

Feasibility Assessment of Interactive Multimedia as an Innovation for Mathematics Learning in Elementary Schools

Sri Winarni¹, Muhammad Akhyar², Sudiyanto³

¹ Sebelas Maret University, Indonesia; winnernes1@gmail.com

² Sebelas Maret University, Indonesia; makhaliya@yahoo.com

³ Sebelas Maret University, Indonesia; soeddie.fkipuns@gmail.com

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ABSTRACT

Mathematics is a subject that is full of challenges and practical tasks that students must be able to do, this of course must be in line with the availability of various appropriate and innovative learning tools and resources which can then be used by students to deepen the material. Through research that aims to develop an interactive multimedia, it is hoped that it can become one of the appropriate learning media for students to use. This type of research is a Research and Development (RnD) method that adopts a 4D development model (Define, Design, Develop, Disseminate), with a focus on extracting data on Development (D) which contains an assessment of the feasibility of media products, with data collection techniques, namely non-test through a questionnaire, accompanied by a questionnaire instrument validation sheet. The data will be analyzed descriptively using percentage conversion in order to describe the feasibility of multimedia products. The results show that interactive multimedia that has gone through an assessment process from each evaluator with details, namely the assessment of media experts 90.1%, material expert assessments 83.3%, linguistic experts assessment 98%, media developer assessments 89.9% and assessment of elementary school teachers 97%. Through the results of the assessment, it can be concluded that the product of innovation in the form of interactive multimedia for learning in elementary schools is included in the category suitable for use as learning media.

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Corresponding Author:

Sri Winarni

Sebelas Maret University, Indonesia; winnernes1@gmail.com

1. INTRODUCTION

Overall innovation and change related to digitizing learning content seems to be able to have a positive impact on facilitating student learning, therefore digital transformation in the education system

seems to really have to be a priority in order to fulfill learning content that is relevant to the current generation of students (Roemintoyo & Budiarto, 2021; Linden & OECD, 2016). In line with that, the COVID-19 pandemic event that hit the whole world became the motor of educational institutions to accelerate this transformation (Mulyanti et al., 2020). It is undeniable that 21st century life is synonymous with the integration of technology into various fields of life, without exception education (Anagün, 2018; Atherton, 2019). In the digital era, various challenges for teachers have stood before them, where teachers in this era must be able to become student facilitators and not be left behind in terms of ICT literacy (Tyan et al., 2020; Rusdin, 2018).

Having a role as a facilitator, of course, must be supported by the availability of adequate learning facilities and in accordance with the needs of subjects and students (Malik, 2018; Häkkinen et al., 2017). Therefore, teachers need learning media in both conventional and digital versions in order to convey the contents of learning materials to students. The use of media that is in accordance with student characteristics will certainly make it easier for teachers to facilitate learning, and students will feel facilitated during the learning process (Budiarto et al., 2021; Saputri et al., 2018), besides that learning media also has an important role in trying to create more meaningful and quality learning (Halimah et al., 2019; Purnasari & Sadewo, 2020).

Facts from the field based on observational activities in schools showed that there are still obstacles in the use of learning media, especially in mathematics subjects during the COVID-19 pandemic, for example, learning media is still limited to worksheets, presentation slides, and textbooks which are overall seems unable to accommodate mastery of the material well. The results of this field fact indicate that there is one important component in learning that cannot be optimized, such as technology to make it easier for students to understand the material. (Cvetković & Stanojević, 2017; Shatri, 2020), considering that according to several studies the contribution of learning media that is integrated with technology is quite large in achieving learning outcomes, rather than the use of text-based media and worksheets (Rahmawati & Ramadan, 2021; Singh, 2016).

Putting aside the presence of learning media in learning activities, is the same as allowing students to use one sense in learning, even though through the use of learning media that are in accordance with the characteristics of students, they will be able to have a positive psychological impact on students (Sutrisno & Siswanto, 2016; Aprilia et al., 2017; Nusir et al., 2013). As technology develops, the need for learning media to facilitate students is also increasingly varied, starting from e-modules, videos, websites, games, audio, to multimedia (H et al., 2021; Hapsari et al., 2019; Widyaningsih et al., 2020; Agustini et al., 2020; Bustanil S et al., 2019; Roemintoyo et al., 2022).

