Pass
26	89	Pass	70	not pass
27	73	not pass	86	Pass

From Table 1, it can be concluded that there were39.28% of students didn't pass the minimum passing criteria limit namely 75. There were 17.85% of students who had offline learning who didn't pass the minimum passing criteria limit. From these results, it concluded that offline learning was more effective than online teaching using zoom meeting, google meets, and google classroom. T-test provided further information on whether there was a significant difference between online learning and offline learning. It can be seen in Tables 2 and 3.

Table 2. Descriptive of Online and Offline Score

Class		N	Mean	Std. Deviation	Std. Error Mean
Score	Online	27	76.9630	7.99751	1.53912
	Offline	27	81.7407	6.31599	1.21551

Table 2 explained that the average online learning score was 76.96 and the offline learning score was 81.74. From table 2 it is so clear that offline learning was better than online learning. Significant or no this difference can be seen in Table 3.

Table 3. Independent Sample T-Test

	F	Sig.	t	df	Sig. (2-tailed)
Equal variances assumed	2.32	0.134	-2.436	52	0.018
Equal variances not assumed			-2.436	49.349	0.018

From the table of Independent sample T-Test, it acquired the t value was -2.436 with a significant value was 0.018 (<0.05). From this result, it can be concluded that there was a significant difference between offline learning and online learning. Table 3 showed there was a negative t value. This means offline learning in the classroom in one semester was better than online learning that used an online software platform.

4. DISCUSSION

Results analysis showed that there was a significant difference in the learning and teaching process between two policy were made by schools namely; offline learning in the classroom and online learning using the online software platform (Google Meet, Zoom Meeting, and Google Classroom). Offline learning was better than online learning because teachers can effectively control the teaching and learning process in the classroom. Teachers' control will help students to focus and be serious in learning [1], [2]. Offline learning in the classroom makes an interesting interaction between teachers and students where students can motivate students directly. Teachers can support students who have problems or broken homes [3]. Teachers and students can work together to make an effective relationship where teachers and students shared their experiences so that this relationship will increase students' interest and motivation in learning [4]. Teachers and students can build effective communication in the classroom so that all of the problems about teaching and learning can be overcome [5]. Offline learning gave the best learning result than online learning at COVID-19 Pandemic Era.

5. CONCLUSION

There was a significant difference between offline learning and online learning. Offline learning gave a better impact on the learning results because the teachers can give direct instruction to students if there were students who didn't understand the topic of mathematics. Students can ask teachers if found some difficulties in understanding the mathematics material have been tough by a teacher.

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DEVELOPMENT OF EDUCATIONAL GAME-BASED LEARNING MEDIA BY CONSTRUCT 2

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Abstract. This research aims to find out the results of validity and practicality of products resulting from the development of educational game-based learning media by construct 2. The learning media developed is an interactive learning medium so that it can increase the enthusiasm of learners in the learning process. This learning media can be used in the process of face-to-face learning and online learning during the Covid-19 pandemic. This research is development research that refers to the ADDIE model, which consists of 5 stages namely Analyze, Design, Develop, Implement, and Evaluate. The research instruments used are validation questionnaire sheets, teacher response questionnaires, and student response questionnaires. Data collection using the Likert scale. This research object is in the form of a learning medium with construct 2 on the material to build a flat side room of class VIII junior high school or equivalent. Media was tested to 25 grades VIII student at SMP Babussalam Pekanbaru. Validation data and practicality data obtained are analyzed by determining the average value of each. The average validation value obtained is 91.86% with a very valid category. The average teacher response questionnaire score is 100% with a very practical category and the average value of the student response questionnaire is 84.27% with a very practical category. Thus, it can be concluded that the educational game-based learning media by construct 2 tested its validity and practicality.

Keywords: Development, Learning Media, Educational Games, Construct 2

1. INTRODUCTION

The 4.0 industrial revolution began to enter the world and developed so rapidly that there was a major change to the human lifestyle. This revolution is characterized by the development of new technologies and approaches that will change human lifestyles and interactions.

At the end of 2019, the change due to the industrial revolution 4.0 is visible because of the Covid-19 virus pandemic (Coronavirus disease-2019), which is a virus that attacks the human respiratory system to cause death [8]. The virus is easily transmitted quickly around the world so governments in various countries impose social distancing and lockdown policies. All work is done from home online including teaching and learning activities in schools. In Indonesia, through Circular Letter Number 36962 /MPK. A/HK/2020 on Online Learning and Working from Home in the Context of Preventing and Spreading Corona Virus Disease (Covid-19) published by the Minister of Education and Culture of Indonesia, Nadiem Makarim, teaching and learning activities in schools are closed and diverted into online teaching and learning activities or known as online learning.

Online learning activities require teachers and students to be able to make the most of technology. Especially in mathematic subjects that desperately need media to change abstract things into more concrete. 3D-shapes materials are one part of the mathematics of geometry. Abstract geometric material makes it difficult for the student to learn and understand it. This is because the level of spatial abilities of a student is still low [9]. So, in studying this material needed learning media to help the student visualize geometric objects to be more concrete and students can more easily learn the material.

Construct 2 is software that can be used to create learning media. Construct 2 is a game-making software developed by Scirra. The games are based on HTML 5 which is devoted to 2D platforms. One of the advantages of this construct 2 software is that it does not use programming language so that anyone can use it.

On October 17, 2020, researchers interviewed with mathematics teacher of SMP Babussalam Pekanbaru. Based on the interview obtained information that during the learning process teachers have taken advantage of technological advances. The teacher explains the mathematics material with the help of Microsoft PowerPoint. However, there is less visible interaction of the student with the media used during learning activities. During online learning during the Covid-19 pandemic, teachers have made efforts to explain mathematics subject matter. The teacher provides a learning video downloaded from YouTube then discusses it with a student through the Zoom application. However, there is still less visible interaction of the student with the media used. The enthusiasm of learning students also decreased. So there needs to be the development of learning media that can attract the attention of students so that learning activities can be more interactive.

Based on the above exposure, researchers are interested in researching the development of mathematical learning media with the title "Development of Educational Game-Based Learning Media by Construct 2". The purpose of this study is to find out the results of validity and practicality of the development of educational game-based learning media by construct 2.

2. RESEARCH METHOD

This research is a research and development (R&D) concerning the ADDIE model. The ADDIE model consists of five stages, namely Analyze, Design, Develop, Implement, and Evaluate. The ADDIE development model is a model that adapts well, is flexible, effective, and provides a common structured framework, as well as evaluation and revision at each stage. The object of research is the learning media by construct 2 on the 3D-shapes materials of grades VIII. The test subjects were 25 students of class VIII.4 SMP Babussalam Pekanbaru. The trial was conducted at the computer laboratory of SMP Babussalam Pekanbaru in the even semester of the 2020/2021 school year.

