

Workshop of Technology-Based Mathematics Teaching Materials for Vocational High School Teachers

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ABSTRACT

The development of technology in the digital era 4.0 has an impact on education so that teachers are required to be able to apply technology in teaching. One of the efforts is by providing training about technology-based mathematics teaching materials for vocational high school teachers. The training activity is a community partnership program that aims to improve Vocational High School teachers' understanding in creating technology-based mathematics teaching materials and improve vocational high school teachers' skills in creating technology-based mathematics teaching materials. The method of implementing this community partnership program is in the form of workshop which include giving technology-based mathematics teaching materials, installing applications, applying technology-based mathematics teaching materials, interactive dialogue with presentation simulations, and evaluations as achievement indicators of the implementation of the community partnership program. The results of the community partnership program are in the form of technology-based mathematics teaching materials in mathematics learning. The results achieved are the improvement of Vocational High School teachers' understanding in creating technology-based mathematics teaching materials and improvement of Vocational High School teachers' ability in creating technology-based mathematics teaching materials.

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1. Introduction

The development of technology in the digital era 4.0 has an impact on education, especially in learning mathematics. Technology has benefits in learning mathematics, it can improve the quality of mathematics learning, technology supports learning more effectively and technology has an influence on the mathematics material being taught [1].



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Qualified mathematics learning shows that mathematics teachers are highly competent in teaching and have an impact on the quality of their students. In accordance with the opinion of [2]–[4] stated that the quality of teachers as a whole has a direct impact on the achievement of student competencies. [5], [6] states that every teacher must feel it is very important to understand how to continue learning to improve their competence in the context of meaningful learning so that it can increase the competence of students in every aspect of behavior that is the goal of learning both attitudes, knowledge, and skills. The task of a teacher is complex and must pay attention to the balance between teaching and learning [5].

One of the teacher's duties, including innovating mathematics learning using technology. Technology in education is very useful for mathematics, particularly in mathematics applications, especially mathematics software [7]. In reality, mathematics teachers in Vocational High School (SMK) is rarely explore technology in teaching and learning process. Even though there is a curriculum for SMK that requires students to carry out fieldwork practices, resulting in reduction of face-to-face mathematics lessons, thus effective mathematics learning interactions is required for students who are practicing in fieldwork. In addition, almost all students have facilities that can be used to support learning when students carry out fieldwork practices, for example, Android phones and laptops. So far, these facilities have been underutilized by mathematics teachers in teaching materials at SMK, even though mathematics learning in schools that was previously conventional has gradually shifted to utilizes technology. This is because technology has not been used among SMK mathematics teachers. In this regard, mathematics teachers are required to utilize technology in teaching mathematics. Teaching materials in learning play an important role in improving the quality of learning so that students are more interested, happy, and understand the mathematics material.

One of the technology-based teaching materials is by applying applications in teaching and learning mathematics. The technology application applied in mathematics teaching materials is an application that has almost the same function as MS Word, both processing words but to display writing in digital form with the EPUB format, namely read-era. The read-era is an application that can be accessed anywhere with devices such as computers, laptops, or smartphones.

It is time for SMK mathematics teachers to take advantage of technology in teaching mathematics through technology-based teaching materials. The phenomena and situations that have been described, the community service team through the community partnership program with the partners of SMKN 1 Gedangan Malang Regency tries to solve the problem by providing a community partnership program to carry out community service, namely providing workshop of technology-based mathematics teaching materials for vocational teachers. This community partnership program aims to increase vocational school Teachers' understanding of the stages in making technology-based mathematics teaching materials and improve technology-based mathematics teaching materials skills for vocational high school teachers. The usefulness of this community partnership program activity is to broaden the knowledge of mathematics teachers at SMKN 1 Gedangan Malang Regency about technology, increase understanding of the stages of making technology-based mathematics teaching materials, and being skilled in using technology-based mathematics teaching materials. The target and output of this community partnership program are to produce technology-based mathematics teaching materials suitable for mathematics learning at vocational high school.

2. Methods

The method of implementing the community partnership program is by organizing workshops and mentoring of technology-based teaching materials for mathematics learning at vocational high school. In addition, the establishment of an active and dynamic focus group discussion and conducting teacher conferences to present the results of technology-based teaching materials by teachers involved in this activity, in order to obtain technology-based teaching materials suitable for mathematics learning. The material of the activity is by providing workshop of technology-based teaching materials includes understanding teaching materials, installing read-era applications, implementing, applying skills in learning mathematics and evaluation. The community partnership program are carried out for one month with partners of SMKN 1 Gedangan Malang Regency. The implementation of community service activities uses a laptop or android. This type of implementation of community partnership program is in the form of workshop that include installing applications, providing technology-based mathematics teaching materials, interactive dialogue with presentation simulations, and evaluations as indicators of achievement of the implementation of the community partnership program.

