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Eko Yuniarto, Nia Wahyu Damayanti* & Umul Khayati

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Department of Mathematics Education,
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Development of Mathematics Learning Tools In The New Normal Era for MTs Students to Practice Critical Thinking

¹Eko Yuniarto, ²Nia Wahyu Damayanti*, ³Umul Khayati
Mathematics Education Study Program Universitas Wisnuwardhana
Email: wahyu_nia07@yahoo.co.id

Abstract: *The purpose of this research is that learning in Indonesia continues. The Covid-19 pandemic in Indonesia has made learning carried out online. Therefore, Learning Tool Development is also carried out online by utilizing E-Learning. The e-Learning used is zoom, quizizz, and google classroom. With online learning, it is hoped that students will remain enthusiastic in carrying out learning, even though there are many obstacles experienced by students during this online learning. Learning tools provided online are expected to train students' critical thinking in ways or strategies to solve mathematical problems or problems. By designing learning tools that are attractive, creative, and efficient so that students do not get bored during online learning, and can use smartphones positively and wisely. Learning kits consist of lesson plans, quizizz-based worksheets, and YouTube audio-visual materials. The purpose of this research is for learning to continue even in the new normal era due to the Covid-19 pandemic, by utilizing technology and information media such as E-learning.*

Keyword: Learning Media, E-Learning, Critical Thinking

INTRODUCTION

Learning is teaching or a learning process in mastering knowledge and skill processes to realize a better learning process (Pane, 2017). According to Musanna (2017), to develop the characteristics of a student, character, and quality morals through an educational process that can be carried out with the existence of national education, so that students have the potential to become human beings who have good character, are civilized, ethical, and devout. As a result of the impact of the Covid-19 pandemic, the Ministry of Education and Culture has designed learning in schools to become online or online learning. Online learning is the process of learning online by utilizing a smartphone or laptop which is carried out online without meeting or meeting teachers with students (Syalwa, 2020). Lots of learning media are used in online learning, including using the application via zoom, via quizizz, and via google classroom. Learning tools that are given to students will support learning mathematics, in learning mathematics students are required to be able to think critically and be able to solve the problems faced. Efforts or efforts to train critical thinking have motivation and activities that students must do (Rosmayadi, 2017). If someone has the ability to think critically, this can train the quality of their thinking in solving a problem (Marzuki & Basariah, 2017). Critical Thinking is the ability of students to come up with ideas, formulate, evaluate student opinions, make assumptions about student statements, with logical reasons (Johnson, 2014). The ability to think critically is the ability to solve math problems and other problems (Sugiharti, et al, 2019).

With the ability to think critically which contains mathematics teaching, students are expected to be able to solve mathematical problems. Mts students have not been able to

think critically, in terms of some work results regarding critical thinking exercises. To be able to improve critical thinking, students should be given questions in the form of problems to find solutions (Sulistiyorini & Napfiah, 2019). Learning mathematics that involves students to be active in the learning process will develop critical thinking processes for students from elementary school age (Mujib & Mardiyah, 2017). Active students will influence their learning, which will add to their learning experience (Anggraeni & Akbar, 2018). To be able to solve problems, have skills, and have their own learning model contained in the Problem Based Learning (PBL) curriculum and designed for students (Ridwan, et al, 2016). The advantages of PBL are to shape students so they can process something new, think critically, do something, stimulate students' thinking skills in a problem, students are more active and responsible, solve the problems they are facing (Rachmantika & Wardhono, 2019). Hu, et al, 2016 stated that: "with the knowledge can be formed thinking skills by teaching methods of thinking and training in thinking" that is, with the knowledge possessed by students, thinking skills can be formed by teaching thinking methods and thinking training.

In order to practice critical thinking skills, it is necessary to develop learning tools that are carried out online, learning tools in the form of Learning Implementation Plans (RPPs) and Student Worksheets (LKS) which are designed online based on quizzes. Student Worksheets (LKS) are a means of supporting activities to support students to learn more actively and systematically either independently or in groups (Fannie & Rohati, 2014). The Learning Implementation Plan (RPP) is a planning in learning one or more meetings made by a teacher or teacher (Minister of Education and Culture Number 22 of 2016). RPP is one or more direct meetings with students conducted by teachers against students (Purwanto, 2019).