Instruments to measure media validity are validation sheet instruments filled by 3 validators, including media expert validator, material expert validator, and linguist expert validator. Validation sheets are filled using the Likert scale consisting of 4 answer options with categories of very good, good, bad, very bad. Then, the data obtained is analyzed by

determining the average value of the combined validator. The criteria for the validity of learning media can be seen in Table 1 [3].

Table 1. Validity Criteria

Validity Criteria	Level of Validity
76% - 100%	Very Valid
51% - 75%	Valid
26% - 50%	Invalid
0% - 25%	Very Invalid

Research instruments used to measure the practicality of learning media are a teacher and student response questionnaire sheets. The indicators of the teacher's response sheet are:

Table 2. Teacher Response Questionnaire Indicators

Indicators	Item Number
Ease of use of media	1,2,3,4
Time efficiency	5
Benefits of media	6,7,8,9
Ease of understanding the material	10
Attraction	11,12

Indicators of student response can be seen in the following table:

Table 3. Student Response Questionnaire Indicators

Indicators	Item Number
Presentation of material in the media makes it easier for the student to understand the material.	1
Presentation of material on the media attracts students to learn.	2
Interesting media display.	3
Images and animations on the media clarify the material presented.	4
Ease of navigation.	5
Ease of choosing a serving menu.	6
The language used is easy to understand.	7
The language used is communicative.	8
Learning activity increases.	9
Helps to increase the knowledge of the student.	10
Facilitate students in making conclusions.	11

The response questionnaire is filled using a Likert scale consisting of 4 answer options with categories of very agreed, agreed, disagreed, and very disagreed. The response

questionnaire is filled after using the media during the learning process. The practicality criteria of learning media can be seen in Table 4 [4].

Table 4. Practicality Criteria

Practicality Criteria	Level of Practicality
75,01% - 100%	Very Practical
50,01% - 75%	Practical
25,01% - 50%	Less Practical
00,00% - 25%	Unusable

3. FINDINGS AND DISCUSSION

A. FINDINGS

This research resulted in the development of interactive learning media based on educational games by constructing 2 on 3D-shape materials. The media can be run on computers /laptops operating Windows and can be used as self-learning. This media can also be used in online learning during Covid-19 and face-to-face learning. Educational game-based learning media by construct 2 was developed using the ADDIE development model.
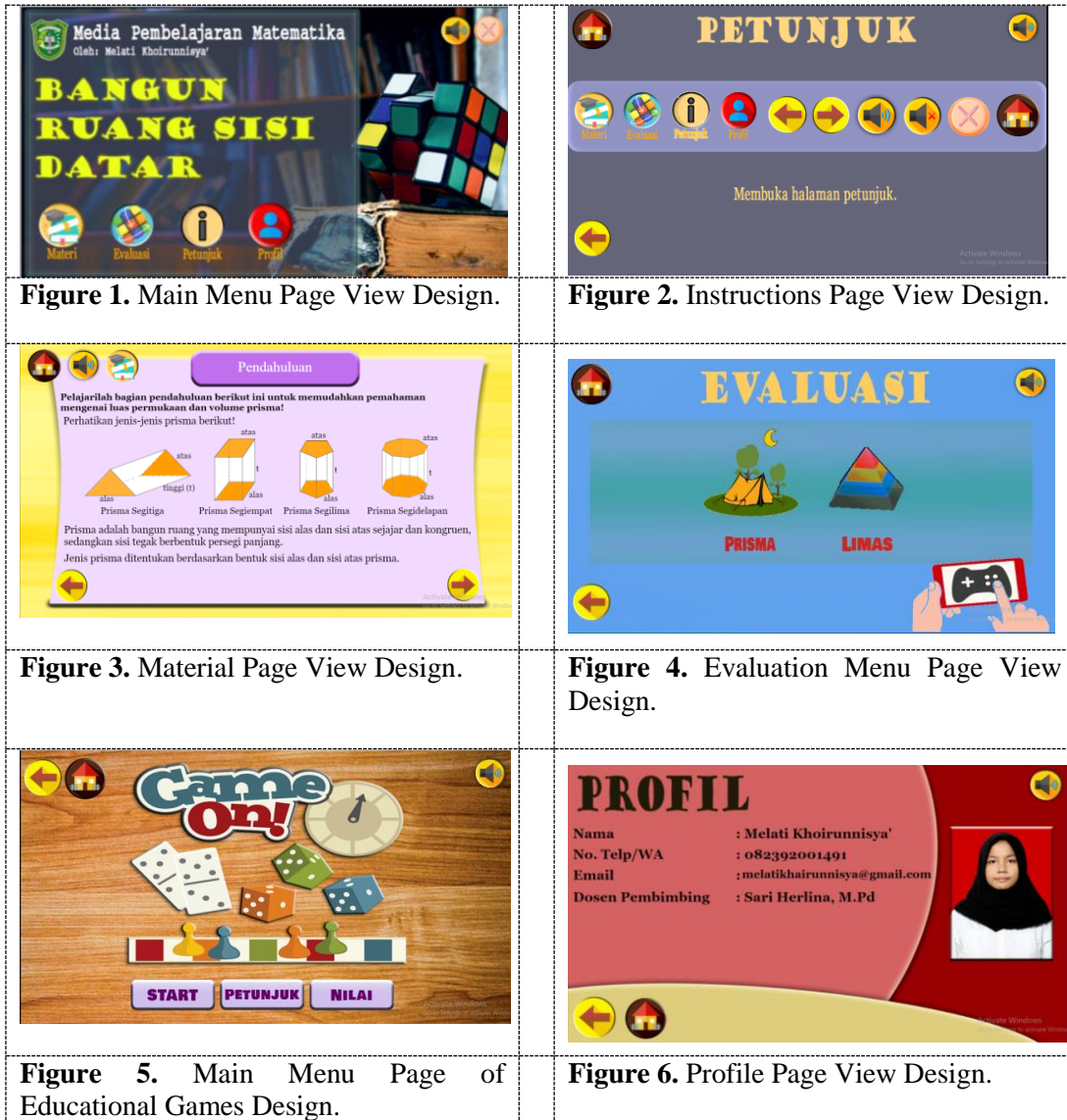
1. Analyze

In the early stages, an analysis of the needs of teachers and learners is carried out. Data were obtained from the results of interviews with the mathematics teacher of SMP Babussalam Pekanbaru about mathematics subject matter, learning media used, and characteristics of the student during the learning process. Based on the analysis of the material obtained the result is that the 3D-shape material is material that is abstract and difficult for a student to understand so that the media is needed to make the material more concrete. In media analysis obtained the results that during the learning process needed media that can increase the motivation and enthusiasm of students during the learning process to create interactive learning activities.