As technology develops, the need for learning media to facilitate students is also increasingly varied, starting from e-modules, videos, websites, games, audio, to multimedia (Roemintoyo et al., 2022; Han & Niu, 2019), as a technology that facilitates students to learn, interactive multimedia can be used as a platform to provide information, directions for investigations, and challenges for students to learn various things, for example making decisions independently (Amelia & Harahap, 2021; Tukenova et al., 2019). By making interactive multimedia an application program on gadgets, students can learn anywhere and anytime (GebreYohannes et al., 2016; S. Malik & Agarwal, 2012). Interactive multimedia is considered to tend to be more attractive than other media, although all media developed must be based on the results of a needs analysis (Budiarto et al., 2021; Cahyo et al., 2019).

Theoretical facts show that the use of interactive multimedia is considered effective for improving students' critical thinking skills (Emma Valensia Aurum & Herman Dwi Surjono, 2021; Suparno, 2018; Djamas et al., 2018), and has a high level of practicality to be used in the teaching and learning process, both by teachers and students (Weng et al., 2018; Shofa & Surjono, 2018). Besides that, through interactive multimedia it has also been proven to be able to train students' critical thinking skills, problem solving, increase literacy, train students' speaking or language skills (Emma Valensia Aurum & Herman Dwi Surjono, 2021; Sayono et al., 2020; Wang et al., 2019; Wang et al., 2019; Shamir et al., 2019). Disamping itu, penggunaan multimedia interaktif juga turut berkontribusi dalam peningkatan performa keaktifan siswa didalam kelas, khususnya pada mata pelajaran matematika (Caetano & Zaro, 2018). As one of the

important competencies to be mastered in this century, critical thinking skills are important to be mastered by students as a strategic set of reasoning skills to develop a form of reflective thinking that ultimately optimizes itself, including a commitment to using results as a basis for decision making and solving problems (Arifin, 2020; Hafeez, 2021).

Some relevant research and field facts showed that it can still be seen until now mathematics learning in elementary schools tends to be not optimal where students still think of mathematics as a difficult subject to understand, besides that mathematics learning also tends to focus on working on problems, not understanding concepts and practice. Through this research, it will be able to have an impact on novelty and innovation in mathematics learning in elementary schools, it cannot be denied that the role of interactive media is very possible to be optimized in learning activities, making it easier for students to understand learning material. This can be seen from the results of the study which showed that interactive multimedia contributed significantly to the improvement of academic achievement and mastery of students' skills. Therefore, an innovation that is deemed appropriate and in accordance with the needs of students is an interactive media product for learning mathematics in elementary schools.

The presence of interactive multimedia can be said to be in line with the needs and characteristics of students who are already accustomed to the presence of technology in their daily lives. Therefore, this study aims to develop an interactive media product for learning mathematics based on Android based on an assessment that it can and is feasible to use as an instructional media.

2. METHODS

This study adopted a research and development (RnD) approach, with the development procedure using a 4D procedure design in the order Define, Design, Develop and Disseminate (Gorbi Irawan et al., 2018; Sugiyono, 2018). However, the focus of this research is only on the Develop stage, which is to identify the opinions of experts regarding the feasibility of the product being developed. This study took samples consisting of three media experts, two material experts, and two elementary school teachers, two language experts and two practitioners of media development competence. Adopting non-test data collection techniques, with the instrument being a validation questionnaire for each sample (Widoyoko, 2012). The data analysis technique adopted in this study is a descriptive analysis technique with percentages to then describe the level of feasibility of the developed media.

Meanwhile, the validity of the instrument goes through an expert judgment process (Maisarah, 2019), where the instrument has been consulted first with an expert who has competence in these fields. The following shows the criteria for the percentage of data analysis for the feasibility level of the product being developed.

Table 1. Product Eligibility Criteria

No	Score (%)	Interpretation
1	<21%	Very unworthy
2	21 – 40%	Not feasible
3	41 – 60%	Feasible enough
4	61 – 80%	Feasible
5	81 – 100%	Very Feasible

Adaptation and modification of Bustanil S et al. (2019); Perdana et al. (2021)

3. FINDINGS AND DISCUSSION

In accordance with the research objectives and the research methods adopted, this research only focuses on assessing the feasibility of the multimedia product being developed, so in this section the results will be presented regarding the results of product development starting from the product display to the response results of each research sample. This research develops an interactive multimedia product for multiplication matrices. The multiplication matrix was developed after

previously carrying out the definition stage which consisted of context analysis, student analysis, task analysis, material analysis. The multiplication matrix was developed with the Smart App Creator (SAC) software.

