Development of EMOPER Media in Mathematics for Elementary School in Jepara

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Abstract

The development of learning media involves a series of processes or activities aimed at producing new media based on existing development theories. Despite these efforts, field data indicates that many students still struggle with understanding multiplication and find mathematics uninteresting and difficult. This issue arises from the lack of technological integration in schools to create engaging learning media. This study aims to analyze the need for developing "Emoper" media for second-grade students and to develop a valid version of this media. The Research and Development method, specifically the Borg and Gall model, was utilized. The research stages included (1) preliminary study and data collection, (2) research planning, (3) product design development, (4) due diligence, (5) final revision of due diligence results, and (6) product dissemination and implementation. Participants were selected through purposive sampling, involving two classes—control and experimental—from elementary schools in Nalumsari District, Jepara Regency. Data collection methods included questionnaires and interviews. The findings indicate that both students and teachers recognize the need for Emoper media in teaching multiplication in mathematics. The media validity test yielded an average score of 3.70, categorizing Emoper media as highly feasible for use.

Keywords: Development, Emoper, Mathematics, Learning Media

INTRODUCTION

The use of learning media is essential to facilitate the comprehension of learning material, making it easier for students to understand. Both teachers and students aim for successful learning outcomes, which are reflected in student performance (Nisai et al., 2020). Effective learning media can standardize the learning process, making it more engaging, interactive, efficient, and ultimately improving the quality of education (Julianto et al., 2021). Besides aiding material comprehension, learning media offer numerous benefits to both teachers and students by overcoming limitations in information delivery and time constraints (Indahini et al., 2018). Subjects perceived as difficult by students can become accessible when teachers present them in a simple, communicative, and comprehensible manner. Additionally, learning media significantly influence students' motivation and interest in learning by providing clarity on the subject matter, thus capturing their attention (Habibi & Setyaningtyas, 2021). Therefore, it is crucial to develop media that help students discover comprehensive and meaningful concepts (Sajdah et al., 2022).

Questionnaires and interviews with second-grade students and teachers at SDN 2 Bendanpete and SDN 4 Bategede revealed a lack of engaging media in mathematics education. Despite having access to information and technology-based facilities like laptops, Chromebooks, or tablets, these tools are underutilized in teaching. The insufficient use of media in teaching multiplication operations results

in passive and quickly bored students, with minimal engagement in the learning process. Researchers chose e-modules as the focus of this study because they align with students' preference for using gadgets in learning. Additionally, educators must equip students with IT skills to prevent boredom and facilitate easier understanding of multiplication concepts. Previous research supports the effectiveness of e-modules as learning media. Yulando (2019) highlighted the advantages of electronic modules, noting their interactive features and accessibility. Similarly, Jafar et al. (2020) emphasized that IT-based learning media enhance students' enthusiasm for learning. The development of e-modules can leverage various applications, making them adaptable and versatile. Efforts to enhance students' cognitive abilities across disciplines should include the use of engaging learning media. Teaching materials serve as guidelines for teachers, simplifying the instructional process (Kumalasari et al., 2023). Effective use of media in education can positively impact the learning environment, fostering enthusiasm, providing feedback, and achieving optimal learning outcomes (Wahyuningtyas & Sulasmono, 2020; Wulandari et al., 2020). Innovative learning media not only convey cognitive knowledge but also stimulate other skills, such as motor abilities (Pratiwi et al., 2021). Technology-based learning media can promote a conducive learning environment and diverse educational experiences, especially through e-modules that require electronic devices.