2. Design

At the design stage, the design of learning media and research instruments is carried out. The instruments made are validation sheets and response questionnaires of teachers and students. Before designing the learning media first, the preparation of the material to be presented. The material is arranged in 4 meetings consisting of the surface area as well as the volume of prisms and limas.

After compiling the material, then create a main menu page view design. This page contains the main menus presented in the learning media, namely material menus, evaluation instructions, evaluation, and researcher profiles. Next is the design of the instructions page that contains instructions on how to use navigation buttons contained in the learning media. The third design is the design of material menu pages that include prism and limas. Each material consists of three parts: the introduction, the surface area formula, and the volume formula. The fourth design is the design of the evaluation page to conduct an independent learning evaluation. Evaluation is presented based on

educational games that use an unlock-level system. If students have not been able to open the next level, then they need to repeat the learning. The last design created is the design of the researcher's profile page that contains personal data and photos of the researcher.

Figure 1. Main Menu Page View Design.	**Figure 2.** Instructions Page View Design.
Figure 3. Material Page View Design.	**Figure 4.** Evaluation Menu Page View Design.
Figure 5. Main Menu Page of Educational Games Design.	**Figure 6.** Profile Page View Design.

3. Development

Materials from the design stage are used as a basis in creating learning media using *construct* 2 in the development stage. At this stage, data analysis is also carried out from the validation of learning media. Validation sheet instruments are used to obtain data from the validation of developed learning media. Validation sheets consist of three aspects, namely aspects of the media display, material aspects, and language aspects. Validation results by three Validators can be seen in Table 5.

Table 5. Learning Media Validation Results

Media	Assessment (%)	Average (%)	Validity Criteria

	V$_1$	V$_2$	V$_3$		
1st Meetings	85,23	93,18	98,86	92,42	Very Valid
2sd Meetings	85,23	90,91	98,86	91,67	Very Valid
3rd Meetings	85,23	89,77	98,86	91,29	Very Valid
4th Meetings	85,23	92,05	98,86	92,05	Very Valid
Combined Average				**91,86**	**Very Valid**

Based on Table 5 it is known that the average value of learning media validation results is 91.86% with "very valid" criteria. Although the learning media is very valid, the validator also provides some useful suggestions for perfecting the learning media.

 4. Implementation

Valid learning media then can be tested in the learning process. The trial was conducted on the student of class VIII.4 even the semester of the 2020/2021 school year at the computer laboratory of SMP Babussalam Pekanbaru. Media tests were conducted during 4 meetings. After the trial ended, the response questionnaire sheet was given to teachers and students to obtain data on the practicality of the learning media developed. Furthermore, the practicality data is analyzed to find out the practical level of educational game-based learning media by construct 2. The results of the assessment of the response of teachers and students are contained in Table 6 below:

Table 6. Learning Media Practicality Result

Respondents	Average(%)	Practicality Criteria
Teachers	100	Very Practical
Student	84,27	Very Practical

Based on Table 6 it is known that the average value of the teacher response questionnaire is 100% with the criteria "very practical" and the student response questionnaire 84.27% with the criteria "very practical". Students feel that the language used in this learning media is quite difficult to understand.

 5. Evaluate

In this study, the evaluation is only done until the formative evaluation. Evaluation is carried out by revising the learning media based on the suggestions given by validators. Revisions to the media display aspect lie in the layout section between text and images in the problem example and color composition section. In addition, some navigation buttons also need to be fixed because they do not work properly. The validator also suggests adding learning motivation sentences from Muslim mathematicians so that students are more enthusiastic about learning. The display of the motivational sentence can be seen in the following image.

Figure 7. Learning Motivational Sentence Design

Validator juga memberikan saran pada aspek materi, yaitu agar menuliskan satuan panjang pada penyelesaian contoh soal agar dapat diketahui datangnya satuan luas pada kesimpulan jawaban. Beberapa pemilihan gambar juga direvisi karena belum sesuai dengan konsep bangun ruang sisi datar.

B. DISCUSSION

Based on the results of research it is known that the development of educational game-based learning media with construct 2 was developed with the ADDIE development model. This model consists of 5 stages, namely Analyze, Design, Development, Implementation, and Evaluate. The resulting product is educational game-based learning media by construct 2 on the 3D-shapes material.

In the analysis stage, material analysis and media analysis are based on interview results. The result of this analysis is that teachers and students need interactive learning media and can increase the enthusiasm of students in the learning process on 3D-shapes material. After getting the results of the analysis, then at the design stage, the result is used to design learning media. Before making a media design researchers arrange the learning material to be presented. Following the opinion [2], the material is prepared concerning Core Competencies (KI), Basic Competencies (KD), Competency Achievement Indicators (IPK), and Learning Objectives. So that the learning media made is not only limited to "aids". This is in line with opinion[5] because media can be effectively utilized to improve the quality of learning if structured based on learning objectives.

After the media design is made, the next stage is development. At this stage, the media is made using construct 2 concerning the design of the media. Then, the finished media is validated by three experts, namely media experts, material experts, and linguists experts. The validation result obtained is 91.86% with the category "very valid". During the validation process, the validator provides suggestions. This is following the use of validation according to [6] so that the suggestions serve as a basis for revising small errors found in the learning media so that the media is tested for validity.

Learning media that are declared valid can be used in the learning process. At the implementation stage, this media is used during the learning process in 4 meetings. Implementation was carried out at SMP Babussalam Pekanbaru in class VIII.4 semester even the 2020/2021 school year. The response questionnaire instrument is given to students and teachers at the fourth meeting after learning is completed. The results of the practicality analysis obtained from the teacher's response questionnaire are to get an average score of 100% with the category "very practical", and the response questionnaire

of learners obtained an average of 84.27% with the category "very practical". The evaluation stage is carried out by revising the learning media based on the suggestions given by the validator. Revision of learning media consists of aspects of media display and material aspects, while in the language aspect there is no revision.

Based on research that has been carried out, this educational game-based learning media can increase the enthusiasm and learning spirit of the student. The use of unlock-level systems in learning media makes students enthusiastic and fosters their ambition to solve the training problems given. In addition, during the learning process student not only interact with the media but also interact with friends to get better learning outcomes.

