Theoretical Review: The Effectiveness of Photomath Application on Mathematics Learning of High School Students

Akhadina Nur Latifa[1] , Mustika Indah Nurul Safitri[1] , Robiatul Adawiya[1]*, Dyahsih Alin Sholihah[1] , Indah Perdana Sari[1]

[1] Universitas Alma Ata, Yogyakarta, Indonesia
robiatuladawiyah@almaata.ac.id

Abstract. In today's digital age, technology provides various conveniences and joys. The impact of technological advances in this period can be seen in the rapid growth and use of technology. The role of technology is very significant in the development of today's teachers. The rapid advancement of information technology today increases efficiency and enables the implementation of various activities quickly, accurately, and effectively, so that productivity in the world of teaching increases. The method that the author will use is library research, which involves reading, recording, and analyzing literature or reading materials that are selected and considered relevant to the research focus. This technique aims to strengthen facts, compare differences or similarities between theory and practice that the author is researching. besides that the author also uses internet site access (website) in this research. The research results that overall, the results show that Photomath has great potential as a math learning aid by providing benefits for students. However, it should be noted that the use of this application can also have negative impacts, such as excessive dependence and a tendency to be lazy to think manually. Therefore, a wise approach is needed in integrating this technology into the mathematics learning process.

Keywords: Technology, Photomath, Math Learning.

1 Introduction

In today's digital age, technology provides various conveniences and joys. The impact of technological advancements in this period can be seen from the rapid growth and use of technology, such as ways of communicating, lifestyles, promotions, online shopping, and other benefits. As a generation living in this era, each individual is expected to quickly adapt to the facilities available in the digital space. Content that supports and fulfills all needs, including educational needs, has been abundant in the digital world [1]. The role of technology is very significant in today's vocational development [2].

Guruan has an important meaning because without guruan humans will have difficulty in following developments so that they become a backward society [3]. Guruan

K. S. Rouzi et al. (eds.), *Proceedings of the 1st Alma Ata International Conference on Education (AAICE 2023)*, Advances in Social Science, Education and Humanities Research 920,
https://doi.org/10.2991/978-2-38476-414-3_8

is entering the digital era, where all learning needs can be accessed through digital media. The rapid advancement of information technology today increases efficiency and enables the implementation of various activities quickly, accurately, and effectively, so that productivity in the world of education increases. The impact of information technology is significant in teaching, accelerating knowledge transfer, increasing the effectiveness of using digital media, and improving the quality of teaching services to students [2]. The use of technology in the learning process has both positive and negative impacts on teachers and students. The advantages of technology include expanded access, improved quality, and increased learning resources. Meanwhile, the challenges involve the need for new skills, paradigm shifts, and the emergence of ethical issues. Therefore, understanding the influence of technology in teaching, both from a positive and negative perspective, is very important [4].

Technological developments have had a significant impact on the evolution of teaching, resulting in new innovations in the teaching domain. Initially, these innovations mainly focused on the media aspect, adding value to the learning process, vocational products, and the structure or system used [5]. The development and effective use of teacher technology can be realized properly if there are human resources who manage it. They are individuals who have experience and expertise in carrying out activities, and this success is highly dependent on the availability of teachers who are educated and trained in aspects of teacher technology [6] . Teachers hold important responsibilities in order to achieve learning objectives. A teacher must have various abilities as skills that must be possessed as a professional teacher [7]. Therefore, teachers must carry out learning activities appropriately such as selecting learning strategies, designing lesson plans, and selecting the right learning media.

Learning media is an instrument that can help in learning mathematics [8]. According to Cahdriyana & Richardo, the media has the nature of being used as props and students as observers of the media displayed by the teacher [9]. Mathematics is a subject that is given to all students from elementary school level to high school level even to college [10]. This is because mathematics has the advantage of being able to solve a variety of simple problems to complex problems in everyday life that require mathematical knowledge [11]. According to Avanda & Putri, math is a difficult subject for some students in high school [12]. As we know, teachers more often use conventional methods in learning. Reinforced by Handayani's statement that the facts in the field show that not a few teachers use the lecture method in conventional methods [1]. Therefore, it is necessary to have media as a tool to help convey learning material. There are many types of media that can be utilized by teachers in learning activities, but teachers need to be careful in selecting these types of media [13].