3. Results and Discussion

The implementation of activities with SMKN 1 Gedangan Malang Regency includes: 1) Creating mathematics material for SMK with applications, to facilitate teachers in understanding teaching material and applying it in teaching, 2) Conducting workshop of application with material about mathematics teaching materials for SMK; 3) Mentoring Workshop in Technology-based mathematics teaching materials with appropriate applications for vocational high school mathematics learning. In the workshop activities, the principles and steps of making vocational mathematics materials as teaching materials using the read-era application in vocational mathematics learning are also presented. After that, the teacher chooses the teaching material and is continued with workshop mentoring in making mathematics materials as teaching material for vocational high school with read-era application as well as discussion and question and answer.

Community partnership program with partners of SMKN 1 Gedangan Malang Regency is carried out as the following photo documentation:



Figure 1. Workshop on Technology-Based Mathematics Teaching Materials



Figure 2. Mentoring for Workshop of Technology-Based Mathematics Teaching Materials

The achievement of the community partnership program is by providing workshop in technology-based mathematics teaching materials by improving teacher's understanding of the stages or steps of application in technology-based mathematics teaching materials with the process in the following scheme:

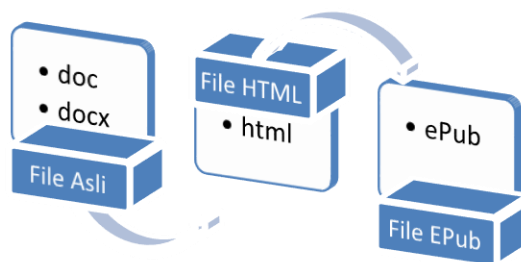


Figure 3. Digital Process of Technology-Based Mathematics Teaching Materials

The results of the community partnership program are also proved in the improvement of skills in making technology-based teaching materials with the results of teaching materials in the Read-era application as follow:

Pertidaksamaan

Dermasalahan Matematika yang berkaitan dengan interval terletak pada pertidaksamaan aljabar. Himpunan jawab atau solusi dari pertidaksamaan aljabar merupakan salah satu dari bentuk interval di atas. Adapun penjelasannya diberikan berikut.

Bentuk umum pertidak samaan aljabar:

$$\frac{A(x)}{B(x)} < \frac{C(x)}{D(x)}$$

$A(x), B(x), C(x)$ dan $D(x)$ merupakan suku banyak (tanda $<$ atau $\geq, >$).

Himpunan semua bilangan real x yang memenuhi pertidaksamaan disebut **himpunan penyelesaian atau solusi pertidaksamaan**.

Cara mencari solusi pertidaksamaan aljabar sebagai berikut:

- Nyatakan pertidaksamaan tersebut sehingga didasarkan salah satu ruasnya menjadi nol.

$$\frac{A(x)}{B(x)} - \frac{C(x)}{D(x)} < 0$$

Kemudian sederhanakan bentuk ruas kiri, misal:

$$\frac{P(x)}{Q(x)} < 0$$

- Cari dan gambarkan pada garis bilangan semua pembuat nol dari $P(x)$ dan $Q(x)$.
- Tentukan setiap tanda ($+$ atau $-$) pada setiap interval yang terjadi dari garis bilangan di atas. Interval dengan tanda ($-$) merupakan solusi pertidaksamaan.

Pertaksamaan dengan Nilai Mutlak

Secara azometris, nilai mutlak atau nilai absolut dari bilangan real x didefinisikan sebagai jarak dari x terhadap 0, sehingga nilai mutlak dari setiap bilangan selalu bernilai positif. Notasi yang digunakan adalah:

$$|x| = \begin{cases} x, & x \geq 0 \\ -x, & x < 0 \end{cases}$$

Sifat-sifat nilai mutlak:

- $|x|^2 = x^2$ dan $|x| = \sqrt{x^2}$
- $|x| < a \Leftrightarrow -a < x < a$
- $|x| > a \Leftrightarrow x < -a$ atau $x > a$
- $|x + y| \leq |x| + |y|$ (ketidaksamaan segitiga)
- $|xy| = |x||y|$
- $\frac{|x|}{|y|} = \frac{|x|}{|y|}$
- $|x| < |y| \Leftrightarrow x^2 < y^2$

Contoh:

- Selesaikan pertidaksamaan $|3x - 5| \geq 1$
- Misalkan ϵ (eposilon) adalah bilangan positif. Tunjukkan bahwa:

$$|x - 2| < \frac{\epsilon}{5} \Leftrightarrow |5x - 10| < \epsilon$$

Figure 4. Technology-Based Mathematics Teaching materials

The results of the implementation of the community partnership program are the improvement of teacher's understanding and skills in technology-based mathematics teaching materials with read-era applications and skills in using applications of mathematics learning for teachers of SMKN 1 Gedangan Malang Regency. The improvement of understanding and application skills of mathematics teaching materials in SMK is indicated by the creativity of the participants in producing technology-based mathematics teaching materials with the read-era application which is feasible to be implemented for mathematics learning in vocational high school with an achievement of 85%. This is in accordance with the opinion [8], [9] which states that it is a pleasant experience when educators deliver mathematics material using an interesting application, by accessing the internet and using applications. In addition, the positive response from the teachers of SMKN 1 Gedangan Malang Regency in the activities and active involvement when practicing the application reflects the enthusiasm in participating the workshop activities. This is in accordance with the opinion [9], [10] which states that the delivery of visual material through computer technology is very important, provided that the program design is structured and easily understood by students. The results achieved are an improvement in understanding the stages of making technology-based mathematics teaching materials and an improvement of skills in making technology-based mathematics teaching materials.

4. Conclusion

Community partnership program through training workshops and mentoring of technology-based mathematics teaching materials can improve the understanding and skills of teacher in using read-era applications for mathematics teaching materials at SMK and technology-based mathematics teaching materials preparation skills, so that the materials are suitable for mathematics learning at Vocational High School in Malang Regency.

References

- [1] NCTM, *Principles and Standards for School Mathematics*. 2000.
- [2] R. A. Rahman, Y. M. Yusof, H. Kashefi, and S. Baharun, "Developing Mathematical Communication Skills of Engineering Students," *Procedia - Social and Behavioral Sciences*, vol. 46, 2012, doi: 10.1016/j.sbspro.2012.06.472.
- [3] I. Jalapang and A. Raman, "Effect of instructional leadership, principal efficacy, teacher efficacy and school climate on students' academic achievements," *Academic Journal of Interdisciplinary Studies*, vol. 9, no. 3, 2020, doi: 10.36941/ajis-2020-0043.
- [4] M. Lampert *et al.*, "Keeping It Complex: Using Rehearsals to Support Novice Teacher Learning of Ambitious Teaching," *Journal of Teacher Education*, vol. 64, no. 3, 2013, doi: 10.1177/0022487112473837.
- [5] J. Loughran, *what expert teachers do: Enhancing professional knowledge for classroom practice*. 2012.
- [6] J. V. Berrocoso, M. del C. G. Arroyo, and M. J. S. Díaz, "Educational policies for the ICT integration in Extremadura and their effects about innovation and teaching-learning process Teachers Perceptions," *Revista de Educacion*, vol. 352, 2010.
- [7] Marsitin, Retno; Rahayu Sesanti, "Pelatihan Software Matematika Maple bagi Mahasiswa Pendidikan Matematika Universitas Kanjuruhan Malang," in *Seminar Nasional Pengabdian Masyarakat 2016*, 2016, pp. 204–208, [Online]. Available:

[https://semmas.unikama.ac.id/lppm/prosiding/2016/PENELITIAN/SAINSDAN/TEKNOLOGI/Retno Marsitin Pengabdian 2016.pdf](https://semmas.unikama.ac.id/lppm/prosiding/2016/PENELITIAN/SAINSDAN/TEKNOLOGI/Retno%20Marsitin%20Pengabdian%202016.pdf) .

- [8] J. Yang, Y. Qiao, X. Zhang, H. He, F. Liu, and G. Cheng, "Characterizing user behavior in mobile internet," *IEEE Transactions on Emerging Topics in Computing*, vol. 3, no. 1, 2015, doi: 10.1109/TETC.2014.2381512.
- [9] A. J. Moreno-Guerrero, I. Aznar-Díaz, P. Cáceres-Reche, and S. Alonso-García, "E-learning in the teaching of mathematics: An educational experience in adult high school," *Mathematics*, vol. 8, no. 5, 2020, doi: 10.3390/MATH8050840.
- [10] A. Casey, R. Layte, S. Lyons, and M. Silles, "Home computer use and academic performance of nine-year-olds," *Oxford Review of Education*, vol. 38, no. 5, 2012, doi: 10.1080/03054985.2012.731207.