4. CONCLUSION

Based on the results and discussion of research obtained that the average value of validation results of educational game-based learning media with construct 2 is 91.86% with "very valid" criteria. The average value of the assessment of practicality results based on the teacher's response questionnaire is 100% with the criteria "very practical" and based on the student response questionnaire obtained a score of 84.27% with the criteria "very practical". Thus, it can be concluded that the products of educational game-based learning media development by construct 2 are tested for validity and practicality.

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DEVELOPMENT OF STUDENT WORKSHEETS (SWS) BASED ON REALISTIC MATHEMATICAL EDUCATION (RME) FOR MATERIAL SYSTEM OF LINEAR EQUATIONS OF TWO VARIABLES

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Abstract. This study aims to produce teaching materials in the form of valid and practical RME-based worksheets on two-variable linear equation system materials for students of SMP N 1 Bangkinang Kota and find out whether these worksheets have a potential effect on meaningful learning for students. The method used is the development method with the Plomp model with the preliminary analysis stage, development stage, and assessment stage. The subjects of this study were 8th-grade students of SMP N 1 Bangkinang Kota. Data collection methods used are questionnaires, documentation, and interviews. The result of this research is to get an RME-based worksheet with a valid and practical two-variable linear equation system material. SWS validity is based on content, presentation, and language. Based on the content, the developed SWS is following the characteristics of the RME with a percentage of 76.7%. Based on the presentation, SWS is well structured with a percentage of 80%. Meanwhile, based on language, SWS has used good and correct language where there are no students who misunderstand and have multiple interpretations when reading it with a percentage of 95%. The practicality of the SWS can be seen from the students being able to use the SWS well.
Keywords: *Development,* SWS*, Two-Variable Linear Equation System, RME*

1. INTRODUCTION

Math is one of the disciplines taught at every level of education. The existence of this science is so important as it relates to the environment of daily life. This is in line with Permendikbud No. 58 of 2016 on Guidelines of mathematical subjects, which states that mathematical learning is needed to understand the world around it. But in fact, many learners still struggle with the mathematics problems they get in the learning materials. This is the result of learners' meager knowledge of the benefits of mathematics which are closely related to everyday life.

One factor is the learning done is still peer-oriented in schools. Learners are accustomed to receiving firsthand knowledge and there is no process of reconstructing knowledge by the learner himself. Thus, it is only natural for many educated students to have difficulty with math subjects. As Ruseffendi [2] says that mathematics (sure science) for children is generally an unpopular subject, if not a hated subject. These suggestions continue to hereditary and make mathematics a lesson that deals with calculation.

To minimize such suggestions, educators are required to employ meaningful learning. The point of meaningful learning is that educators can direct learners toward connecting knowledge gained with everyday life, making it easier for learners to understand and solve the math problems they find.

Based on an interview with an educator of compulsory mathematics at SMP N 1 Bangkinang Kota the ability to understand learners is still severely lacking. According to the teacher's presentation that when held a quiz on basic competence, the student's average score is always below KKM, only 1-8 people have a full score and therefore must be remedial. One is the reason protégé scores are always less likely to be difficult to understand, too many formulas, and very boring.

Teachers as an essential component of learning play a crucial role in improving the learning process. The success of the learning process is largely determined by the quality or ability of teachers [5]. The teacher's duty as an educator is based on the standard learning process, the assessments of learning, the supervision of the learning process for effective and efficient learning processes to accomplish [4]. One of the steps a teacher can take is by making mature learning planning.

One of the teaching materials that can facilitate learning is the learner's worksheet. The worksheet of the learner is selected because the educators can design teaching materials on their own according to the conditions of the trainees. The learner's worksheet can be arranged in a way with one of its purposes to build the learner's knowledge. The development of the learner's worksheet is expected to be a solution to both facilitate and exercise tools for learners to be able to solve math problems that come from real problems (realistic)

According to [3], the educational worksheet can be made on its own and can be much more relevant and contextual to both the circumstances and conditions of the school or the cultural environment of the student audience. Thus, the development of the educational worksheet of learners is necessary in the world of education. Development of the teaching materials is needed to facilitate the desired goals of learning, one of the excellence of the development of the SWS is to be designed according to the circumstances of the student and school characteristics.

One of the learning approaches that can be applied to math learning is a realistic mathematical approach. The current educational concept of realistic mathematic education (RME) corresponds to the requirements of learning for learners to build up their knowledge. Learners are no longer recipients of the information presented by teachers but rather learners as learning subjects that build knowledge upon the experience experienced in the learning process. Learners cannot be regarded as passive recipients of mathematical learning, but mathematical learning should allow learners to reinvent mathematical knowledge by exploiting the opportunities and real-life situations of learners [1]. The knowledge a learner acquires is his understanding of what he learns.

It has been observed that teachers made of Linear Two-Variable Equations Materials (SPLDV) class VIII of Junior High School, that learning still does not make use of the real world for the process of building knowledge, even though SPLDV material is very close to real life. The real world is simply presented as a form of material application, not as the first foundation for creating material concepts. Teachers tend to give common equations from SPLDV without beginning with the concept forming in learners about SPLDV so that few learners will understand the material. The first thing that may come to the minds of

learners is that this material is too abstract because it only talks about variable variables that learners do not know what they mean. It is different when teachers begin learning by presenting contextual problems by having learners build mathematical models of the problem. Then learners will understand the meaning of the variables. It is hoped, therefore, that education-mathematic education (RME) in SPLDV materials will improve the conception of learners and learners will no longer see mathematics as an abstract lesson of insignificance in real life, but math is an essential lesson because it is closely related to human activity in its daily life.

Based on the above background, the authors conducted research entitled: Development of SWS Based on Realistic Mathematical Education (RME) for Materials on Two-Variable Linear Equation Systems in Class VIII SMP.

2. RESEARCH METHOD

The kind of research that people do is research and development. The development model in this study is the Plomp model with our using our preliminary research phase, prototype development stage, and assessment phase. The research facility was conducted at SMP N 1 Bangkinang Kota. The subjects of this study were class VIII students of SMP N 1 Bangkinang Kota in the 2021/2022 academic year. The sample in this study is 9 people, 3 people for individual evaluations, and 6 people for small group evaluations.

