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Developing smart apps creator-based learning media on social arithmetic materials for seventh graders

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Abstract

This R&D (Research and Development) research delivers Smart Apps Creator-based learning media on social arithmetic materials for seventh graders by referring to the Four-D development model. The instruments used were validation sheets and response questionnaires for teachers and students. Material and media experts gave validation scores of 96.9% and 98.2%, respectively, with the Very Valid category. The Smart Apps Creator-based learning media on social arithmetic was very practical for students to use, based on teacher responses, at a percentage of 98.7%. The media was also effective, as demonstrated by the results of student learning tests and responses. The learning test results increased. Before using Smart Apps Creator-based learning media, 41 students had a mean score of 64.4, which was under the Minimum Completeness Criteria set by SMP Negeri 1 Paleleh and hence categorized as Poor, while 15 others scored 72.3, which was above Minimum Completeness Criteria and categorized as Acceptable. After using the media, six students had a mean score of 74.38 in the Acceptable category, 30 with a mean score of 84.67 in the Good category, and 20 with a mean score of 94.38 in the Excellent category. Meanwhile, as exhibited by the results of student response questionnaires concerning the use of Smart Apps Creator-based learning media on social arithmetic materials, 90% of the responses were positive. To infer, Smart Apps Creator-based learning media on social arithmetic materials were valid, effective, and reliable to use.

Keywords: Smart Apps Creator; Social Arithmetic; Learning Media

1. Introduction

Teachers play a critical role in the learning process to manifest quality education. They have to be able to bring on a conducive learning atmosphere, i.e., active, effective, creative, fun, and innovative learning. Creating it takes work, as many factors may hamper the learning process; one is the teacher inability to create and innovate, causing learning activities to grow monotonous.

Students from all education levels, elementary, secondary, and tertiary, study mathematics. Mathematics is a crucial subject for students as they use it on many occasions to present information to solve problems. However, students consider it a difficult subject because of its abstract nature, which, in its delivery, is not related to events students usually meet in their daily lives or due to teachers' claim that students are empty bottles which must be fulfilled and their inability to understand that students can self-construct personal understandings of certain knowledge.

Commonly, the learning process at schools does not deploy information technology-based facilities available at school and employs traditional facilities and infrastructures and learning media, namely books, markers, and whiteboards instead. It also happens in the mathematics learning process at SMP Negeri 1 Paleleh.

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Grounded on our field observation and another observation of mathematics learning experiences among seventh graders at SMP Negeri 1 Paleleh, Buol, the mathematics learning process did not exploit learning media which were attractive, fun, creative, and innovative for students. The learning media were monotonous, causing students to feel bored and participate passively in the learning process, which, according to our observation, still leveraged printed media, e.g., printed books, student worksheets, and whiteboards, engendering students' lack of enthusiasm and motivation in learning. Besides, our interview with the mathematics teacher for seventh graders at SMPN 1 Paleleh informed us that the learning process for seventh graders on the social arithmetic subject used only textbooks and student worksheets as learning media. Conventional learning generated a lack of creativity in students, low curiosity levels, and ill-understanding of concepts or calculations concerning social arithmetic. Furthermore, predicated on document tracking of student learning outcomes, several issues occurred during learning, such as low student learning outcomes based on Minimum Completeness Criteria set by the school in the 2021/22 school year, which was 68, and 65% of students achieving the Criteria. The issues indicate low student learning outcomes.

Based on the evidence, we sum up that interactive learning media, which allows teachers to deliver social arithmetic materials effectively, is needed, and reliable media should be able to display texts, pictures, animation, voice, and videos, enabling students to understand social arithmetic materials. The interactive multimedia has to be packaged attractively and contain materials determined by referring to the applicable curriculum, thus making it interesting and contain desired materials.

Among research on Smart Apps Creator (SAC)-based learning media development is one carried out by Mahuda et al. (2021), concluding that Smart Apps Creator-aided mathematics learning media, which is Android-based, is valid and effective in enhancing mathematical problem-solving skills of students. Another research by Jaiz (2022) points out that Smart Apps Creator-based learning media is effective to use in the learning process and can improve student learning outcomes.

