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PHOTOMATH APPLICATIONS FOR LEARNING MATHEMATICS ANALYSIS

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ABSTRACT

During the Covid-19 pandemic, the implementation of learning in schools underwent a change from face-to-face learning in class to online learning. One form of online defense that is carried out at SMPN 3 Sungaipuh is learning mathematics using the Photomath application. The purpose of this study was to determine the planning, implementation, evaluation and constraints encountered in learning Mathematics using the photomath application. This type of research use a descriptive qualitative analysis approach. Data collection techniques are observation, interviews, and documentation. The results of this study are that in implementing Mathematics learning assisted by the photomath application in solving Mathematics problems can be done in 4 stages, namely: (1) The planning stage, which starts from the stage in recognizing the photomath application and downloading it on the teacher's and students' android. (2) The stage of implementing the photomath application, which is the stage that starts from writing questions, taking photos and scanning questions, answering questions and solving steps in the photomath application, copying questions, working on practice questions, and evaluation/assessment, (3) Evaluation results Mathematics learning with the help of the photomath application has been going well as seen from the 20 grade VIII students of SMPN 3 Sungai Full who managed to solve the problems well as many as 15 people. (4) Constraints/weaknesses in using the photomath application are difficult for students who do not have an Android which will make students only copy answers. Based on the results of the research above, researchers suggest using the photomath application to help teachers teach students to answer sample questions quickly and in complete steps -the steps.

Keywords : Mathematics, Learning, Photomath, Application, Analysis

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PRELIMINARY

Currently, the condition of the COVID-19 pandemic in the city of Sungai Full has begun to decline. The online learning process has again changed its policy from the local government to carry out face-to-face schools. All teachers and students were asked to return to school to carry out the learning process face-to-face. Given the importance of the learning process carried out face-to-face. The face-to-face learning process is carried out by paying attention to the health program by always wearing a mask, washing hands, keeping a distance, reducing interaction, and always keeping the classroom clean.

As information conveyed by the Deputy Head of Curriculum for SMP Negeri 3 Sungaipuh revealed, the learning process is currently being carried out face-to-face again. Teachers and students return to school under normal conditions to carry out the learning process in class. This was done to reduce the spike in COVID-19 cases in the city of Sungai Full. Re-learning is carried out face-to-face so that students are more focused on learning in class and the teacher can guide them to study optimally. Therefore, starting from September 6, 2021, learning activities will be carried out at schools with the condition that no crowds, wearing masks, keeping your distance, washing your hands, or communicating in close proximity are allowed.

Based on the information above, it is explained that in the learning process at SMP Negeri 3, SungaiFull is conducting face-to-face at this time, seeing the many obstacles and obstacles experienced during online learning. Face-to-face learning is also carried out by observing that the condition of COVID-19 in the city of Sungai Full is starting to decline. All students participate in the face-to-face learning process, as well as learning Mathematics. The process of learning mathematics is no longer carried out online. Because many students complain of difficulty doing math assignments online. Learning mathematics requires direct guidance and explanation from the teacher; otherwise, students will find it difficult to understand. (Fitriyani, et al, 2018). Learning mathematics is different from other learning because the examples taught are different from the assignments given. This makes it difficult for most students to analyze how to solve math problems. (Dewi&Yulia, 2018).

Many students still find learning mathematics difficult because mathematics has many formulas, has special properties, and has abstract objects that are difficult for students to understand. (Navia&Yulia, 2017). In learning mathematics, many students do not understand the concept of mathematics, which is essentially a deductive science and departs from abstract matters, so that many students do not understand solving mathematical problems. (Yulia&Ningsih, 2018). Especially when explaining math material, there are lots of examples of problems, so it is very necessary to provide understanding to students by giving lots of examples of math problems. (Bagindo&Yulia, 2019).