The steps for developing media with SAC are installing SAC software on a laptop, creating a mindmaster, preparing the materials needed for multiplication interactive multimedia in the form of images and videos, making interactive multimedia according to a predetermined path. The following shows some views of the developed media products.

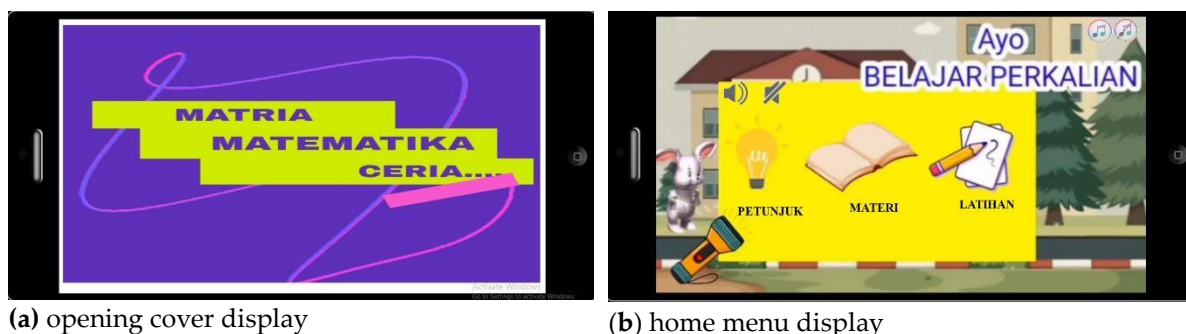


Figure 1. (a) opening cover display, (b) home menu display

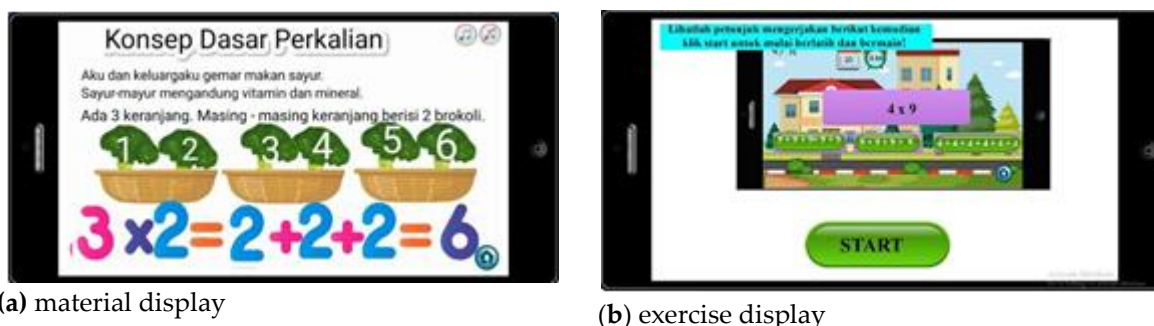


Figure 2. (a) material display, (b) exercise display



Figure 3. Display practice questions

Furthermore, to determine the feasibility of interactive multimedia multiplication matrices, media validation was carried out by 3 media experts, 2 material experts, 2 linguists, 2 media development practitioners and 2 teaching practitioners. The data of this study were obtained from filling out questionnaires given to 3 media experts, 2 material experts, 2 linguists, 2 media developer practitioners and 2 elementary school teaching practitioners to assess the feasibility of the multiplication matrix interactive multimedia developed. Before the validator fills out the questionnaire, the validator

conducts a trial first on the interactive multimedia that has been developed. The results of the validation test from media experts are shown in the following figure.