In today's digital era, the utilization of technology as a learning medium can be an option for both teachers and students. Learning media with technology that is often used by teachers is by using applications that can help in completing tasks given by teachers [14]. The use of technology as a learning tool by students includes the use of applications that assist them in completing the tasks given by the teacher [15]. One of the applications that can help complete tasks, which in this case is a math task, is the photomath application. Photomath is an application that is used by utilizing the camera in a smartphone to solve math questions [8]. Photomath besides being able to solve

problems, there is also a feature to get a discussion about working on the problem completely and precisely [12]. The presentation of complete features along with the working steps is certainly much favored by students. Especially for students at the high school level who have been allowed to bring smartphones to school.

So in this study the authors will conduct a literature review on the effectiveness of the photomath application when used in every work in order to help students solve math problems. So, the author tries to conduct a literature review research with the title "The Effectiveness of Using Photomath Applications for Learning Mathematics for High School Students"

2 Methods

The method that the author will use is library research, which involves reading, recording, and analyzing literature or reading materials that are selected and considered relevant to the focus of the research. The literature is then filtered and presented theoretically in a framework of thought related to learning mathematics in high school. This technique aims to strengthen facts, compare differences or similarities between theory and practice that the author is researching.

The search was conducted on websites that provide a lot of data and information related to the research, especially those containing research journals on photomath applications. At the beginning of the research, the author collected research results as many as 12 articles. Furthermore, the author focused the research on the use of photomath applications, so that only 8 articles were the focus of the review.

The research process begins with creating a research matrix that includes the author's name, research background, research methods, research results and discussion and the author's perspective. This matrix aims to facilitate the author in reviewing the results of the research results. In reviewing each research result, the author examines the discussion and results in previous research.

3 Result and Discussion

3.1 Effectiveness

In essence, learning can be explained as the transformation of student behavior arising from the interaction between teachers and students. Therefore, it is expected that a learning process can take place smoothly and with satisfactory results. In this context, the word "effective" as defined in the Big Indonesian Dictionary, refers to the impact, success, efficacy, and stability in the implementation of learning [16]. Furthermore, Aan Komariah & Cepi Triatna explained that effectiveness is an evaluation carried out related to the achievement of individual, group, or organizational achievements. The evaluation is related to the expected achievement, and the goal is to optimize the assessment results effectively [17].

Learning is considered successful if students can understand the material well and efficiently. From this definition, it can be concluded that successful learning involves cause, effect and outcome. The characteristics of successful learning include the establishment of positive relationships with students, the existence of learning guidance, mutual love, the emergence of high motivation and interest in learning, and a supportive environment to develop students' abilities [18]. To achieve a common goal, good cooperation between teachers and students through positive reciprocal relationships is needed.

3.2 Photomath App

Photomath application acts as a tool to solve math problems. At the high school level, both science and social studies majors, math subjects are an important part of the curriculum. Photomath is considered a helpful tool in solving math assignments given by teachers. Many students utilize this application to overcome the difficulties they may face in solving math problems [12].

Students often find it difficult to solve math tasks and use Photomath as a tool to solve them. This is due to the obstacles or difficulties experienced by students in understanding these math problems. Therefore, Photomath is used as a solution to get the final answer to these math problems. It should be noted that the process provided by this application may not always be complete and can be different from the process taught by the teacher. Students only know the final result of the problem without understanding the whole process, and understanding the process may take longer [12].

3.3 Math Learning

The learning process involves interconnected communication, where teaching is done by the teacher as a teacher, while the learning process is done by students. Learning contains the concept of learning and teaching, and is a teaching-learning activity [19]. This learning applies to all subjects, one of which is mathematics learning.

One of the characteristics of the field of mathematics is the existence of abstract objects. This characteristic is often the cause of the dislike of most students towards learning mathematics. As a result, many learning materials are difficult to control properly, especially when conventional learning methods are applied that do not attract students' attention. As a result, complaints often arise that mathematics only confuses students and is considered as something scary for most of them [20]. It causes students to be afraid to solve math problems.