Based on the results of interviews with Grade VIII students of SMP Negeri 3 SungaiFull, it was revealed that online learning for learning mathematics is indeed difficult compared to other learning methods. Moreover, working directly on assignments to answer math questions is very difficult without being taught by the teacher. Working on math

problems taught by the teacher face to face is also ineffective, especially if the problems are not explained to us by the teacher.

In addition, the results of interviews with mathematics teachers revealed that learning mathematics must be explained directly to students face-to-face; the teacher must explain the steps for solving problems to students and provide lots of examples of questions so that students understand well how to solve problems. If students still have difficulty solving questions directly, then they must be discussed together in class.

Based on the results of the interview above, it was revealed that teaching mathematics in class VIII SMP Negeri 3 Sungai Full is currently still ineffective. Some of the reasons students have difficulty learning mathematics are because they still do not understand how to solve problems from many types of questions. Students do not understand how to complete examples of difficult questions, but students can still do easy questions. In addition, face-to-face mathematics learning is carried out to guide students who have difficulty solving difficult problems. Therefore, mathematics teachers need to explain how to make solving difficult problems easier. Then, to achieve maximum learning results, it also requires more and longer practice questions, while the teacher's time teaching mathematics in class is limited to only 4 hours in 1 week.

Based on the results of an initial study that the researchers conducted with several Class VIII students and mathematics teachers at SMP Negeri 3 Sungai Lilin, the researchers explained that the process of learning mathematics has not been running optimally. The process of learning mathematics is less effective in providing a good understanding for students in solving problems from assignments given by the teacher. Many students find it difficult to solve questions, especially those that have difficult and long ways of being solved. In the process of learning mathematics, the teacher should have a method that makes it easier for students to master ways to solve problems. (Haryani, et al, 2014). If not, then learning mathematics cannot achieve optimal learning results. (Sari&Yulia, 2017).

Therefore, it is necessary to have a solution that can overcome the difficulties experienced by students in solving math problems. Teachers must have teaching methods and models that can help them teach students to solve questions properly and correctly (Nasution,et al, 2019). So far, conventional methods have not been able to bring the mathematics learning process to the desired goals (Rahmi,et al, 2022). In addition to teaching methods, teachers can also choose learning media that can help make it easier for students to learn independently (Yulia,et al 2021).

In order to carry out a good mathematics learning process, a method is needed that can make it easier for teachers to explain how to solve math problems (Ratnasari&Yulia, 2018). The teacher not only gives assignments to students, but the teacher must also explain how to complete the task. Either way, as long as it can help students understand well how the learning process is using assistive media in the learning process (Amirulloh, et al, 2019). One of the media that can help teachers teach students to solve math problems is the photomath application. The photomath application is an Android, iOS, or Windows phone application that functions to answer math questions by taking a photo or writing the math problem, and then the results come out on how to solve them (Avanda&Putri, 2020). The photomath application is an application that is used to help solve mathematical problems related to division, roots and powers, decimal squares, as well as basic arithmetic and simple linear equations (Fransela&Rangkuti, 2019). Correct and thorough mathematical applications make it easier for students to concretize symbols, tabulate, and complete mathematical calculations. One application that can be used is the photomath application (Sibuea, et al, 2022).

The photomath application is a special application to help students who have difficulty solving math problems in a fast, practical way and can be used for easy or difficult questions (Webel&Otten, 2015). The photomath application is an application that is downloaded from the APP store. The App Store is an application distribution platform for iOS developed and maintained by Apple (Nguyen&Chen, 2016) . The method of use is that students record questions on sheets of paper in clear and neat writing so that they can be read by the application. Pictures that have been written on paper and then photographed, followed by the results and how to solve them. The photomath application cannot record questions that are written unclearly and untidily; this is useful for students to be able to make clear and beautiful writing.

The use of the Pothomath application in learning mathematics has several advantages or benefits for students. Students can learn on their own from the photomath application, because with the photomath application, students only write down the questions clearly and neatly on paper and then take photos of them (Saundarajan, et al, 2020) . After the results and methods of solving the problems are out, students can copy them into books while at the same time understanding the steps listed in the photomath application. The use of the photomath application can also be useful for students in correcting students' questions answered by students manually.

