Journal of Mathematics and Mathematics Education
https://jurnal.uns.ac.id/jmme

p-ISSN 2089-8878; e-ISSN 2715-8276
Vol. 13, No. 2, December 2023

STUDY ON THE SUITABILITY OF MATHEMATICS LEARNING MEDIA TO INCREASE INTEREST OF VOCATIONAL STUDENTS THROUGH MEDIA LEARNING EXHIBITION ACTIVITY

Rubono Setiawan[1,*], Henny Ekana Chrisnawati[1]

[1]Mathematics Education Department, Faculty, Faculty of Teacher Training and Education Sciences, Universitas Sebelas Maret, Surakarta, Indonesia

*Correspondence purposes, email: rubono.matematika@staff.uns.ac.id

Abstrak: Dalam penelitian ini diberikan hasil analisis kesesuaian beberapa media pembelajaran nyata dan maya untuk meningkatkan minat siswa dalam pembelajaran matematika khususnya adalah siswa Sekolah Menengah Kejuruan (SMK). Media pembelajaran nyata dan maya disajikan dalam suatu kegiatan gelar karya yang juga merupakan bagian dari kegiatan pengabdian kepada masyarakat di SMK Warga Surakarta. Dalam kegiatan gelar karya tersebut, tim mahasiswa bersama dengan dosen memberikan penjelasan tentang cara kerja media pembelajaran yang dipresentasikan. Kemudian guru matematika SMK sebagai pengguna memberikan penilaian dan analisis terhadap kesesuaian media pembelajaran yang disajikan. Hasil informasi yang diperoleh dalam kegiatan gelar karya, data observasi, lembar validasi instrumen, dan informasi – informasi tentang media pembelajaran akan disajikan secara diskriptif kualitatif. Selain itu juga diperoleh informasi saran perbaikan dan pengembangan yang dapat dilakukan untuk meningkatkan kualitas media pembelajaran. Berdasarkan analisis kualitatif diskriptif yang telah dilakukan, media pembelajaran nyata dan maya yang disajikan dianggap valid, sesuai dan dapat digunakan dalam proses pembelajaran untuk meningkatkan minat siswa.

Kata kunci : *Media Pembelajaran Matematika, Gelar Karya, Minat Belajar*

Abstract: In this research, an evaluation was carried out to determine the suitability of different hands-on and digital learning tools designed to stimulate students' enthusiasm for mathematics, especially those in Vocational High Schools (SMK). These physical and digital educational resources were showcased during an exhibition, which was part of community engagement initiatives at SMK Warga Surakarta. During this event, a team of students and professors elucidated the functioning of these educational tools. Following this, math teachers from SMK, the intended users, provided assessments and analyses regarding the suitability of the demonstrated educational tools. Information collected from the exhibition, observations, validation records, and specifics about the educational tools were presented in a detailed and qualitative manner. Additionally, feedback for enhancements and advancements to elevate the quality of educational tools was gathered. Based on the qualitative descriptive analysis

Accepted: October 10, 2023 Approved: November 16, 202 Published: December 12, 2023
DOI: https://dx.doi.org/10.20961/jmme.v13i2.79592

undertaken, both the physical and digital educational tools presented were deemed valid, fitting, and practical for the learning process, effectively augmenting students' interest.

Keywords: Mathematics Learning Media, Learning Exhibition, Learning Interest

INTRODUCTION

Teachers face a challenge in boosting students' enthusiasm for learning. Students' disinterest in mathematics often stems from various factors, including their inability to grasp the practical applications of math in daily life. This situation can lead to a diminished motivation to engage with the subject. Additionally, some students struggle with intricate math concepts, eroding their confidence in participating actively in math lessons. Less engaging and interactive teaching methods also contribute to this issue.