The development of students' ability to think is still low. In fact, at MTs in the Jabung area, the implementation of teaching and learning mathematics has not fully trained students to think critically. The problems (questions) in the set presentation and the Venn diagram will be presented: There were 54 motorcyclists who were ticketed. There were 33 drivers who did not carry SIM A, 28 did not carry a STNK, and 17 riders committed other violations. Many motorists who get ticketed because they do not carry SIM A and do not carry a vehicle registration is... (Draw a venn diagram first to answer the questions).

The problem above is a critical thinking problem with the set material, with the critical thinking questions that have been given, it can be seen whether students can think critically or not. The following shows the results of student A's work:



Figure 1 Student Work Results A

Figure 1 is the result of student A's work. Student A is still unable to think critically, as evidenced by student A directly answering practice questions without examining and paying close attention to the questions given. The researcher also reminded student A to research and pay attention to any problems that were given.

METHOD

The method used in this research is the development method with the Plomp development model. In this Plomp model there are 3 stages, namely preliminary research, the development stage (prototyping phase), and the research phase (assessment phase). This research is located at MTs in the Jabung area for a period of 3 months, starting from September to December 2020. The subjects of this study were students of grade VII of the set material in the sub-chapter presenting the set and the venn diagram for the odd semester of the 2020/2021 school year. This research procedure is based on Problem Based Learning to develop learning tools such as lesson plans and worksheets with the Plomp development model. The data collection instrument is a tool to find out the actual data that can be done in various ways such as interviews, observations, tests, observations, questionnaires, multilevel scales, documentation, observation sheets, and validation sheets. The data collection techniques used by researchers were tests, observation sheets, and validation sheets which were carried out by utilizing the application media zoom, google classroom, WhatsApp and quizizz. The data analysis technique used is qualitative data and quantitative data. This qualitative data is obtained from the validator in the form of constructive suggestions and comments, as well as from notes in the field during online learning. Meanwhile, the quantitative data were obtained from the scores of students' work and the study materials used. Quantitative data and qualitative data are combined together and will be assessed. There are several aspects to be assessed, namely the validity of the learning tools, the practicality of the learning tools, and the effectiveness of the learning tools. The following table will present the validity, practicality, and effectiveness of the learning tools as follows:

Table 1 Criteria for the Validity of Learning Devices

Score	Meaning
$80 \leq score \leq 100$	Learning tools are valid and ready to be tested.
$60 \leq score < 80$	Learning tools are quite valid and have a little revision.
$40 < score < 60$	Invalid learning device and overall revision.

In the table the criteria for the validity of learning devices are used to state whether the learning device is valid or not. The results of the validity of the learning device were obtained from the assessment of 2 validators by finding the average number of 2 validators.

Table 2 Criteria for Practicality of Learning Devices

Score	Meaning
$80 \leq score \leq 100$	Practical learning tools for product quality.
$60 \leq score < 80$	There is a slight revision of learning tools.
$40 < score < 60$	Whole revision learning tools and tried again.

In the table the criteria for practicality of learning devices are used to state whether the learning device is practical or not. The results of the practicality of the learning device were obtained from the instrument assessor of the learning device assessment by 4

students, by looking for the average number of assessments of 4 students.

Table 3 Criteria for the Effectiveness of Learning Devices

Score	Meaning
$80 \leq score \leq 100$	Very active students.
$60 \leq score < 80$	Active students.
$40 \leq score < 60$	Students are less active.
$20 \leq score < 40$	Inactive students.

In the table of learning device effectiveness criteria, it is used to state whether the learning device is effective or not. The results of the effectiveness of learning devices are obtained from the assessment of student learning outcomes, by finding the average number of 10 student learning outcomes.