Mathematics learning involves two interrelated activities, namely learning and teaching activities. In the process of learning mathematics, both teachers and students act together as actors in achieving learning goals. The success of achieving this learning goal can be maximized if learning runs effectively. Effective learning is learning that successfully involves all students actively [21].

One of the objectives of learning mathematics at school is to train thinking and reasoning skills so that students can draw conclusions, develop skills in solving problems, and improve the ability to convey information or communicate ideas through various

means, such as oral, writing, pictures, graphs, maps, diagrams, and other forms of expression [22]. Thus it can help students in mastering mathematical material.

Based on the description above, the author concludes that the learning process, especially in the context of mathematics learning, involves communicative interaction between teachers and students. Mathematics learning has characteristics that include the existence of abstract objects, which are often a challenge for some students. Complaints about difficulties in understanding mathematics arise due to the use of conventional learning methods that are less interesting. The importance of the active role of both teachers and students in achieving mathematics learning goals is in the spotlight. In this case, mathematics learning is expected to help students master mathematical material better

3.4 Senior High School

Senior High School, or SMA, is one of the formal vocational institutions that organize general education at the secondary vocational level. SMA functions as a continuation of Junior High School (SMP), Madrasah Tsanawiyah (MTs), or other similar institutions, either as the next stage after completing junior high school or MTs with equal recognized achievements [23].

High school students refer to individuals between the ages of 16 and 18, who are experiencing the adolescent phase that ranges between 10 and 19 years old. Adolescence, which is a period of transition from childhood to adulthood, is characterized by various developments, including puberty (the desire to approach the opposite sex) and the search for self-identity. It is clear that high school students are in a phase of adolescence that is turbulent, stressful, and includes aspects of puberty, as well as the level of ability to think abstractly and interpret an object without having to rely on physicality or previous experience [23].

The management of Senior High Schools in Indonesia was initially carried out by the Central Government. However, with the advent of the reform era that brought the concept of regional autonomy, management is now handed over to the Central and Regional Governments in accordance with their respective authorities [23].

The implementation of guruan itself is carried out by the Government, both at the central and regional levels, and involves community participation. Specifically, for public senior high schools that were previously under the Ministry of National Education, after the implementation of regional autonomy in 2001, the responsibility shifted to provincial and district/city governments according to their authority. Teacher units under provincial jurisdiction include Special Education and Special Services, while formal and non-formal education is the responsibility of the district/city [23].

3.5 Study on the Effectiveness of Using Photomath Application in Student Mathematics Learning in Senior High School

The research results from 8 articles related to photomath applications. the author summarized them as the last step in this research methodology, as described below:

Table 1. Table captions should be placed above the tables.

No.	Author Name	Title
1	Rika Wijayanti, Cahyo Hasanudin	Utilization of Photomath Application in Mathematics Learning
2	Amelia Muslimah, Cahyani Ramadannia, Anita Fitri, Finda Dzakiroh, Jaka Wijaya Kusuma	Application of Multimedia Utilization in Photomath Application in Learning Trigonometry Class Xi Mipa V at Sman 3 Cilegon
3	Assabiq Yudhy Avanda, Salma Almira Wahyu Putri	Existence of Photomath Application in Mathematics Learning for High School Students
4	Rima Dwi Oktaviani, Tsamrotul Ilmiah, Nadirotus Sholihah, Rozita Apriliyani, Imron Fauzi	Utilization of Photomath Application as a Mathematical Problem Solving Media
5	Derianto Derianto	Improving Student Learning Outcomes on Function Material Using Photomath Application in Class X Sma Negeri 1 Montasik Aceh Besar
6	Zatman Payung, Yaya Kusuma, Endang Cahya.	Mathematics Learning with the Help of Mathematica and Photomath Software to Improve Mathematics Problem Solving of Prospective Elementary School Teachers Students
7	Mustika Fitri Larasari Sibuea, Muhammad Ardiansyah Sembiring, Iin Almeina, Raja Tama Andri Agus	Utilization of Photomath Application as Math Learning Media
8	Aulia Zakial Fikri, Putri Yulia, Rahmi Putri	Photomath Applications For Learning Mathematics Analysis

The results of the previous research literature review will be described below.