Learning mathematics through the photomath application can be used by students to help them solve math problems that are difficult to analyze simply (Fransela&Rangkuti, 2019). This means that the use of the photomath application in learning mathematics can help students solve difficult math problems easily; students can learn, understand, understand ways to solve problems correctly, and learn to master the correct steps for solving problems, helping students with independent learning and self-taught learning; teachers can work with students quickly; and students no longer find learning mathematics difficult.

The purpose of this study was to determine the planning, implementation, evaluation, and constraints encountered in learning mathematics using the photomath application. This research is different from previous research, namely research conducted by Avanda & Putri (2020) which discusses more about the existence of photomath use in high school students; in this study, it was revealed that high school students used photomath applications outside the learning process. While this study reveals that planning, implementing, evaluating, and overcoming obstacles encountered in learning mathematics while accompanied by a teacher.

METHODS

This research uses a type of qualitative research, namely research that emphasizes observation of phenomena and examines more into the substance of the meaning of these phenomena (Iskandar, 2009). This research was conducted to understand and find out about various problems in real terms from the analysis of mathematics learning assisted by the photomath application. The type of research approach used is grounded theory. According to Lexy J. (2013), a grounded theory approach is a qualitative research method that uses a number of systematic procedures to develop theory. The systematic procedure starts with collecting data, with the possibility of interpretation and analysis at the time of collecting data, followed by the data analysis stage. Then, it is continued with the formation of the concept, starting the first stage of coding the substance. After finding related keywords, categories are generated.

The informants for this study consisted of 1 mathematics teacher as the key informant and 20 VIII B students. Data collection techniques in this study were observation, interviews, and documentation. The interview guideline grid can be seen in the table below:

Table 1. Interview Guideline Grid

No	Indicators
1.	Learning Mathematics before using the photomath application
2.	Mathematics learning method before using the photomath application
3.	Explanation of the photomath application
4.	Steps to use the photomath application
5.	How to solve math problems with the photomath application
6.	Advantages and benefits of using photomath applications
7.	Constraints and disadvantages of using the photomath application
8.	How to overcome obstacles or disadvantages of using the photomath application

The data analysis technique used in this research is the triangulation method. Method triangulation is done by collecting data with other methods. In this study, researchers used the methods of observation, interviews, and documentation. In order to obtain correct information and a complete picture of certain information, researchers can use these methods. The analysis used in this study is componential analysis, which looks for specific characteristics in each internal structure by contrasting elements with each other. It is done by observation and selected interviews with questions related to the problem.

RESULT AND DISCUSSION

1. Planning for Mathematics Learning with the Help of the Photomath Application

Based on the results of observations and interviews, at the planning stage of implementing mathematics learning assisted by the photomath application, the teacher downloaded the photomath application and included it in the learning device as a learning medium. At this planning stage, the things that must be prepared are understanding the photomath application, downloading the application, preparing lesson plans that contain media assisted by the photomath application, explaining the use of the photomath application to students, and explaining how to use the photomath application in solving problems.

An analysis of the results of research conducted on mathematics learning planning assisted by the photomath application reveals that the initial stage before using the photomath application is downloading the photomath application on Android. The photomath application will be used to teach students how to solve practical questions. Then the researcher also observed the Androids owned by the teacher and students, and it was seen that the teacher and students had downloaded the application on their respective Androids. The photomath application form can be presented in the following figure:

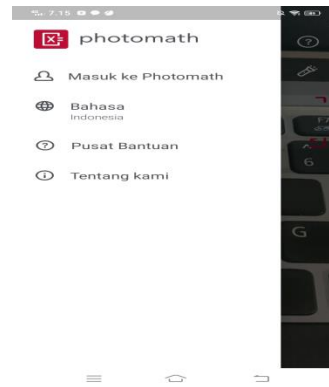


Figure 1. Photomath Application

Planning for mathematics learning with the help of the photomath application is first carried out by planning the teacher by preparing a lesson plan that includes the photomath application in the lesson plan. The results of the research above reveal that students and teachers first download the photomath application to Android to make it easier for them to carry out learning. So, the lesson plan for mathematics with the help of the photomath application is prepared first in the lesson plan, and the photomath application is prepared on each Android.