E-modules are advanced versions of traditional modules, incorporating multimedia elements like images, animations, audio, and video (Nikmah et al., 2020). They transform printed modules into digital formats, making them more engaging and interactive (Sofyan et al., 2019). E-modules are comprehensive educational tools designed to facilitate self-instruction, self-containment, independence, adaptability, and user-friendliness (Kimianti & Prasetyo, 2019). Various applications can be used to develop e-modules, such as Kvisoft (Reza & Hakim, 2018), Flipbook Maker (Septi, 2021), Sigil Software (Rahmawati et al., 2021), and Ethno digital Module (Suwanggono & Fathurohman, 2021). The advancement of science and technology encourages teachers to create technology-based learning media to enhance the quality of education (Mulyani & Haliza, 2021). E-modules, typically printed as books for independent study, now include digital features while retaining the characteristics of traditional modules (Asrial et al., 2020). This research aims to analyze the need for Emoper media and assess its validity for teaching multiplication in second-grade mathematics.

METHODS

This research employs a Research and Development (R&D) approach, utilizing the Borg and Gall development model to design and develop Emoper media. The study population comprises twenty (20) students from SDN 2 Bendanpete and twenty (20) students from SDN 4 Bategede, along with their respective second-grade teachers. The purposive sampling technique was employed, as the researchers identified similar issues at both schools. Additionally, the minimum completeness criteria and school accreditation levels for both schools are comparable. The data analysis for assessing the development needs of Emoper media includes both quantitative and qualitative methods. For quantitative analysis, the Guttman scale was used, which involves binary responses ("yes" and "no") that are subsequently converted to numerical values (1 and 0). The collected data is then analyzed using the percentage formula.

The data collected was transformed into qualitative sentences. To determine the criteria for the percentage of media development needs, the method proposed by Arikunto (2010) regarding percentage score criteria was applied, as excellect (81-100), good (61-80), satisfactory (41-60), poor (21-40), and bad (0-20) by (Amanda et al., 2019).

Media is considered necessary if it falls into the "good" or "very good" categories. The analysis of data regarding media development needs, based on observations and interviews, follows the analytical steps of Hubermann and Miles (1983). This data analysis technique consists of four steps: data collection, data reduction, data display, and drawing conclusions. For media validity analysis, the researcher used Arikunto's (2010) scoring method for the validation sheet, utilizing a rating scale, as follows: 1) Calculate the total criteria scores, which is 4 times the number of assessment indicators, where a score of 4 is the highest value; 2) Create a range of value intervals from the criteria scores into four categories: bad, poor, satisfactory, good and excellent; 3) Determine the total score from the data collected; and 4) Position the total score within a continuum of intervals to conclude the quality of the

developed learning media. The data obtained from expert validation was analyzed to determine the validity of the product. The developed product is considered valid if it meets the criteria for being either "valid ($2.50<X\leq3.25$)" or "very valid ($3.25<X\leq4.00$)." The product quality is deemed good if the validation data results fall within the valid or very valid category intervals.

FINDINGS AND DISCUSSION

In this study, various research techniques were employed to gather data, including student needs questionnaires and teacher interviews regarding the necessity of EMOPER media in second-grade mathematics classes in Nalumsari, Jepara. Based on Table 1, the EMOPER media needs questionnaire for second-grade students at SDN 2 Bendanpete and SDN 4 Bategede indicated that 40 students from SDN 2 Bendanpete provided an average percentage of 79% affirmative ("yes") responses across fifteen questions. The remaining 21% were negative ("no") responses. These results place the EMOPER media development needs in the 61-80% range, categorized as "good," signifying that EMOPER media is indeed necessary for second-grade students in Nalumsari District, Jepara Regency.

Table 1 Recapitulation of student needs questionnaires for EMOPER media

No. Items	Options		Percentage (%)	
	Yes	No	Yes	No
1	31	9	78	23
2	32	8	80	20
3	30	10	75	25
4	33	7	83	18
5	29	11	73	28
6	26	14	65	35
7	36	4	90	10
8	36	4	90	10
9	33	7	83	18
10	31	9	78	23
11	27	13	68	33
12	34	6	85	15
13	31	9	78	23
14	29	11	73	28
15	35	5	88	13
Average			79	21

The teacher interviews further underscored the need for developing EMOPER media. The findings revealed that current mathematics instruction lacks engaging media to capture students' attention. Despite having access to information and technology-based facilities like laptops, Chromebooks, or tablets, these tools are underutilized in the classroom. The existing media for teaching multiplication is inadequate, leading to passive and quickly bored students, with minimal involvement in the learning process.