Research conducted by Wijayanti & Hasanudin found that the photomath application can be used by students as a tool in learning, making it easier for students to do problems and has a function to solve math problems by taking pictures. The utilization of photomath applications can be beneficial for students because it can help the mathematics learning process [8].Furthermore, research conducted by Muslimah in a journal

which has the results that the photomath application helps most students, but also has a negative impact such as lazy thinking and only relying on photomath in solving math problems without calculating manually. Photomath applications can also have a positive impact, namely students being able to know the answers to the math problems given [10].

Research conducted by Avanda & Putri showed that the results showed that 89.8% of students already knew the photomath application, 66.1% had used the photomath application, 79.7% of students said that the photomath application did not interfere with the math learning process and on average considered this application as an ordinary application. This photomath application is also helpful for most students, but also has a negative impact such as lazy thinking and only relying on photomath in solving math problems without calculating manually [12]. Then the research conducted by Oktaviani the results showed the benefits of the photomath application as a mathematical solution media in terms of features, performance in the photomath application. From the results of the study it can be concluded that the photomath application has benefits for its users, both in terms of features and performance [14].

Research conducted by Derianto which obtained research results showed that the use of Photomath applications can improve student learning outcomes as indicated by an increase in the average value of the pree test which is 44.83 increasing to 75.67 in the post test which is reinforced by the results of the hypothesis test, namely tcount> ttable (4.46>1.67) so that Ha is accepted [24]. Furthermore, research conducted by Payung showed that students' problem solving skills increased based on the form of conclusions given. Prospective elementary school teacher students are increasingly motivated to learn mathematics by utilizing Photomath and Mathematica software. Photomath and mathematical software can also complement each other to facilitate student learning and understanding [25].

Research conducted by Sibuea showed that the results obtained from the implementation of this activity were 80% of students were able to achieve a score of 75 or more, and this met the category of complete student learning outcomes and showed that students had been able to apply mathematical applications in understanding and solving mathematical problems [15]. Furthermore, research conducted by Fikri obtained the results of the author suggesting the use of photomath applications to assist teachers in teaching students to answer sample problems quickly and complete steps [26].

4 Conclusion

From the explanation above, it can be concluded that overall, the research results show that Photomath has great potential as a mathematics learning tool by providing benefits for students. However, it should be noted that the use of this application can also have negative impacts, such as excessive dependence and the tendency to be lazy to think manually. Therefore, a wise approach is needed in integrating this technology into the mathematics learning process.

Acknowledgments. Thank you to Universitas Alma Ata for funding and guiding during this research so that this research can be published.