Grounded on the explanation, we are motivated to develop interactive multimedia-based mathematics learning media through research titled "**Developing Smart Apps Creator-Based Learning Media on Social Arithmetic Materials for Seventh Graders**." We aim to induce Smart Apps Creator-based learning media on social arithmetic materials for seventh graders, which are effective and reliable to use in the mathematics learning process.

2. Material and method

This R&D (Research and Development) research applied the descriptive approach, oriented to the product or learning media development, which was based on the Four-D development model, comprising four development stages: Define, Design, Develop, and Disseminate. Data collection was conducted using instruments, i.e., expert validation sheets, teacher response questionnaire sheets, student response questionnaire sheets, and tests (a pre-test and a posttest). Data were analyzed descriptively.

3. Results

3.1. Expert Validation Results

3.1.1. Material Expert Validation

Our Smart Apps Creator-based learning media was assessed to attest that materials in the mathematics learning media were complete and aligned with learning indicators. Predicated on material expert validation, material experts gave a mean score of 97.9% to the material and language suitability aspect of Smart Apps Creator-based learning media on social arithmetic materials. It showed that the learning media was very valid and reliable to use.

3.1.2. Media Expert Validation

Our Smart Apps Creator-based learning media on social arithmetic materials for seventh graders was assessed to prove that the learning media composition was comporting with interactive learning media characteristics. The assessed aspects of the interactive learning media were appearance design, audio, video, animation, and efficient media use. Based on the media expert validation, both media experts gave a score of 98.2% with the Very Valid criterion, stating that our Smart Apps Creator-based learning media was reliable to use.

3.2. Limited Test

The limited test was performed to fine-tune the Smart Apps Creator-based learning media on social arithmetic materials, and the subjects were six eighth and ninth graders. Of the six students responding, one gave a comment/suggestion to add voice/speakers to the materials. We improved our learning media based on the comments and used the deliverable of the limited test, undertaken in a small group, to revise Draft II and produce Draft III.

3.3. Large Group Test

3.3.1. Results of Teacher Response Questionnaires

The teacher response questionnaire contained 14 questions clustered into three assessment aspects: appearance, benefit taking, and use. The assessment scores were 1 = Poorly Suitable, 2 = Acceptable, 3 = Suitable, and 4 = Very Suitable. Table 1 suggests the data analysis results on teacher responses. Based on Table 1, the mean percentage of teacher responses was 97.8%, demonstrating that teachers gave a positive response to the Smart Apps Creator-based learning media on social arithmetic materials and considered the media suitable to the defined criteria. The Smart Apps Creator-based learning media on social arithmetic materials, hence, was effective and could be used in learning as good and quality media.

Table 1 Results of Teacher Response Questionnaires

Teacher	Teacher Response Score	Percentage (%)	Mean Percentage (%)
G1	55	98.2	97.8
G2	56	100.0	
G3	52	92.8	
G4	56	100.0	
G5	55	98.2	

3.3.2. Results of Student Response Questionnaires

The student response questionnaire contained 12 questions. Table 2 exhibits that the score of student responses to each assessed aspect was above 90%, indicating that students gave positive responses to the Smart Apps Creator-based learning media and deemed it as suitable to the determined criteria. The Smart Apps Creator-based learning media on social arithmetic materials was, therefore, effective and could be used in learning as good and quality media.

Table 2 Results of Student Response Questionnaires

Item	Number of Students		Percentage (%)	
	S	TS	S	TS
1	56	0	100.0	0.0
2	56	0	100.0	0.0
3	55	1	92.8	1.8
4	56	0	100.0	0.0
Mean Percentage (%)			99,5	0.5
	B	TB	B	TB
5	54	2	96.4	3.6
Mean Percentage (%)			96.4	3.6
	BT	TBT	BT	TBT
6	55	1	98.2	1.8
7	54	2	96.4	3.6

Mean Percentage (%)			97.3	2.7
	T	TT	T	TT
8	55	1	98.2	1.8
9	53	3	94.6	5.4
Mean Percentage (%)			96.4	3.6
	J	TJ	J	TJ
10	56	0	100.0	0.0
11	54	2	96.4	3.6
12	56	0	100.0	0.0
Mean Percentage (%)			98.8	1.2

Description: S: Happy; BT: Willing; J: Clear; TS: Unhappy; TBT : Unwilling; TJ: Unclear; B: New; T: Interested; TB: Old; TT: Uninterested

3.4. Learning Media Effectiveness

When participating in mathematics learning using the Smart Apps Creator-based learning media on social arithmetic materials, students were enthusiastic and active. Furthermore, learning goal achievement, which, in this case, was learning completeness assessed using a pre-test and a posttest, pointed out an increase. Table 3 presents the pre-test results.