2. Implementation of Photomath Application-Assisted Mathematics Learning

Based on the results of research conducted on the mathematics learning process assisted by the photomath application, it is very easy and fast in terms of time effectiveness. The steps in using the photomath application to solve questions start with students writing questions on sheets of paper, taking photos, and scanning the questions. After clicking "OK, the photomath application immediately presents the answers and complete steps for solving them.

Then, students just have to transfer the answers from the photomath application to the notebook. To describe how the implementation of learning mathematics with the help of the photomath application can be described, the stages can be described as follows: a. Question-Writing Stage The process of using the photomath application begins with writing questions. Students write the questions neatly on blank paper. Students create math questions for which answers will be sought in clean, neat, and easy-to-read/scannable writing by the photomath application. If the questions are long, students must write them according to the frame in the photomath application. If the questions are short, it is enough to write them in a standard size so that they are easier to be scanned by the photomath application. The results of students writing math questions whose answers use the help of the photomath application can be displayed in the following example image:



Figure 2. Question Recording Stage

a. Stages of Photographing and Scanning Questions

Next, the photo and scan stage uses the photomath application on questions that students have written on sheets of paper. At the photomath and scan stages, this problem is easier to solve than at the question-writing stage because students can open the photomath application and take photos of the questions and scan them. This step is short and fast; in this case, students only point the camera at the problem until the frame size in the photo math application is appropriate and click OK. What students have to pay attention to when taking photos and scanning questions is the light setting, and the frame must fit the problem. To see how students' pictures carry out photoshoots and scan questions, the researcher can insert them in the following picture:

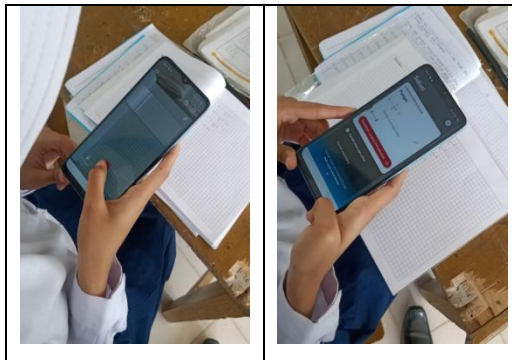


Figure 3. Photographing and scanning questions

b. Stage of writing results and steps to solve problems

After taking photos and scanning math questions that use media assisted by the photomath application, the application shows the answers and steps for solving the problems. On the photomath application screen, complete answers and problem-solving steps appear, and students copy the completion steps into a notebook. Students transfer the results of the questions that the answers are looking for in the photomath application. In this activity, the teacher directs students to understand and learn while copying the answers onto notebook sheets. Then, students can also ask the teacher if they don't understand the steps in solving the problem. To find out the pictures of students writing answers and the

steps for solving questions from the results of scanning the questions, researchers can enter them in the following picture:

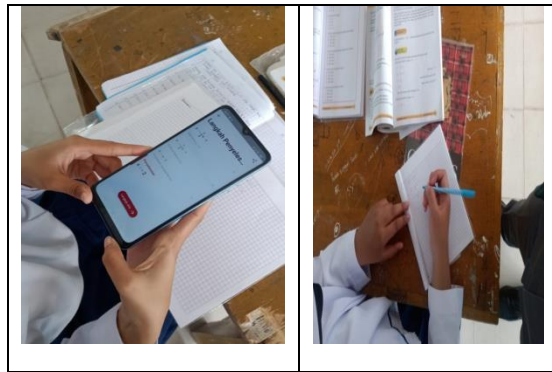


Figure 4. Recording the Steps to Answer the Question

The photomath application is an application that uses an Android camera to find answers to math problems in an easy and practical way. How to use it is very easy: open the application, point the camera at the problem book, take a photo, and then the photomath application immediately provides detailed instructions for solving it without requiring complex input from the user. The photomath application also does not require an internet connection; it only requires an Android, then it can work offline (Coutinho, Feitosa, & Pinheiro., 2020).