The data collection instruments in this study were a validation sheet to obtain data on the results of the validation of the RME-based SWS experts, and a questionnaire sheet to obtain RME-based SWS student response data. Data analysis techniques used in this study are:

1. Validity Analysis of SWS

Table 1. Likert Scale Item Score

Score	Category
5	Very Good
4	Good
3	Pretty Good
2	Not Good
1	Very Not Good

Source: (Riduwan, 2015)

According to (Riduwan, 2015) to measure the calculation of the value data, the validity results were analyzed on a scale (0-100) using the formula:

$$NA = \frac{PS}{SM} \times 100\%$$

Description:
NA: Final Score
PS: Score
SM: Maximum Score

The criteria for obtaining the level of validity of SWS use the criteria as shown in Table 2.

Table 2. Validity Criteria

Average	Criteria
81% − 100%	Very Valid
61% − 80%	Valid
41% − 60%	Pretty Valid
21% − 40%	Not Valid
0% − 20%	Very Not Valid

Source: (Riduwan, 2015)

Based on the criteria in table 3.6, it can be concluded that the Learner Worksheet based on Realistic Mathematical Education (RME) for opportunity material is said to be valid if the average obtained is 61%.

2. Practical Analysis of SWS

The teacher and student response questionnaires are arranged in the form of a Likert Scale. Scoring for each item using a Likert scale with alternative answers can be seen in table 3

Table 3. Likert Scale Item Score

Score	Category
5	Very Agree
4	Agree
3	Quite Agree
2	Not Agree
1	Very Not Agree

Source: (Sugiyono, 2013)

The teacher and student response questionnaires are arranged in the form of a Likert Scale. Scoring for each item using a Likert scale with alternative answers can be seen in table 3:

$$NA = \frac{PS}{SM} \times 100\%$$

Description:

NA: Final Score

PS: Score

SM: Maximum Score

The practicality category of the Student Worksheet (SWS) is based on the final score obtained and can be seen in Table 4:

Table 4. Practical Criteria

Interval (%)	Category
0% − 25%	Less Practical
26% − 50%	Enough Practical
51% − 75%	Practical
76% − 100%	Very Practical

Source: (Riduwan, 2015)

3. RESULTS AND DISCUSSION

The results of the research on the development of s SWS based on Realistic Mathematical Education (RME) on the material for the Two-Variable Linear Equation System (SPLDV) in class VIII SMP are as follows:

A. RESULTS PRELIMINARY RESEARCH

The prototype in the form of SWS based on Realistic Mathematical Education (RME) was prepared based on preliminary research. The preliminary research stage aims to determine and define the learning requirements needed in developing a prototype. At this stage, needs analysis activities, student characteristics analysis, curriculum analysis, and concept analysis are carried out. This analysis is carried out to produce prototypes needed by students and teachers.

B. PROTOTYPING PHASE

1. SWS Validation Results by Experts

Based on the results of the assessment of 3 validators, it was found that in general the whole SWS based on Realistic Mathematical Education (RME) was declared valid

a. Content Validation

Table 5. Validation Results by Content Experts

No	Rated Aspect	Score	Category
1.	The problems presented are rightly directed to the learning principles of Realistic Mathematical Education (RME)	4	Valid
2.	The problem is appropriate for mathematical activities	4	Valid
3.	Image according to context	3	Quite Valid
4.	Horizontal and vertical mathematization activities are clear	4	Valid
5	The concept discovery activity is right	4	Valid
6	Its role is to encourage students to find concepts independently	4	Valid
	Sum	**23**	
	Feasibility Presentation	**76,7%**	**Valid**

The results of the validation by content experts showed the total score was 23 and the percentage was 76.7% with the "Valid" category so that it was feasible to be used as teaching material for class VIII students of SMP N 1 Bangkinang Kota. However, there are a few comments and suggestions to improve the teaching materials of this Student Worksheet. The comments and suggestions from the validator are that the addition of questions must describe the RME and include the original image in SWS.

b. Presentation Validity

Table 6. Validation Results by Presentation Expert

No	Rated Aspect	Score	Category
1.	The problems given are problems of everyday life that need to be translated from verbal form to mathematical form or involve mathematical ideas to solve them.	4	Valid
2.	Questions in the Students' Worksheet (SWS) facilitate students to understand the problem	4	Valid
3.	The sequence of steps for the Realistic	4	Valid

No	Rated Aspect	Score	Category
	Mathematical Education (RME) approach is correct		
	Sum	**12**	
	Feasibility Presentation	**80%**	**Valid**

The results of the validation by the presentation expert showed the results of the total score of 12 and the percentage of 80% with the "Valid" category. However, there are a few comments and suggestions to improve this Student Worksheet (SWS) teaching material. The comments and suggestions from the validator are adding numbers from the steps of Realistic Mathematical Education (RME) to become the hallmark of Realistic Mathematical Education (RME).

c. Language Validation

Table 7. Validation Results by Language Expert

No	Rated Aspect	Score	Category
1.	Compatibility of language use with EBI	4	Valid
2.	The sentences used are easy to understand	5	Very Valid
3.	Sentences do not cause multiple interpretations or misunderstandings	5	Very Valid
4	Clarity of directions and directions	5	Very Valid
	Sum	**19**	
	Feasibility Presentation	**95%**	**Very Valid**

The results of the validation by the discussion experts showed the results of the total score of 19 and the percentage of 95% with the "Very Valid" category".

2. Results One-to-One Evaluation

In the results of the revision of prototype 1, namely prototype 2, a trial was carried out on 3 students using SWS which had been declared valid by an expert validator. The three students have heterogeneous abilities. These abilities start from students with low, medium abilities, to students with high abilities. The summary of student response data can be seen in table 8.

Table 8. The Average Results of SWS Practicality by Students in the One-to-One Evaluation Stage

No	Statement	Score
1	SWS displays or pictures make me happy in learning the material	4,7
2	The activities in the SWS make it easy for me to understand the material	4,3
3	With SWS I find it easy to remember the concepts of the subject matter	4,3
4	The display or picture of the math worksheet is boring	1,0
5	I like math lessons in groups	5,0
6	I understand better if the mathematical formula is obtained by finding it yourself	4,0
7	Learning like this is too convoluted so that it makes me confused about understanding the material	1,7
8	Math learning like this is more fun	5,0
9	This kind of learning process makes it easier for me to understand the	3,7

No	Statement	Score
	material	
10	I'm lazy to interact with friends during group discussions	1,0
11	Learning mathematics like this makes me lazy to listen to the material being studied	1,3
12	The activities in the SWS made me understand the material	4,7
13	By learning mathematics, it makes it easy for me to express ideas or opinions	4,7
14	The orders in the SWS make me confused	2,3
15	I prefer learning activities as usual	1,7
Final Score		**49,4**
Persentase		**66%**
Category		**Practical**

Based on the results obtained in the One-to-One stage with a practical category level with a percentage value of 66%. This result is stated practically based on table 3.8. So the SWS based on Realistic Mathematical Education (RME) is stated to be practical to use.