Using learning media is one of the methods that can be used to increase students' interest in learning. Various factors such as the complexity of the subject matter, the perception of the difficulty of mathematics lessons, and the lack of connection between the material and the real world can often be solved by using appropriate learning media in the learning process. Through the right approach, teachers can also develop more creative learning methods and increase students' interest in learning. The problem of interest in mathematics subjects in vocational schools can also be resolved by using appropriate and interesting mathematics learning media, either in the form of real teaching aids or mathematics learning media in the form of IT-based learning videos. This can be seen in several research results by Herawati, et al. (2021), Zakiy, et al. (2018), Sugiyati (2016), Amaliah, et al. (2022), Ekayani (2017), Deviana and Prihatnani (2018), and Prasetya (2016).

Before learning media is used in the learning process, the learning media can be reviewed for suitability first. One way is through learning media exhibitions. In the learning media exhibition activity, learning media will presented and detailed in how the media works. Then the user, in this case, the teacher, will provide comments, suggestions, and corrections, and also validate the suitability of the media. In this article, we will present an analysis of the suitability of using mathematics learning media, both real products and virtual, to be used in the learning process. The analysis was carried out based on the results of learning media exhibition activities which were the result of the integration of the results of community service activities at SMK Warga Surakarta.

p-ISSN 2089-8878; e-ISSN 2715-8276

RESEARCH METHOD

The findings presented in this article stem from a series of community engagement initiatives carried out at SMK Warga Surakarta, which included showcasing educational math tools. The research methodology employed here is qualitative and descriptive. Descriptive methods were utilized to offer comprehensive insights into the features of both tangible and digital math instructional materials developed. Moreover, a qualitative approach was adopted to illuminate the influence of the existing instructional materials. Interviews were conducted with teachers, and the end-users, to delve deeper into their experiences and perspectives on utilizing the showcased math instructional materials. Additionally, feedback from teachers was gathered through evaluations of the math instructional materials presented during the exhibition event.

RESULTS AND DISCUSSION

The learning media discussed in this paper were crafted by a group of undergraduate mathematics education students, guided by faculty members in mathematics education: Dr. Rubono Setiawan, S.Si., M.Sc., Henny Ekana Ch., S.Si., M.Pd., and Ira Kurwniawati, S.Si., M.Pd.. These educational materials were developed as part of the instructional media course curriculum. The team created two types of learning tools: real and virtual. Specific tools were chosen from these options, considering their appropriateness for the characteristics of SMK students. This selection aimed to implement these educational materials in the exhibition event. The event was organized to inspire and offer additional insights to collaborating mathematics teachers, enabling them to develop teaching methods that boost students' interest and motivation in learning.

Real product learning media refers to physical materials or objects used in the learning process. Examples of such media include some math objects, physical models, math games, and other teaching aids. The primary characteristic of real learning media is their capacity to facilitate direct interaction between students and the subject materials. Some of the main advantages of this type are given in the following explanation.

1. Students can directly touch and interact with the real learning media. This interaction makes students better understand mathematical concepts related to the media.
2. The real media allows students to experience mathematical concepts in a real and visible context. These processes connect abstractions to situations in everyday life.
3. Providing strong visual representations to the students

Learning media in the form of virtual media refers to learning materials presented in digital or online formats, such as instructional videos, interactive simulations, learning applications, and e-learning platforms. The main characteristics of virtual media are flexibility and accessibility. These allow students to access learning materials anytime and anywhere. Here are the main advantages of this type of media.

1. Virtual media often incorporate interactive elements that enable students to actively participate in the learning process.
2. Students can access learning materials or models from various devices like computers and smartphones.
3. Virtual media can present content in interesting formats, such as animations, videos, and interactive graphics, which enhance students' interest and understanding of the material.

The learning media exhibition event is one of the dissemination models used to showcase the created learning media to potential users (teachers). During this event, the users can gain new experiences with various engaging mathematics learning media. Moreover, the teacher can provide feedback and corrections for the showcased learning media. These corrections and feedback are invaluable and can be utilized to modify the learning media in the future making them more suitable for the users' characteristics. In this paper, explanations and analyses will be provided for examples of real and virtual learning media used in the exhibition event. There are three real learning media used, namely named: KOLOM, KOLITRI, and P3T. Here are the explanations and suitability analyses for these media.