The results of research from Franselaa dan Rangkuti (2020), indicate that the implementation of mathematics learning assisted by the photomath application is carried out by using the steps of using a photomath cellphone camera to see answers to math exam questions while studying, starting from writing questions, taking photos, and writing down the answers displayed on the screen of the photomath mobile phone application. So, the implementation of mathematics learning with the help of the photomath application is the same as the steps carried out in class VIII B SMP Negeri 3 Sungai Kunci in mathematics, namely starting from writing questions, taking photos and scanning questions, and recording answers and solving steps in student notebooks.

3. Evaluation of Photomath Application-Assisted Mathematics Learning

After the students copied and transferred the results of the answers and the steps for solving the questions using the photomath application, the teacher gave practice questions that had to be answered manually. This is done to find out the extent to which learning can solve problems using the photomath application. Students transfer the results of the questions that the answers are looking for in the photomath application. At this stage, the teacher provides reinforcement of the students' understanding by providing some practice questions. Then, this stage is also the implementation of the results of student learning in

solving problems using the photomath application. This stage is called the evaluation stage, where the teacher evaluates the learning process carried out by students using the photomath application.

Based on the results of observations and interviews, it was revealed that the use of the photomath application in solving math problems is indeed very practical and easy. Problems of any kind can be solved easily by the photomath application by simply taking a photo and scanning it. Then the photomath application is also useful for facilitating teacher performance in explaining the complete and detailed steps for solving problems. Based on the results of an evaluation of the student answer sheet documents from 20 class VIIIB students of SMP Negeri 3 Sungai Full, overall, things have been going well. 16 students have been able to answer questions properly and correctly, although not perfectly, which shows that the use of math applications in learning mathematics has improved students' ability to answer questions.

The results of student answer sheets whose scores reach above the Minimum Completeness Criteria (KKM), which can be presented in the following figure:

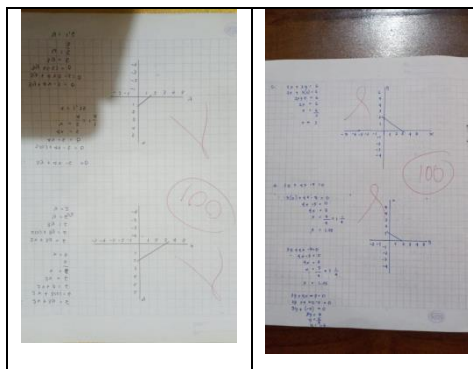


Figure 5. Student Answer Sheets (PSR) and (AM)

Based on the results of the student answer sheets above, it can be seen that all the student answers were correct, and it turned out that the student was able to complete the questions perfectly. Even though students answered practice questions without using the photomath application, they were able to answer the questions correctly and complete the steps for solving them. As the results of the interviews with students with the initials PSR and AM showed, the researcher explained that for students learning mathematics with the help of the photomath application, it was very enjoyable for them. Learning with the help of the photomath application makes students understand how to solve problems correctly more quickly.

Furthermore, the researcher also took samples from student answer sheets whose scores were above the KKM. It could also be explained that these students were able to

complete the questions well but were still incomplete. As the observation results from the answer sheets of students with the initials AE, it can be seen that their scores have reached above the KKM. The results of student answer sheets can be seen in the following figure:

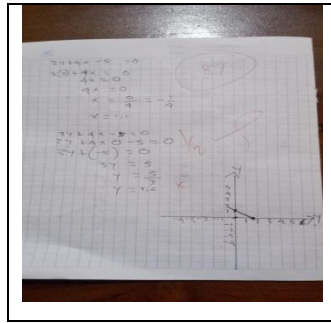


Figure 6. Student Answer Sheet (AE) above the KKM Score

Based on the student answer sheet above, it can be seen that students with the initials t a can solve the questions well but are still not perfect. Students (AE) explained that learning mathematics with the help of the photomath application really helps students learn well. Students feel that learning to use the photomath application can make it easier to answer questions. Even though students (AE) have not been able to answer questions perfectly, they have understood the questions well.