3. Results Small Group Evaluation

In prototype 3, another trial was conducted on several students of class VIII SMP. In the small group evaluation, students consist of 6 people. The six students have different abilities. These abilities start from students with high, medium abilities, to students with low abilities. The student is given a valid and practical SWS based on the One-to-One Evaluation stage. From the practicality questionnaire, namely the response questionnaire from 6 students who took the test on SWS that was tested, the results were obtained as shown in table 9 below.

Table 9. Data on Student Response Questionnaire Results in Small Group Trials

No	Rated Aspect	Practical Value	Category
1	SWS displays or pictures make me happy in learning the material	90%	VP
2	The activities in the SWS make it easy for me to understand the material	90%	VP
3	With SWS I find it easy to remember the concepts of the subject matter	87%	VP
4	The display or picture of the math worksheet is boring	30%	EP
5	I like math lessons in groups	100%	VP
6	I understand better if the mathematical formula is obtained by finding it yourself	90%	VP
7	Learning like this is too convoluted so that it makes me confused about understanding the material	37%	EP
8	Math learning like this is more fun	97%	VP
9	This kind of learning process makes it easier for me to understand the material	90%	VP
10	I'm lazy to interact with friends during group discussions	37%	EP
11	Learning mathematics like this makes me lazy to listen to the material being studied	40%	EP
12	The activities in the SWS made me understand the material	93%	VP

No	Rated Aspect	Practical Value	Category
13	By learning mathematics, it makes it easy for me to express ideas or opinions	83%	VP
14	The orders in the SWS make me confused	40%	EP
15	I prefer learning activities as usual	40%	EP
	Practicality Average	**69,6%**	**P**

Based on table 9, it can be seen that the overall percentage value is 69.6% in the practical category. This means that SWS based on Realistic Mathematical Education (RME) to facilitate students' conceptual understanding skills is declared practical. As for the results of the analysis of the practicality of small group evaluation questionnaire data, the percentage results for each indicator are between 51% - 75%. The summary of student response data is as follows:

Table 10. Results of Small Group Student Response Questionnaire Analysis

No	Student Name	Score	Practical Value	Criteria
1	Nova Engela	51	68%	P
2	Muhammad Hardin	53	71%	P
3	Virat Togatorop	57	76%	VP
4	Yogi Damara Putra	52	69%	P
5	Panggawa Mukti	51	68%	P
6	Pairegen T	54	72%	P

Based on the results obtained at the Small Group stage with the category level of each student in the practical to very practical category with an average value of 51%-75%. So SWS based on Realistic Mathematical Education (RME) is stated to be practical to use.

Table 11. Practical Results of SWS by Mathematics Subject Teachers

No	Statement	Value
1	SWS mathematics emphasizes process skills	5
2	Learning activities in mathematics worksheets are student-centered	5
3	The concepts listed on the SWS are following the correct mathematical concepts	5
4	The composition of the material in the SWS is presented in sequence	5
5	The depth of the material in the SWS is following the abilities of students based on content standards	5
6	The material presented is following the RME approach	5
7	Sentences in SWS have a double meaning	1
8	The sentences used in SWS are easy to understand	5
9	The language used is EBI compliant	5
10	The language used is communicative	5
11	Learning assessment can measure the achievement of KD	5
12	SWS can increase students' interest in learning	5
13	Learning activities provide direct experience to students in understanding the material	4
14	The activities carried out to encourage students to conclude concepts or facts	5
15	The learning activities carried out confuse students	2
16	SWS physical appearance design is attractive	5

No	Statement	Value
17	The text and pictures in the SWS relate to and support the clarity of the concept	4
18	SWS directs students to find concepts	5
Final Score		**81**
Persentase		**90%**
Category		**VV**

On the acquisition of the practical value of SWS based on Realistic Mathematical Education (RME) by the teacher, SWS based on Realistic Mathematical Education (RME) is declared practical without revision with good comments and is easily understood by students. Then it is declared practical to use.

4. CONCLUSION

Based on the analysis of the data obtained from the validation results and the results of the questionnaire, it can be concluded that this study produced a Student Worksheet (SWS) based on Realistic Mathematical Education (RME) that met the valid and practical criteria with very good interpretation based on the validation analysis of the validators, indicating that The Student Work (SWS) is valid based on aspects of content, presentation, and language, and practically based on the results of student responses when conducting one-to-one trials and small group trials. The results of the response indicate that there is an ease in using SWS based on Realistic Mathematical Education (RME).

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EFFORTS TO IMPROVE THE STUDENTS' LEARNING OUTCOMES IN MATHEMATICS BY USING TGT COOPERATIVE LEARNING MODEL OF SMAN 10 PEKANBARU

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Abstract. Mathematics is a tool to develop humans' ways of thinking and this science facilitates a framework logical thinking. However, to practice this logical thinking is not such an easy way to implement for students. In addition, the Students' motivation is also very low to learn mathematics. Teams Games Tournament (TGT) Cooperative learning will foster students' enthusiasm and motivation learning Mathematics. The goal of the research is to improve the student learning outcomes mathematics of class X-2 SMAN 10 Pekanbaru through the application of the cooperative learning TGT. The study include the type of classroom action research with subject of students class X-2 in SMAN 10 Pekanbaru. The research instrument used is to test and observations. The test results are said to have improved student learning outcomes if there is an increase in the average class scores in each cycle. After conducting research with two cycles, the application of the cooperative learning teams games tournament (TGT) can improve student mathematical learning outcomes in the staple of mathematical logic where there was an increase in the average class scores before the action from 66.70 to 74.87 in the first cycle and then increased again in the second cycle to 80.13. Based on these results can be concluded that cooperative learning TGT can improve student mathematics learning outcomes in the class X-2 of SMAN 10 Pekanbaru.
Keywords : Team Games Tournament (TGT) ; Mathematics Learning Outcomes.

1. INTRODUCTION

Mathematics is one of difficult subject that is considered by the students. As well as mathematics lesson in class X-2 SMA 10 Pekanbaru. Based on test the learning outcomes done by students of class X-2 during one semester, only 20 students who scored above 78 on the first test and 27 students on the second test. The average value is still below 78. The value doesnot fulfilled the Minimum Exhaustiveness Criterion (KKM) that is 78 for mathematics. Mathematics is a tool to develop someone's thinking and mathematics is also a branch of knowledge which facilitates logical thinking possessed by human beings. Besides, this logical science has important role towards development of various other disciplines. That is why Mathematics is called as a *King and a Good Servant* as well. However, mathematics is considered as an abstract formula, frightening subject for learners. As a result, the learners' output is at low level in mastering this subject. In line with this, learning process of Mathematics at State Senior High School No. 10 Pekanbaru is also challenging, or it is still far from the expected scores. This condition is due to learners' less focus when the teacher is explaining. In addition, once the learners are given the assignments, they tend to copy paste from other peers.