References

1. Handayani, A. The effectiveness of using the Photomath application in increasing the learning interest of students in class VIII of Junior High School Negeri 2 Bajo. Palopo: IAIN PALOPO, 2022.
2. Salmah, Affan, S., & Fuadi, A. Analysis of the Benefits of Technology and Information in Supporting the Progress of Digital-Based Islamic Religious Education at MTs Nurul Islam Dusun IX Suka Maju Tanjung Pura Village. Edu Society: Journal of Teaching, Social Science, and Community Service, 2022, pp. 512-527.
3. Adawiya, R., Alin Sholihah, D., Richardo, R., Anis Abdullah, A., Najib Mubarrak, M., Nurul Azizah, F., Ananda, L., & Nur Cahyo, D. Development of Learning and Teaching Innovations in the Disruption Era Through Online and Offline Learning (Hybrid Learning System). Literacy Journal of Community Service and Innovation, Vol. 2(2), pp, 1440-1445. https://doi.org/10.58466/literasi.v2i2.1210
4. Dewi, A., Maulana, A., Nururrahmah, A., Ahmad, Naufal, A., & Fadhil, S. M. The Role of Technological Advances in the World of Teachers. Journal on Education, 2023, pp. 9725-9734.
5. Yuberti. Dynamics of Teacher Technology. Bandar Lampung: Institute for Research and Community Service, 2016.
6. Widyastuti, A. Introduction to Teacher Technology. Jakarta: Yayasan Kita Tulis, 2020.
7. Abdullah, A. A. The Role of Teachers in Transforming Culture-Based Mathematics Learning. Proceedings of the Mathematics and Mathematics Teacher Seminar, November, 2016. pp. 640-652. http://jurnal.fkip.uns.ac.id/
8. Wijayanti, R., & Hasanudin, C. Utilization of Photomath Application in Mathematics Learning. PROSIDING: Online National Seminar, 2023.
9. Cahdriyana, R. A., & Richardo, R, Characteristics of Computer-Based Learning Media. AlphaMath Journal of Mathematics Education, Vol.2(2), 2016, pp. 1-11.
10. Muslimah, A., Ramadannia, C., Fitri, A., & Kusuma, J. W. Application of Multimedia Utilization on Photomath Application in Learning Trigonometry Class XI MIPA V at SMAN 3 Cilegon. Indonesian Journal of THousand Literacies, 2023.
11. Istiqlal, M., & Wutsqa, D. UDevelopment of High School Mathematics Learning Multimedia to Increase Motivation and Achievement in Mathematics Learning Mathematics Logic Material. Pythagoras: Journal of Mathematics Teacher, 2013, pp, 44-54.
12. Avanda, A. Y., & Putri, A. SExistence of Photomath Application in Mathematics Learning for High School Students. Proceedings of Mathematics and Mathematics Teacher, 2020.
13. Hasan, M., Milawati, Darodjat, Harahap, T. K., Tahrim, T., Anwari, A. M., . . . Anwari, M. Tahta Media Group, 2021.
14. Oktaviani, R. D., Scientific, T., Sholihah, N., Apriliyani, R., & Fauzi, I. Utilization of Photomath Application as a Mathematical Problem Solving Media. Range: Journal of Guruan Mathematics, 2022, pp. 40-45.
15. Sibuea, M. F., Sembiring, M. A., Lubis, I. A., & Agus, R. T. Utilization of Photomath Application as a Mathematics Learning Media. Journal of Social Empowerment and Community Technology, 2022. pp. 109-115.
16. Djaka, Kamus Lengkap Bahasa Indonesia Masa Kini. Surakarta: Pustaka Mandiri, 2011,

17. Komariah, A., & Triatna, C. Visionary Leader Ship Toward Effective School. Bandung: Bumi Aksara, 2005.
18. Haidar, S, Learning Strategy. Medan: Perdana Publishing, 2014.
19. Ahmad, S. Learning and Learning Theory in Elementary School. Jakarta: Prenadamedia Group, 2016..
20. Wangge, MImplementation of ICT-Based Learning Media in the Mathematics Learning Process at School M. Fractal: Journal of Mathematics and Mathematics Teacher, 2020. pp.31-38.
21. Negara, H. S. Basic Concepts of Mathematics for PGSD. Bandar Lampung: AURA, 2016.
22. Rizqi, N., & Surya, E, An Analysis Of Students' Mathematical Reasoning Ability In VIII Grade Of Sabilina Tembung Junior High School. IJARIIE, , 2017, pp, 3527-3533.
23. Senior High School from Time to Time. Retrieved from repository.kemdikbud.go.id: (2023, December 22). https://repositori.kemdikbud.go.id/18468/1/SMA%20dari%20Masa%20ke%20Masa.pdf
24. Derianto, D. Improving Student Learning Outcomes on Function Material Using Photomath Application in Class X SMA Negeri 1 Montasik Aceh Besar. Scientific Journal of Guruan Students, 2023.
25. Payung, Z., Kusuma, Y., & Cahya, E. Mathematics Learning with the Help of Mathematica and Photomath Software to Improve Mathematics Problem Solving for Prospective Elementary School Teachers. Elementary Journal: Journal of Elementary School Teacher Training, 2022.
26. Fikri, Z. A., Yulia, P., & Putri, R. Photomath applications for learning Mathematics analysis, 2023