KOLOM. KOLOM is an acronym for "Kotak Logika Matematika" (Mathematical Logic Box). This media was created by a team of students from the Mathematics Education Program, including Aisyah Pramudita, Dilla Aulia Ramadhanti, Nada Ayu Pramudita, Rachma Lutfiana, Ridho Dwi Saputra, and Wulan Ramadhany. The overview of the KOLOM media is presented in the following figure.

Figure 3.1. Media KOLOM (Pramudita *et al.* (2023))

This learning media is created with the main topic being mathematical logic (conjunction and disjunction). The media is designed based on the principles of electrical circuits. According to the

p-ISSN 2089-8878; e-ISSN 2715-8276

instructional media report compiled by Pramudita *et al.* (2023), the following are the benefits of this media.

1. Visualizing Logical Concepts: This learning media is designed with various electrical circuits that help students visualize mathematical logic concepts more concretely. Each light installed in the electrical circuits represents the truth value of statements. Then, this visual representation guides students to see how truth values change with different inputs.
2. Increasing Engagement and Interaction: Students can directly interact with various switches in each type of electrical circuit. They can control inputs (turn switches button on or off) and observe the changes in the lights. Through this process, student engagement is enhanced.
3. Developing Problem-Solving Skills: This learning media helps students practice problem-solving skills and logical thinking. Moreover, students can try different input combinations, observe the results, analyze patterns, and understand the underlying logical principles.
4. Understanding Logical Concepts: The media aids students in understanding basic logical concepts concretely by visualizing truth values through the illumination of lights.

Still, according to Pramudita *et al.* (2023), the strengths and weaknesses of this media are as follows:

Advantages:

1. Clear Visualization: The media provides clear visual representations of basic logical concepts.
2. Interactive and Enjoyable: The interactive aspect of the media makes learning enjoyable for students.
3. Problem-Solving Development: The media aids in the development of problem-solving skills.

Disadvantages:

1. Complexity: The circuit of lights has limitations regarding the number of inputs and propositions (statements) it can handle. Hence, it cannot be used to teach highly complex logical concepts.
2. Cost and Maintenance: Creating the "KOLOM" media involves high costs. Moreover, maintenance and regular check processes are required.

In summary, while "KOLOM" offers clear visualizations, and interactivity, and enhances problem-solving skills, it does have limitations concerning the complexity it can handle and the associated costs of creation and maintenance. Despite its limitations, the strengths of this media align well with the characteristics of the SMK learning process the majority of which have disciplines related to machinery and electronics. The hands-on and interactive nature of the "KOLOM" media makes it particularly suitable for vocational schools that focus on fields such as machinery, vehicles, and electronics. The exhibition event was specifically conducted in vocational high schools specializing in these areas, enhancing its relevance and effectiveness for students in these fields.

KOLITRI. KOLITRI is an acronym for "Kotak Lingkar Trigonometri" (Trigonometry Circle Box). This tangible learning media was created by students from the Mathematics Education undergraduate program, including Raras Barokah Nursalima, Muhammad Febby Angga, Camelia Theana Rahmawati, Muhammad Mafaza Rabbani, Rayhan Akmal Hidayat, and Rosyida Syafa Khoira. Based on a media report from Nursalima *et al.* (2023), KOLITRI media can be described as follows:

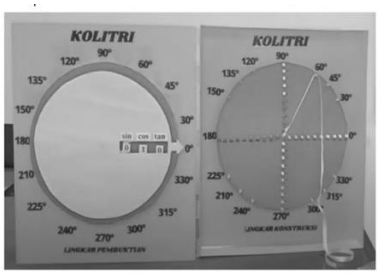

Figure 3.2. KOLITRI (Nursalima, *et al.* (2023))

This learning media was created to help students understand trigonometry concepts more easily. A tutorial on how to use this media can be found at uns.id/TutorialPenggunaanKolitri. According to Nursalima, *et al* (2023), the strengths and weaknesses of KOLITRI media are as follows:

Advantages:

1. Novelty: There are no similar media available (innovative).
2. Visual Learning Style: It caters to visual learning styles, allowing students to operate the learning tool by themselves.
3. Collaboration and Interaction: This tangible media allows direct collaboration and interaction among students.