The teacher as an educator has the main goal in learning activities at school that is creating a pleasent learning atmosphere, can attract students' interes and enthusiasm and can motivate students to always learn well and spirit , because with a pleasent learning atmosphere will have a positive impact in achieving learning outcomes the optimal.

Learning Outcomes are not separate from the learning process itself because learning outcomes arise due to learning activities. In other words learning outcomes are goals to be achieved from learning activities. [19] states "learning outcomes are patterns of actions, values, understandings, attitudes, appreciation and skills". Soedijarto [12] states "learning outcomes are the level of mastery achieved by students in following the teaching and learning process in accordance with established educational goals". In line with this opinion [21] states "learning outcomes are changes in behavior that is relatively settled in a person as a result of one's interaction with their environment". According these opinions it can be concluded that learning outcomes are changes in student behavior achieved after implementing the learning which the behavior changes include affective, cognitive and psychomotor aspects. The behavior change is due to the achievement of mastery over some materials provided in the learning. Achievement is based on learning goals that have been set. To achieve this goal teacher's role is very decisive. According to [15], "Competent teachers are teachers who are able to manage teaching and learning programs". Managing has a broad meaning concerning how Teachers are able to master teaching skills, also how teachers apply strategies and carry out conducive learning. A similar opinion was put forward by Roestiyah [1] that the teacher must be able to choose a learning strategy so that students can learn effectively and efficiently, and achieve expected goals. Meanwhile according to Wina [13], the teacher's role is: "as a learning resource, facilitator, manager, demonstrator, mentor, and evaluator". As a motivator, the teacher must be able to generate student motivation so that student activities in the learning process work well. One way to generate student activity in the learning process is to change the method or learning model to be more interesting.The teacher-centered learning paradigm should be changed to student-centered learning [2]. The best teaching and learning process is when students are actively involved in learning activities in the classroom [8]. If students are active in learning activities, then student learning outcomes will also be good. [11] revealed that in cooperative learning there are various methods such as Learning Together, Constructive Controversy, Group Investigation, Jigsaw, and Teams-games-tournament. Slavin [5] has stated that if cooperative learning model is not properly designed, then it will cause some students are not responsible towards their group works. Besides, some other learners who lack of capabilities are considered as neglected memberships within their group. The application of the cooperative learning TGT which contains academic games can encourage all group members to be involved in working on their group assignments. This happens because students feel more relaxed and happy when learning and discussing with their friends.

According to [9], "Teams Games Tournament (TGT) is a type or method of cooperative learning that is easy to apply, involves the activities of all students without having to have differences in status, involves the role of students as peer tutors and

contains elements of the game". Meanwhile, according to [10]: "Teams Games Tournament (TGT) is a type of cooperative learning that places students in study groups consisting of 5-6 students who have different abilities, gender and ethnicity/race". Through Team Games Tournament (TGT) by using game tournaments where students compete with other team members, it will foster motivation and enthusiasm learning. If they already have strong motivation and feel happy, students can be active so that they show interest, activity, and participation in participating in learning activities that are being carried out. Likewise in learning mathematics, if students have strong motivation and can be active in learning, mathematics will not be the most frightening subject anymore. Thus, through this learning model, it is expected that students to improve their learning outcomes.

Based on problems that have been stated above, the goal of this research is to improve students' mathematics learning outcomes of X-2 grade students of Senior High School No. 10 Pekanbaru on the subject of mathematical logic through the learning model of Team Games Tournament (TGT). "In TGT each student is placed in a group consisting of several students with low, medium and high ability" [6]. Through this learning model, students with low ability can play an active role in learning through their groups, while those with high ability can help other students who have lower ability than themselves in the group. According to Slavin [18], in this type of learning model after students learn and work cooperatively, students are invited to an academic game called Teams games tournaments. In this game, the first thing to do is to place students as tournament participants on tournament tables. The students represent their respective groups. The research is expected to be useful for mathematics teachers as well as for students of SMAN 10 Pekanbaru.

2. RESEARCH METHOD

The research is a Classroom Action Research (CAR) conducted by teacher concerned, the researcher himself. Wina [14] states "Classroom Action Research (CAR) can be interpreted as a process of studying learning problems in the classroom through self-reflection in an effort to solve these problems by carrying out various planned actions in real situations and analyzing each effect of treatment the ". The subjects this study were students of class X-2 of SMAN 10 Pekanbaru in the 2016/2017 school year, with the number of students in one class consisting of 47 people consisting of 20 men and 27 women. This research will be applied to Mathematics subject subject to Mathematics Logic in the even semester of the academic year 2016/2017. The time of this study is from February 13, 2017 to April 12, 2017. The research was conducted in 2 cycles, each cycle consisting of 4 stages namely: 1) planning, at this stage the researcher compiles learning tools consisting of Lesson Plan, Syllabus, providing Worksheets, planning learning outcomes tests in the form a grid of daily questions I and daily tests II and questions Daily test I and daily test questions II along with alternative answers, and prepare observation sheets. 2) implementing actions, implementing actions carried out in a structured learning process in accordance with the Lesson Plan, syllabus, providing Worksheets by applying TGT learning model. 3) observation, observations made on the activities, interactions and learning progress of students during learning takes place. 4) reflection, reflection is done

after the action of each cycle ends which is a reflection for the teacher or researcher on the impact of the learning process carried out. Data collection techniques used in this study were observation and achievement test. Observations were made during the teaching and learning process while the learning outcomes test was carried out after each cycle I and II. The test used in this assessment is a daily test. According to Endang Mulyatiningsih (2011: 25) "Tests are methods of collecting research data that serve to measure one's ability". The instrument in the form of a test is used to find out the mathematics learning outcomes of students after the teaching and learning process which will be analyzed descriptively quantitatively by calculating the average. The average class obtained in each cycle is calculated the difference to find out the increase in student learning outcomes. Data from observations showing the implementation of the Teams Games Tournaments (TGT) type of cooperative learning model will be analyzed descriptively qualitatively by explaining the results of observations through words. The data is compared to show the implementation of the cooperative learning model that was applied before the action, cycle I and II.