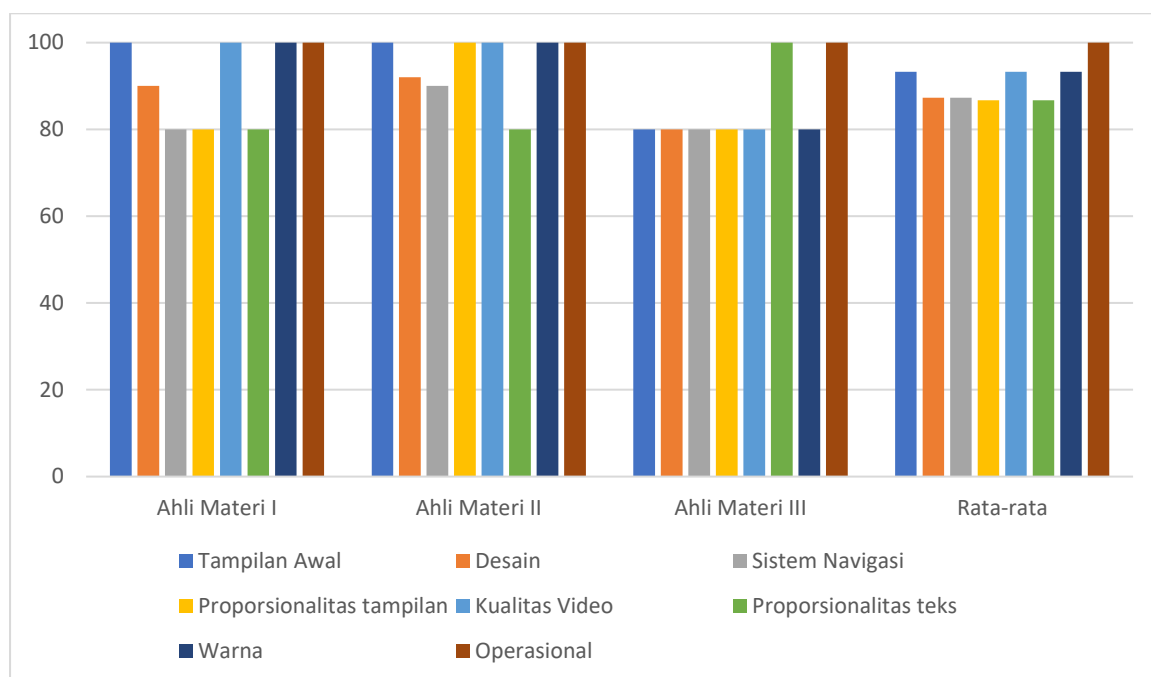


Figure 4. Media expert assessment results

Based on the assessment, it is known that the percentage of eligibility in terms of the attractiveness of the initial appearance of the media from the three experts obtained an average value of 93.3%. Based on the design aspect obtained an average of 87.3%. Aspects of the navigation system obtained an average of 80%. Aspects of choosing the type and size of letters to support more attractive media obtained an average of 86.7%. Aspects of the suitability of the video with the material obtained an average of 93.3%. The average aspect of the ease of reading text/writing is 86.7%. The average color selection aspect is 93.3% and the operational aspect average is 100%.

The results of the next assessment are material validation tests by material experts in the form of responses and assessments from material experts. The results of the assessment show that the percentage of eligibility in terms of the competency suitability aspect of the two experts obtained an average value of 90%. Based on the quality aspect of the material obtained an average of 90%. Aspects of the quality of the presentation of practice questions obtained an average of 85%. The following is a graphic illustration of the results of the material expert's assessment.