Disadvantages:

1. Small Size: The size of the learning tool is too small, making it unsuitable for use in large classrooms.
2. Heaviness: The learning tool is too heavy, making it impractical to carry around.
3. Fragile Material: The material is vulnerable to damage, detachment, and breakage.

In summary, KOLITRI offers a fresh approach to teaching trigonometry with its interactive style, but it has limitations in terms of size, weight, and material durability.

P3T. P3T stands for "Papan Pergeseran Pencerminan Transformasi Geometry" (Board of Sliding Reflection Geometric Transformations). This tangible learning media was created by a team of students from the Mathematics Education undergraduate program, including Marsella Friskana Putri, Alifia Qolbiyatus Syifa, Canting Muktiningrum, Dwija Hasta Gavrila, and Wildan Rifa'i. As quoted from Puteri *et al.* (2023), the P3T media can be described in the following figure.

p-ISSN 2089-8878; e-ISSN 2715-8276

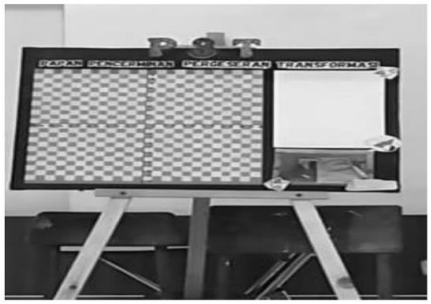

Figure 3.3. Learning Media P3T (Puteri *et al.* (2023))

The purpose of creating the P3T media is to facilitate students' learning of geometric transformations, especially translation and reflection. According to Puteri *et al.* (2023), the working mechanism for reflection is as follows: (1) Known points are applied in coordinates on the P3T board to form a shape, (2) Determining the distance between the known points and their reflections, (3) Forming a shape with the resulting reflected points. For translation, steps (1) and (3) are the same, but step (2) is modified. Each known point is measured concerning a shifting point. If the x-coordinate is positive, shift to the right; if negative, shift to the left. If the y-coordinate is positive, shift upwards; if negative, shift downwards. This media has several advantages, including its aesthetically pleasing design, aiding students in understanding the concepts of translation, reflection, and providing additional motivation for learning. However, its limitations include not covering all learning material in transformation geometry (for example, it doesn't explain dilation and rotation concepts) and being challenging to transport due to its size.

In addition to real media, this paper also discusses a digital media called TRIGOPEDIA, developed by a team of students from the Mathematics Education undergraduate program, including Alifta Nurillah Kosasih, Bagus Aqil Saputra, Fatikha Nabila Az Zahra, Hervany Chuswatun Hasanah, Ririn Dwi Is Yulianti, and Ruqoyyatul 'Ulya Ummul' Uluum. TRIGOPEDIA is designed to solve right-angled triangle problems involving trigonometric ratios and their applications. This digital media utilizes the Smart Apps Creator software integrated with Google Forms and Geogebra, providing an interactive and engaging learning experience for students. According to Kosasih *et al.* (2023), the advantages of TRIGOPEDIA include its interactivity, concept visualization, accessibility, flexibility, and progress monitoring. However, it has limitations such as dependence on technology access, lack of direct guidance, and constraints on additional materials.

The exhibition event was chosen as a form of dissemination and testing before the learning media products could be directly used by students in the learning process. This exhibition took place after the

learning media had been prepared by the undergraduate students of the mathematics education team. During the exhibition, the student development team presented and demonstrated the functionality of the learning media (real and virtual). Furthermore, teachers which is as users, were asked to fill out an assessment instrument. This user assessment instrument consisted of 8 questions, which are as follows:

1. Alignment with learning objectives
2. Concept attainment
3. Ease of use
4. Potential to generate students' interest and motivation when used in individual or classroom learning.
5. Potential for individual student learning and/or teaching aid for teachers.
6. Likelihood to promote students' critical thinking and problem-solving abilities.
7. Contextual relevance with real-life applications suitable for students' characteristics.
8. Potential for further development.