According to students (PSR), (AM), and (AE), learning to use the photomath application is fun and can help students understand how to solve problems more easily. Students are greatly helped by the photomath application because the use of the application in solving examples of math problems can help students learn more quickly and understand the questions well. So, in the process of learning mathematics that is assisted by the photomath application, it can help student learning outcomes achieve scores above the KKM.

The use of the photomath application for some students is less influential in achieving scores above the KKM. Some students admitted that using the photomath application made it easier to solve sample questions, but without using the photomath application, some students still had difficulty answering questions. Some students seem to have not optimally answered questions without using the math application. Some students admit that using the photomath application is very easy, but it is still difficult to answer questions manually. In the following, the researcher displays pictures of students' exercise answers, and their values can be seen in the following figure:

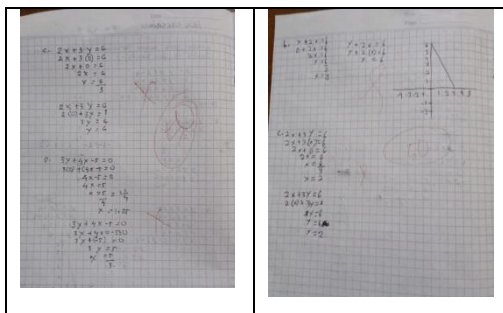


Figure 7. Answer sheets (AAP) and (NA) under the KKM score

Based on the student answer sheets (AAP) and (NA) above, it can be seen that the scores obtained by students when solving questions without using the photomath application are still below the KKM score. The answer sheet explains that students have been able to complete practice questions, but there are still mistakes.

Based on the results of the practice questions that the students worked on, it indicated that the photomath application was not able to teach students how to work on the questions correctly. Based on the results of interviews with students (AAM) and non-students (NA) with researchers, these students revealed that, in using the photomath application, they did not understand and quickly forgot. When working on sample questions using the photomath application, students can answer sample questions, but when given practice questions without using the photomath application, they forget and cannot answer the questions perfectly. This means that the results of the evaluation show that in the mathematics learning process assisted by the photomath application, it still has little effect on some students ability to solve questions correctly and completely. As the answer sheet from one of the students (SFY) in the following figure:

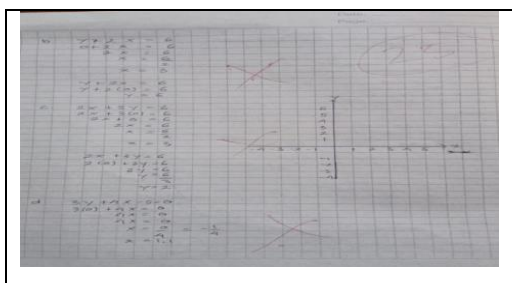


Figure 8. Student Answer Sheet (SFY) under KKM Score

Based on the picture above, the researcher can explain that at the stage of working on practice questions without using the photomath application, it can be seen that students are only able to solve 1 question, while the other 3 questions cannot be answered. Thus, the mathematics learning process assisted by the photomath application in working on sample questions has not been able to make students answer all of them. From the results of interviews with students (SFY), it was explained that these students still had difficulty

understanding how to solve the questions properly. Even though the math application is considered easy, working on math problems requires higher-level thinking skills in solving problems.

After students work on practice questions from the end of the mathematics learning activity, assisted by the photomath application, the teacher then evaluates and assesses the students' results in working on the questions. At this stage, the teacher evaluates the students' ability to solve problems without the help of a photomath application.