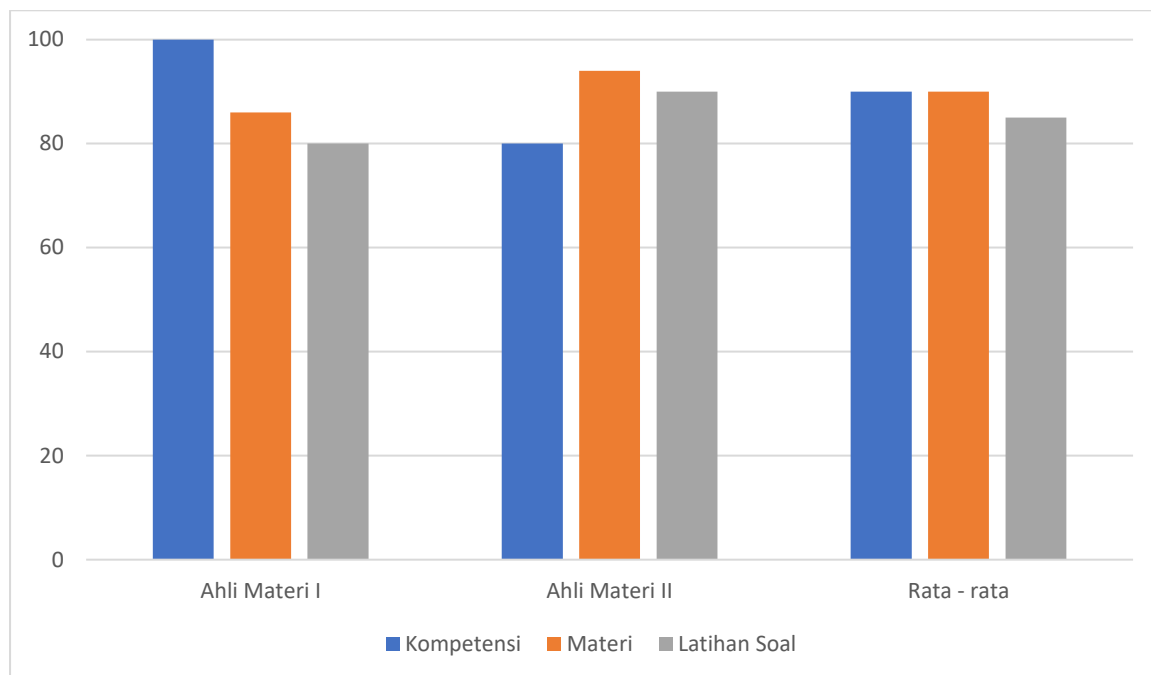


Figure 5. Material expert assessment results

Meanwhile, for the results of the language validation test by linguists in the form of responses and assessments from linguists, the percentage value of eligibility in terms of the clarity of usage instructions from the two experts obtained an average value of 100%. Based on the suitability of language with students' thinking level, it was obtained an average of 90%. Aspects of the suitability of language with the level of social emotional development of students obtained an average of 100%. The average aspect of the ability to encourage students' curiosity is 100%. The average aspect of politeness in language use is 100%. Below is a graphic illustration of a linguist assessor.

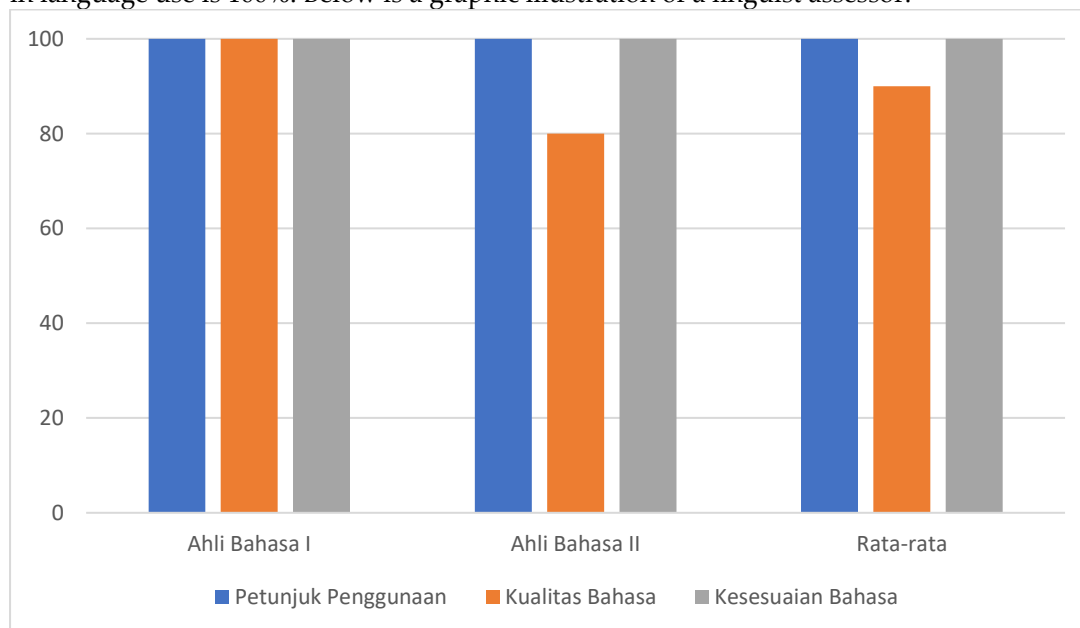


Figure 6. Hasil penilaian ahli bahasa

The results of the media validation test by media developer practitioners in the form of responses and assessments from media developer practitioners, obtained the percentage of feasibility results in terms of the attractiveness of the initial appearance of the media from the two media developer practitioners obtained an average value of 100%. Based on the design aspect obtained an average of 94%. Aspects of the navigation system obtained an average of 85%. Aspects of choosing the type and size of letters to support more attractive media obtained an average of 80%. Aspects of the suitability of the video with the material obtained an average of 100%. The average aspect of the ease of reading text / writing is 90%. The average color selection aspect is 90% and the operational aspect average is 80%. Here is a graphic illustration.