Each statement in the assessment instrument had a scoring range from 1 to 5, where 1 = not suitable /relevant/possible, 2 = somewhat suitable/relevant/possible, 3 = sufficiently suitable/relevant/possible, 4=suitable/relevant/possible, and 5= highly suitable/relevant/possible. During the exhibition of learning media, three teachers from SMK Warga Surakarta served as evaluators or filled out these assessment instruments. In addition to completing the instruments, teachers were also asked to provide suggestions for improvement and increasing the quality of the learning media. Based on the evaluation results from the teachers, a summary was compiled in the following table.

Table 1. Score Recapitulation For Each Aspect of Learning Media

Learning Media	Aspect dan Score Recapitulation
KOLOM	Aspect 1 = Score 5 =2, Aspect 2 = Score 5 =2, Aspect 3 = Score 5 =2, Aspect 4 = Score 5 =2, Aspect 5 = Score 5 =2, Aspect 6 = Score 5 =2, Aspect 7 = Score 5 =2, Aspect 8 = Score 5 =2,
KOLITRI	Aspect 1 = Score 5 =2, Aspect 2: Score 4 = 1, Score 5= 1 Aspect 3: Score 5 = 2, Aspect 4: Score 4 =1, Score 5 =1 Aspect 5: Score 4 =1, Score 5 =1, Aspect 6: Score 3 =1, Score 5=1 Aspect 7: Score 3=1, Score 4 =1, Aspect 8: Score 4=1, Score 5=1
P3T	Aspect 1: Score 5 = 2, Aspect 2: Score 5 = 2, Aspect 3: Score 5 = 2 Aspect 4: Score 4 = 1, Score 5 = 1, Aspect 5: Score 5 = 2

p-ISSN 2089-8878; e-ISSN 2715-8276

	Aspect 6: Score 4 =1, Score 5 = 1, Aspect 7: Score 3 =1, Score 4=1 Aspect 8: Score 5=2
TRIGOPEDIA	Aspect 1 : Score 5 = 2, Aspect 2 : Score 5 = 2, Aspect 3 : Score 5 = 2 Aspect 4: Score 5 = 2, Aspect 5: Score 5 = 2, Aspect 6: Score 4 = 1, Score 5 = 1, Aspek 7: Score 3 = 1, Score 4 = 1, Aspect 8: Score 5 = 2

Based on Table 1, the majority of the scores given were 4 and 5 for each evaluation aspect, indicating that the presented learning media received excellent ratings from the evaluating teachers as validators. The lowest score was 3, indicating that there were still some aspects considered moderately suitable. However, this score only occurred in one or two evaluation aspects. Hence, it can be concluded that the learning media (real and virtual) presented during the exhibition event were highly suitable and can be regarded as effective learning media to increase vocational high school student's interest in mathematics. In addition to the evaluation scores, valuable feedback for improvement was provided for each presented learning media. Here is a summary of the suggestions and corresponding analyses based on the learning media conditions:

1. KOLOM: This media has the potential for further development. Teachers suggested adding content related to implications topics, bi-implications topics, inverses topics, and contrapositives. The media has proven to increase students' interest in learning.
2. KOLITRI: Despite its contextual relevance to real-life applications, teachers found it less engaging for teaching special angle trigonometry. They suggested adding information about the practical applications of KOLITRI in everyday life to make it more interesting.
3. P3T media has the potential for further development, especially for topics related to rotation and dilation. The size of the boxes in the media should be enlarged for easier use in teaching, as per teachers' feedback.
4. Virtual Media: TRIGOPEDIA: Trigopedia has the potential for further development. Teachers suggested adding concrete examples of how the material can be applied in real life. Additionally, it is advisable to develop this media for offline use to eliminate dependency on internet signals.

During the exhibition event, students had the opportunity to present their media products to potential users, namely the teachers. This interaction allowed teachers to provide valuable

feedback, offering a chance for refinement and improvement before these learning media are extensively used in the teaching and learning process.