RESULT AND DISCUSSION

The results of this study are the compilation of learning tools consisting of lesson plans, worksheets based on quizizz, and audio-visual design materials in the form of youtube. This learning is carried out online by utilizing the E-Learning platform. E-Learning is a teaching and learning process that utilizes electronic media that can be used as a medium for teaching and learning (Setiawan, 2020). E-Learning is widely used for the online / online learning process which is widely used by teachers so that learning continues as long as the Covid-19 pandemic has not ended. With this e-Learning, teachers are helped to carry out their obligations. Teachers are very important for the success of learning. One of them was the delivery of material online during the Covid-19 pandemic.

There are four parts of the description that will be discussed in the results of this study, namely the results of synchronous learning via zoom, the results of asynchronous learning via google classroom and quizizz, and finally the results of optimization via WhatsApp regarding learning devices. Asynchronous is learning that is carried out online to convey messages or information using communication media (Indarti, 2014). Synchronous is online learning that is done directly by utilizing communication media (Hasibuan & Meitro, 2014).

The results of asynchronous learning via google classroom show that students have started to think critically, seen from the teacher giving problems then students can analyze these problems. Google classroom is an online learning media with the aim of making it easier for teachers and students to communicate like it is in the classroom without having to match teaching hours (Sabran & Edy, 2019). The problem given by the teacher to practice mathematical critical thinking is "Empty sets are groups that have no members.

1. Is the following set empty or not?

The names of the months of the year are, January, February, March, April, May, June, July, August, September, November, December. The set A is the name of the month starting with the letter O.

Please answer the question above, then take a photo of your work and send it to Google Classroom "

After the teacher gives problems to students through google classroom, students provide responses which are also sent via google classroom. The following are the results of student work:



Figure 2 Student Work Results 1

In Figure 2 is the result of student 1's work, student 1 has started to think critically. Student 1 pointed out that in the problem the name October had not been mentioned. Student 1 commented that in the questions given the name of the month there was no "ma. Umul is the name of the month there is no October?" and the teacher responds to a question from student 1 with the answer "if there is no October, add it yourself, yes" and the teacher concludes the answer for student 1 with the answer "So in the names of months in 1 year, the letters starting with the letter O are included in the empty set or not? If the set is empty there are no members". That way student 1 can think critically, as evidenced by student 1 before solving the problem, student 1 examines the problem first, examines the problem, and understands the meaning of the mathematical problem it faces.

The results of synchronous learning via zoom are used by the teacher as a virtual face-to-face learning media, with the learning media via zoom, it is hoped that the learning process will continue to run well. Zoom is an application that uses video conferencing and provides features such as group messages and chat (Brahma, 2020). In via zoom, the teacher only uses 30 minutes for virtual eyes, considering that many students are constrained by data packages and conditions in areas that are not covered by signals, so the teacher minimizes meetings via zoom in the learning process. The following are the results of learning carried out through virtual face (zoom):

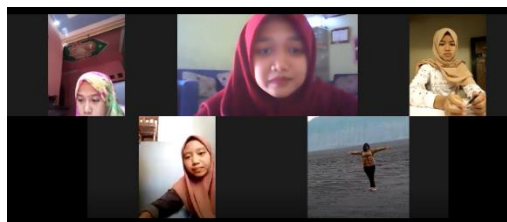


Figure 3 Face-to-Maya Learning Between Teachers and Students

Figure 3 shows the appearance of virtual face-to-face learning by the teacher and students via zoom. In this lesson, only 4 students can participate in learning via zoom, the teacher greets students and reminds them to always comply with health protocols, and the teacher also explains the material about presenting the set and venn diagram.

The results of asynchronous learning via quizizz are provided with critical thinking practice questions with an attractive quiz design consisting of 5 multiple choice questions. Quizizz is a learning medium that can be done via a smartphone by giving quizzes for learning. LKS made with quizizz design is to attract students' attention and give students

enthusiasm in working on problems or problems in the context of critical thinking (Wibawa. R.P, et al, 2019). Here are the questions via via quizzz:



Figure 4 Quizizz Question Display

In Figure 4, the quizizz questions consist of 5 multiple choice questions by providing story questions that can train students to think critically, in addition to questions in the form of stories, the questions are presented in the form of attractive pictures with colors, and in these questions there are multiple choices in the form of pictures. colorful nuances too.