Table 2 Recapitulation of multiplication EMOPER media validation results

No.	Members	Average Score	Category
1.	Material	3.6	Highly Valid
2.	Learning Media	3.6	Highly Valid
3.	Language	3.9	Highly Valid
	Average	3.7	Highly Valid

The validation test was conducted to assess the quality of the multiplication e-module media. The study involved three validators: a material expert, a media expert, and a language expert. The validation of the multiplication e-module media was performed using a questionnaire instrument based on a Likert scale with four criteria: 4 (very good), 3 (good), 2 (adequate), and 1 (poor). Based on the recapitulation of the validation results shown in Table 2, the EMOPER media achieved very high validity scores. Material experts awarded a score of 3.6, learning media experts also gave a score of 3.6, and language experts rated it at 3.9. The overall average score was 3.7, placing it firmly in the "very valid" category.

The analysis of the need for multiplication e-module media indicated strong support for its development. The needs questionnaire, distributed to 40 second-grade students at SDN 2 Bendanpete, revealed that 79% of responses were affirmative ("yes"), while 21% were negative ("no"). This suggests that there is a substantial demand for multiplication e-modules, as the 61-80% range is classified as "good," indicating the media is necessary to improve the cognitive abilities of second-grade students in Nalumsari, Jepara. This aligns with Suwanggono and Fathurohman (2021), who emphasizes that well-structured and engaging modules, which include material content, methods, and evaluations, can be used independently by students to achieve desired competencies. Additionally, teachers have leveraged students' interest in gadgets to facilitate online learning.

Interviews with second-grade students and teachers at SDN 2 Bendanpete and SDN 4 Bategede highlighted the lack of engaging media in mathematics education. Although these schools possess technology-based facilities like laptops, Chromebooks, and tablets, these resources are underutilized in teaching. The existing multiplication teaching methods are insufficient, leading to passive and disengaged students. These findings underline the necessity of developing multiplication e-module media, as supported by Sari and Kusmariyatni (2020), who noted that abstract mathematical concepts become more comprehensible when linked to familiar local culture through learning media.

The expert validation results were as follows: 1) material experts: 3.6 (very valid), 2) learning media experts: 3.6 (very valid), and 3) language experts: 3.9 (very valid). These scores confirm the high quality of the developed teaching materials. To be deemed effective, teaching materials must be communicative, systematic, clear, and free from language errors. The material expert validation score of 3.6, the language expert score of 3.9, and the learning media expert score of 3.6 all fall within the "very valid" category. This is consistent with Sugiharni et al. (2018), whose research indicated that a validity score of 3.0 or higher signifies a valid product, even if some revisions are needed. Media validation plays a crucial role in ensuring the quality of teaching materials.

The overall average score of 3.7 signifies that the multiplication e-module media is highly valid. This assessment confirms that the media is functioning well without any errors during use. Consequently, the multiplication e-module media developed to enhance the cognitive abilities of second-grade students in Nalumsari, Jepara, is considered highly valid in terms of material, language, and learning media. As Nikmah et al. (2020) noted, a validation score of 3.49 or higher falls within the "valid" criteria, making the product suitable for use, subject to any necessary expert-recommended improvements. The multiplication e-module media validated by three experts—material, learning media, and language—demonstrates its effectiveness and applicability in educational settings.

CONCLUSION

In conclusion, EMOPER media is highly suitable for use as a learning tool for second-grade elementary students in Nalumsari District, Jepara Regency. It is recommended that EMOPER media be utilized for teaching multiplication in mathematics to facilitate easier comprehension for second-grade students. Additionally, it is hoped that EMOPER media will assist teachers in their instructional roles and be adaptable for use across all educational levels. Future development of this media should aim to enhance its creativity and innovation.

DATA AVAILABILITY STATEMENT

Data will be made available on request.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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