CONCLUSIONS AND SUGGESTIONS

In the article, several instructional media created by a team of students and lecturer of faculty from the Mathematics Education undergraduate program at FKIP UNS have been discussed. These media include KOLOM, KOLITRI, P3T, and the virtual media Trigopedia. The exhibition event was chosen as the method for disseminating and testing these products. Based on the reviews conducted by teachers, who served as reviewers during the exposition event, it was concluded that these instructional media can improve students' interest in learning during the teaching process. Moreover, there is potential for further development with some improvements, particularly in expanding the coverage of broader subtopics.

ACKNOWLEDGMENTS

The authors would like to thank the mathematics teachers of SMK Warga Surakarta and the team of undergraduate students from the Mathematics Education Program for their contributions. Moreover, the authors would also like thank to the anonymous editors and reviewers for their valuable comments and suggestions, particularly to the Editor-in-Chief, which have improved the quality of this article.

REFERENCES

Amaliah, A., Faujiah, A.N., Habsah, D., Suhaibah, E., Zairah, Z. (2022). Analisis pemanfaatan media pembelajaran terhadap minat belajar matematika siswa, *Renjana Pendidikan Dasar*, 2 (3), 191 – 195.

Deviana, D.R. & Prihatnani, E. (2018). Pengembangan media monopoli matematika pada materi peluang untuk siswa SMP. *Jurnal Review Pembelajaran Matematika*, 3(2), 114-131.

Ekayani, P. (2017). Pentingnya penggunaan media pembelajaran untuk meningkatkan prestasi belajar siswa. *Jurnal Fakultas Pendidikan Universitas Pendidikan Ganesha Singaraja*, 2(1), 1-11.

Herawati, S., Sumaji, Ulya, H. (2021). Pengembangan media monopoli berbasis android untuk menumbuhkan kemampuan pemecahan masalah matematis dan minat belajar siswa, *Prosiding Seminar Nasional Pembelajaran Matematika, Sains, dan Teknologi*, Vol.1, 118-125.

p-ISSN 2089-8878; e-ISSN 2715-8276

Kosasih, A.N., Saputra, B.A., Zahra, F.N.A., Hasanah, H.C., Yulianti, R.D.I., Uluum, R.U.U. (2023). Laporan Pengembangan Media Pembelajaran Maya "TRIGOPEDIA". Program Studi S1 Pendidikan Matematika FKIP UNS.

Nursalima, R.B., Angga, M.F., Rahmawati, C.T., Rabbani, M.M., Hidayat, R.A., dan Khoira, R.S. (2023). Laporan Pengembangan Media Nyata "KOLITRI" Mata Kuliah Media Pembelajaran Matematika, Program Studi Pendidikan Matematika FKIP UNS.

Prasetya, F. (2016). Pengaruh media audion visual terhadap hasil belajar matematika, *Jurnal Kajian Pendidikan Matematika*, 1(2), 257-266.

Pramudita, N.A., Ramadhanti, D.A., Pramudita, A., Lutfiana, R., Saputra, R.D., dan Ramadhany, W. (2023). Laporan Media Pembelajaran Nyata" Kotak Logika Matematika, Program Studi Pendidikan Matematika, FKIP, Universitas Sebelas Maret.

Puteri, M.F., Syifa, A.Q., Muktiningrum, C., Gavrila, D.H., dan Rifa'i, W. (2023) Laporan Analisi Pengembangan Media Nyata Pembelajaran Materi, Program Studi Pendidikan Matematika FKIP, UNS.

Sugiyati (2016). Pengaruh mdia pembelajaran dan minat belajar terhadap hasil belajar matematika, *Jurnal Penelitian dan Penilaian Pendidikan*, 1 (2), 228-242.

Zakiy, M.A.Z., Muhammad, S., & Farida. (2018). Pengembangan media android dalam pembelajaran matematika, *TRIPLE S: Journals of Mathematics Education*, 1(2), 87-96.