3. FINDINGS AND DISCUSSION
A. FINDINGS

Data was obtained from field explained that the implementation of cooperative learning using the Teams Games Tournament (TGT) can improve mathematics learning outcomes of Class X-2 of SMAN 10 Pekanbaru. This means that an increase in the average value of the class that is at the time before the action 66.70 increased to 74.87 the first cycle and then increased again in the second cycle to 80.13. Improved student learning outcomes occur because in the Teams Games Tournament (TGT) students are more motivated and active. The research result are presented in the Table 1:

Table 1. Result of The Cycle I

No.	Completeness	amount	%
1	Complete	32	68,09%
2	Not finished yet	15	31,91%
Amount		47	100%
The highest score		90	
Lowest Value		45	
Average value		74,87	

Based on the results of test after the first cycle action can be known the average value test using TGT cooperative model after the first cycle action has increased by 8.17 points compared to the initial test, from 66.70 to 74.87. The table also shows that the number of students who have completed has risen from 22 to 32, although the percentage is still low at 68.09%. the grade average is still below the specified KKM of the school which is 74.87 while the KKM of the school is 78. Therefore it is necessary to take action in cycle II. The results of Cycle II are average of the evaluation values that have been carried out at each meeting in Cycle II. Cycle II results if described in Table 2.

Table 2. The Results of Cycle II

No.	Completeness	amount	%
1	Complete	38	80,85%
2	Not finished yet	9	19,15%
Amount		47	100%
The highest score		98	
Lowest Value		50	
Average value		80,13	

From the results of the test after the second cycle of action can be known the average value of the test using TGT cooperative model (Teams Games Tournaments) after the second cycle of action has increased by 5.26 points compared to the test after the first cycle, namely from 74.87 to 80.13 . it means that the average grade of the class is above the school KKM value set at 78. The table also shows that the number of students who have completed has gone up from 32 people to 38 people, and the percentage of students who have completed is 80.85%. Increased average acquisition after the first cycle of action with after the Cycle II if described in tabular form as follows

Table 3. Comparison of The Value In Each Cycle

No.	Completeness	Pre-cycle	Cycle I	Cycle II
1	Complete	22	32	38
2	Not finished yet	25	15	9
Amount		47	47	47
The highest score		80	90	98
Lowest Value		30	45	50
Average value		66,70	74,87	80,13

From the table above the number of students who completed the pre-cycle was only 22, up to 32 students in cycle I and in cycle II it rose to 38 students. The average value also increased from 66.70 before the first cycle action to 74.87 after the first cycle, and rose again after the cycle II to 80.13. Thus learning using TGT is said to able to improve student learning outcomes.

B. DISCUSSION

Based on observations of learning outcomes before the actions taken by researchers, data obtained an average grade of 66.70. These results illustrate that student mathematics learning outcomes are still low. This is due to the use of inappropriate learning models. Learning activities still apply the learning model whose activities are centered on the teacher, so students are less active. This contradicts opinion of [19] stating that "knowledge is the result of construction of a person's activities or actions so that knowledge should be constructed (built) rather than directly perceived by the senses". On the other hand mathematics is a lesson that requires extra hard thinking so that teachers should use learning strategies that are fun in order to reduce the tension of children's thinking. One of the fun learning methods is to use a cooperative learning model, one of which is the Teams Games Tournaments (TGT) type, where there are academic games that are liked by students. [16] stating that TGT concepts were academic tournaments, quizzes

and individual progress score systems, where students compete in their team as representatives each of team in the classroom. Through academic tournaments, quizzes and awards for the team that gets the highest score makes TGT a fun learning model for students. With this fun learning, students can easily understand the subject matter quickly so that students' learning outcomes can improve. Therefore, mathematics learning should be use TGT . In learning using, the increasing of learning outcome happened maximally. This can be seen from student learning outcomes which increased from 66.70 at the time before the action increased to 74.87 in the first cycle then increased again to 80.13 in the second cycle. Improved student learning outcomes in the first cycle, caused by teachers using TGT.

TGT type of cooperative learning model requires students to be active in learning activities. In addition, the existence of an academic game makes students enthusiastic in participating in learning activities. Classroom action research in cycle I there are still some obstacles. For this reason, the research continues to cycle II by looking at important notes which still need to be reflected again for the next learning. Actions taken in cycle II still use TGT based on reflection of cycle I. In cycle II the teacher conditions students and motivates and guides students in group activities so that there are no students who are passive in group activities In cycle II, learning outcomes increased again when compared to cycle I. This can be seen from the increase in the average class from the first cycle of 74.87 to 80.13 in the second cycle. Improving student learning in cycle II, shows that the use of cooperative learning models Teams Games Tournament (TGT) in Mathematics can improve student learning outcomes. The actions in the second cycle are quite effective in applying TGT type of model in learning and are more optimal for improving student mathematics learning outcomes. With the existence of the Teams Games Tournaments (TGT) type of cooperative learning model, students can be more active in classroom learning so that it affects the improvement of student learning outcomes. Existing data illustrates the increase in student mathematics learning outcomes before conducting learning activities using the Teams Games Tournaments (TGT) cooperative learning model and after using the TGT type cooperative learning model, so the research was carried out only until the second cycle.

From the results of the study, it was proven that the use of the Teams Games Tournaments (TGT) type of cooperative learning model was considered successful and could improve student learning outcomes. This is in accordance with the theory contained in chapter II, namely Mathematics is a lesson that requires extra hard thinking so that teachers should use learning strategies that are fun in order to reduce the tension of children's thinking.

Based on the description above, it can be said that the use of the TGT learning model can improve students' mathematics learning outcomes. This statement is supported by research conducted by [17], stating that the TGT learning model has an influence on students' mathematics learning outcomes on the subject of two dimensions. This can be seen from the mathematics learning outcomes of students who are taught TGT are higher than students who are taught using the STAD learning model. Furthermore, research

conducted by [4] states that the use of the Teams Games Tournament (TGT) type of learning model can increase learning activities which have an impact on increasing student learning outcomes. This is in line with [3] Team Game Tournament (TGT) learning can increase student activity and student learning outcomes in learning mathematics. This increase can be seen from the indicators of student activity and student learning outcomes in learning mathematics.

4. CONCLUSION

Based on the results and discussion, it can be concluded that the use of the Teams Games Tournament model can improve mathematics learning outcomes for Mathematics Logic in class X-2 of SMAN 10 Pekanbaru. This is indicated by an increase in the average value of the class that is at the time before the action 66.70 increased to 74.87 in the first cycle and then increased again in the second cycle to 80.13. Improved student learning outcomes occur because in cooperative learning model Teams Games Tournament (TGT) students are more motivated and active.

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