With the photomath application, students can learn and understand how to solve problems and the steps to solving problems correctly. In addition, the use of photomath application media is also useful to help students absorb and think about solving problems easily and practically. Based on the evaluation results of the mathematics learning process assisted by the photomath application, it is known that the students' ability to solve math problems as a whole has been going well. The use of the photomath application for some students can have an impact on their ability to solve problems; some students are less able to do so.

As explained by Irwan in Avanda & Putri (2020), the use of the photomath application in solving math problems, namely: (1) assisting students in working on math problems that can no longer be done manually, applies to some students whose ability in mathematics is lacking. (2) With photomath, students can find out the process of working on math problems, although not all questions can be solved with this application. For this reason, teachers and students feel the presence of the photomath application can be likened to a mathematics dictionary, which can provide knowledge, understanding, skills, and also the ability of students to solve questions properly and correctly, complete with problem-solving steps (Igcasama, et al, 2020).

In addition, by providing training to students on how to use mathematical applications such as Photomath, which can be downloaded via cellphone or Android, it can help students understand mathematics learning material (Abdillah, et al, 2021). The use of the Photomath Application has an effect on students' ability to understand mathematical concepts, and the findings suggest that teachers should be able to use Photomath Application-based media in mathematics lessons (Yolandasari, et al, 2022).

4. Obstacles to Photomath Application-Assisted Mathematics Learning

Based on the results of observations and interviews in class VIII B SMP Negeri 3 Sungai Full, the implementation of learning using the photomath application does not only bring benefits to students. If the process of using the photomath application is used

unwisely, then this application only makes students lazy to think and lazy to work hard in solving problems through research. Even though the photomath application can help students solve math problems quickly, However, this application also has obstacles that are not good for students if they cannot be used wisely. Because this practical photomath application makes students lazy to think about solving problems, any problem can be solved with this application. Students also seem to just copy the answers and steps for solving the application without processing it first to find the answer.

The drawback of using the photomath application is that students who don't have an Android cannot use the photomath application to solve problems. Some students who are too lazy to think tend to use photomath applications to cheat. Students don't want to try and think about learning how to solve problems correctly according to what is taught in the photomath application. In addition, some of the answers on the photomath application are not appropriate. Four solutions have been obtained that are inconsistent with the discipline of mathematics in solving quadratic equations in photomath applications (Meldi & Suratman, 2022).

As explained by Irwan in Avanda & Putri (2020), the use of the photomath application for some students can make them feel lazy to think about solving problems, and some students become less independent in working on math problems manually. Then, the use of the photomath application also creates dependency, which can cause students to only want to cheat when given questions by the teacher. Even with the manual method, students can learn the process properly. This dependence can have a very fatal impact when the student no longer wants to think in a manual way. Even with the manual method, students can learn the process properly. Furthermore, the photomath application causes students not to actively tend to be silent, and the photomath application increases the likelihood of groups of students completing the mathematical communication ability test (Saputra, 2018).

CONCLUSION

The conclusion of this study is the planning stage, which starts from the stage of preparing the lesson plan and preparing the photomath application by downloading it on the teacher's and students' androids, namely the stage starting from writing questions, photographing and scanning questions, answering questions and solving questions on the photomath application, copying questions, working on practice questions, and evaluation and assessment.

The evaluation stage of the photomath application-assisted mathematics learning was carried out by collecting the results of student practice sheets that worked without using the photomath application. The evaluation results obtained from the assessment of students who have achieved a score above the Minimum Completeness Criteria (KKM) and students who have not achieved the Minimum Completeness Criteria (KKM) score will be used as a reference for improving how to use the photomath application in solving difficult questions in mathematics. Constraints in using the photomath application are difficult for students who don't have an android, which will make them just copy answers. If students are not impressed with cheating, then when giving practice questions, they are directed to do the questions manually. So that students are not lazy to think in working on questions, they must also be given practice answering questions so that they are independent in working on questions.

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