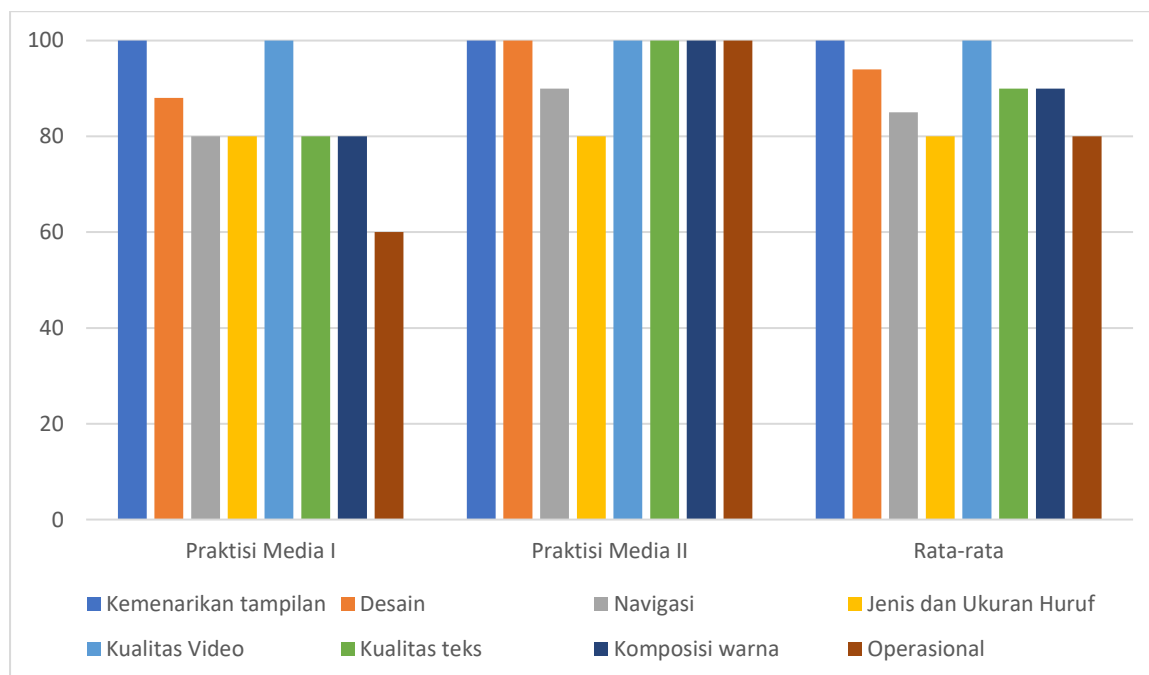


Figure 7. Media practitioner assessment results

The results of the media validation test by teacher practitioners identified that the percentage of eligibility in terms of the aspect of using interactive multimedia from the two teacher practitioners obtained an average value of 97%. Based on the material and practice aspects, an average of 96% was obtained. Aspects of language suitability obtained an average of 100%. The average of the layout aspect is 94%.