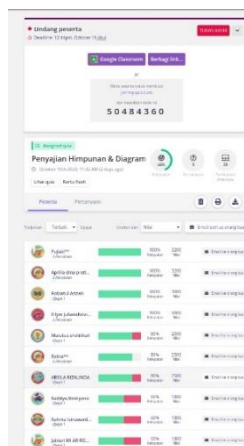


Figure 5 Display of Quizizz Based Student Worksheets

Figure 5 shows the results of the quizizz-based Student Worksheets of 10 students who worked on the quizizz. Of the 10 students 4 students answered 100% correct, 3 students answered 80% correct, 3 students answered 60% correct. From the results of quizizz-based Student Worksheets, it can be concluded that student achievement is formulated by $(\text{Score obtained}) / (\text{Ideal Score}) \times 100\% = 100\%$. So the success of students in solving critical thinking questions is 82% in terms of the results of quizizz-based Student Worksheets, which means that students are very active.

The results of the optimization via WhatsApp are reviewed from students asking about the set presentation material and Venn diagrams to the teacher. Apart from via google classroom, via zoom, and quizizz. Students also take advantage of WhatsApp for learning optimization. With the optimization through WhatsApp, students will better understand how to understand the set presentation material and Venn diagrams that the

teacher has explained online. With students asking through WhatsApp, it indicates that students are enthusiastic in understanding the material being taught, students will be more active and think critically in dealing with problems. There are some students who optimize the set presentation material and Venn diagrams through their personal WhatsApp for the teacher. The following are the results of the optimization via WhatsApp:



Figure 6 Views of Student Consolidation 1 Regarding Quizizz Problems

Figure 6 shows that student 3 consulted the questions that were on the quizizz via WhatsApp. Student 3 is able to think critically as evidenced by the student asking whether the picture provided is meatball or bakmie. With the question "What is meant by both meatballs and noodles, ma'am, because in that question the pictures are soto and meatballs, there is no bakmie?" In the question, it is explained that the food items are meatballs and bakmie, apparently in the picture there are only meatballs and soup. The teacher responds to student questions by providing an explanation "ok, yes, that's what I want to answer mathematical problems, not carelessly, it must be studied and can think critically, good you have started to think critically" with the teacher giving a good response, student 3 will also be more able to train critical thinking. Here it can prove that the student is critical in facing problems. In the display image WhatsApp is used for consolidation and explanation of the material being discussed or studied.

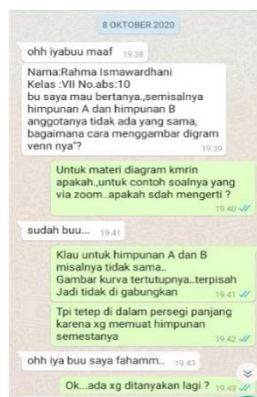


Figure 7 Consolidation of Material by Students 2

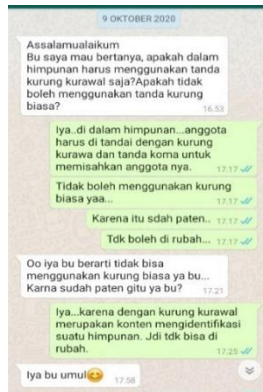


Figure 8 Consolidation of Material by Students 3

In Figures 7 and 8 the teacher stabilizes the material through WhatsApp, students do not fully understand the material that has been explained through zoom or google classroom, therefore students stabilize the material by asking the material that has been discussed through zooming to the teacher. The teacher is happy and excited to explain the material so that students can better understand and be able to understand the content of the set presentation material and Venn diagrams.

CONCLUSION

Online learning is the right step that has been taken by the Ministry of Education and Culture during the new normal period due to the Covid-19 pandemic. With the existence of learning devices that are designed to be attractive and efficient, learning in the midst of the Covid-19 pandemic continues, by utilizing very effective learning media to continue to improve the quality of education. By utilizing the zoom application, google classroom, and quizizz as a means to achieve learning goals amid the Covid-19 pandemic. The existence of online learning proves that learning continues to improve and maintain education and is not an excuse for hampering education due to the Covid-19 pandemic.

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