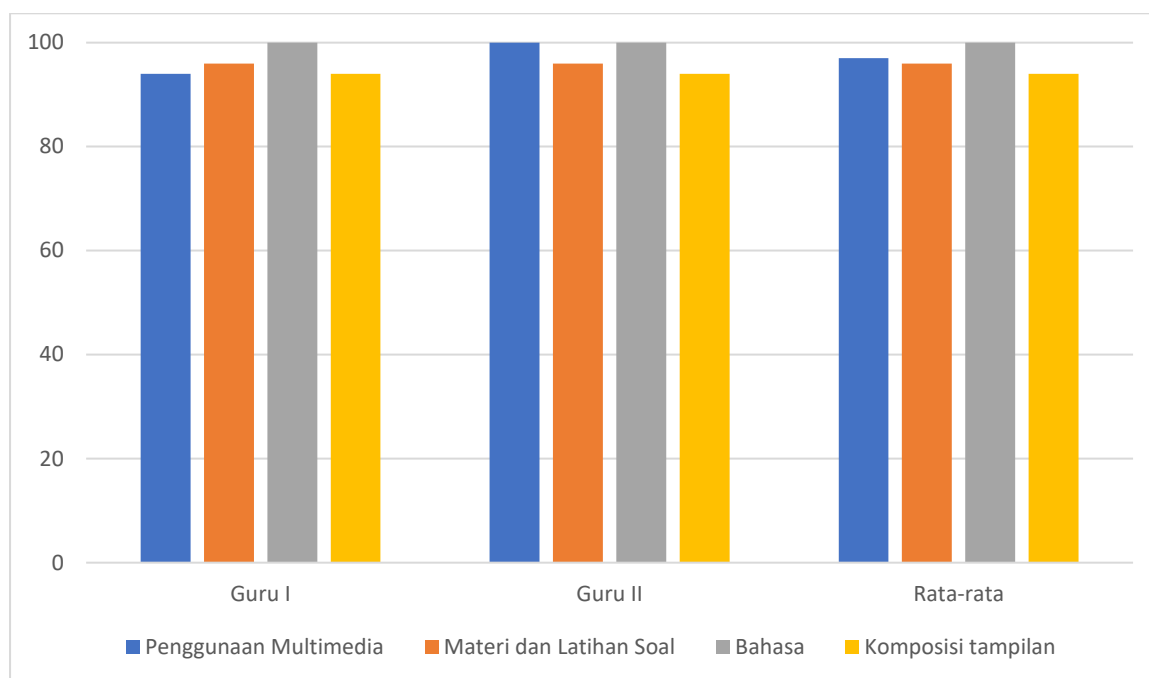


Figure 8. Teacher's assessment results

Discussion

Referring to several results, the average percentage of identification of multimedia products developed, media experts is 90.1%. This shows that the multiplication matrix interactive multimedia is very feasible to use. Based on material experts obtained an average of 83.3% which states that interactive multimedia multiplication matrix is very feasible to use. The average linguistics expert is 98% also stated that interactive multimedia multiplication matrix is very feasible to use. Meanwhile, the assessments from media developer practitioners and teachers obtained an average of 89.9% and 97%, respectively, which stated that the multiplication matrix interactive multimedia was very feasible to use. Overall, the assessment of this product states that the product is included in the worthy category to be used as a learning medium.

These results certainly cannot be separated from the advantages, interactive multimedia multiplication matrix has several advantages including interactive multimedia which is more attractive to students than the media used previously. Interactive multimedia is effectively used to improve students' critical thinking skills and is practically used in the learning process (Emma Valensia Aurum & Herman Dwi Surjono, 2021; Amelia & Harahap, 2021; Yulianci et al., 2021). The use of interactive multimedia can improve students' critical thinking skills through high-level problems that require critical thinking to be solved. As a result, this media can train students' critical thinking skills so that they are accustomed to critical thinking in solving a problem (Ziden & Abdul, 2013; Kadek Suartama et al., 2020).

Overall, the product developed is one of the innovations that is very suitable for the needs of students. This, of course, cannot be separated from the various advantages and main benefits inherent in the product, besides the format for presenting the material in this media tends to be attractive and interesting, and adaptive to the development of information technology (Anagün, 2018; Motamedi, 2019). This study also succeeded in identifying various benefits of interactive media integrated into the learning process, which theoretically proved to have a very positive impact on increasing the dynamics of learning between teachers and students (Sert & Boynueğri, 2017; Ishaq et al., 2020).

Referring to the assessment report, the developed interactive media product has been declared feasible by various experts who assess it, thus the product can be an innovation to be applied in the

learning process, especially mathematics in elementary school. However, this research report is still limited to assessing the feasibility level of interactive media products. Therefore, further trials are still needed for potential users, namely elementary school students themselves, both in order to find out the level of practicality of their use, as well as to determine the level of effectiveness of interactive media products.

4. CONCLUSION

The use of digital technology for the implementation of learning is one of the solutions offered in the implementation of education. Through this research, it can be seen that the innovation in the form of interactive multimedia learning mathematics for elementary school students has gone through various stages of feasibility testing by experts. The test results indicate that the developed media is included in the appropriate category to be used during learning activities. There is great hope, especially for elementary school teachers, to be able to provide learning innovations through the integration of ICT, as an effort to create an interesting and dynamic learning environment, thereby creating a meaningful learning process.

Conflicts of Interest: The authors declare no conflict of interest.

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