Table 3 Student Pre-Test Results

Competency	Number of Students	Mean Score
Excellent (91-100)	-	-
Good (81-90)	-	-
Acceptable (70-80)	15	72.3
Poor (< 70)	41	64.4

Table 3 shows that 41 students (73.21%) acquired scores under Minimum Completeness Criteria, while 15 others (26.79%) fulfilled them. After using the Smart Apps Creator-based learning media, students were given a posttest to identify any increase in their learning outcomes. Table 4 suggests student posttest results.

Table 4 Student Posttest Results

Competency	Number of Students	Mean Score
Excellent (91-100)	20	94,38
Good (81-90)	30	84,67
Acceptable (70-80)	6	74,38
Poor (< 70)	-	-

Table 4 demonstrates a significant increase in student scores after using the Smart Apps Creator-based learning media. 20 students (35.71%) were categorized as Excellent, 30 (53.58%) were categorized as Good, and six (10.71%) were categorized as Acceptable. If we observed the set score range, we could state that all students met Minimum Completeness Criteria (≥ 70). The Smart Apps Creator-based learning media on social arithmetic materials, thus, was effective and reliable to use in mathematics learning.

4. Discussion

The learning media used in mathematics learning on social arithmetic materials was developed using Smart Apps Creator, software for making learning media supported with text content, images, audio, and videos adjustable to learning goals. The resulting media was also equipped with engaging quiz content, allowing students to directly and actively interact in the learning activity.

The process of developing this learning media implemented Thiagarajan's 4D model, covering the activities of Defining, Designing, Developing, and Disseminating, as the model was rational, systematical, easy to learn, and complete. The systematical 4D model allowed an organized development process; each stage was thus undertaken by always referring to the previous one through a revision process, enabling developers to acquire an effective learning media product.

In the Defining stage, we carried out an initial analysis of the issues in learning activities at SMP Negeri 1 Paleleh and the cruciality of developing interactive learning media to address the learning issues. We figured out that the limited learning media teachers used made students understand materials from the available packaged books only, and the learning process still applied a lecturing method, causing students to feel bored and participate passively. Teachers were supposed to be more creative in learning activities, which were only allocated twice weekly. Facilities and infrastructures, e.g., laboratories, computers, projectors, and the internet connection (Wi-Fi), were available, and teachers and students had good laptop/computer operating skills. However, the facilities and infrastructures were still poorly used, breeding monotonous learning activities students considered unattractive.

Teachers were not the only learning sources, but considering their position as motivators, they had to be able to plan and create other learning sources, bringing about a conducive learning environment (Munadi, 2008). We hence developed interactive learning media which could present interesting content, raising student interest and learning motivation in the mathematics learning process and helping them achieve learning objectives.

In the Designing stage, we made a design based on the previous analysis stage. This design affected the entire form of the developed mathematics learning media. This Smart Apps Creator-based learning media was developed by combining texts, images, audio, and videos. This mathematics learning media on social arithmetic materials was developed using content adjusted to student characteristics. In deciding the text types, text colors, image packaging, and audio and video addition, we should consider student interests, making them pay attention to learning using the learning media. The materials developed and integrated into the mathematics learning media were adjusted to basic competencies and achievement indicators as well.

In the Developing stage, the suitability of the developed mathematics learning media with multimedia learning characteristics was reinforced by referring to materials experts' suggestions. All items in the instrument were considered very suitable, but we had to revise two items based on the suggestions concerning material suitability and language suitability aspects. Grounded on media experts' validation, out of 21 items, three needed revisions, and we revised them predicated on the experts' suggestions concerning appearance design, audio, video, animation, and efficient media use aspects. Material and media experts gave scores of 97.9% and 98.2%, respectively.

In the Disseminating stage, we tested the practicality and effectiveness of the developed learning media. The practicality test was carried out by distributing response questionnaires to teachers and students, engendering the result of 97.8% from teacher responses to the Smart Apps Creator-based learning media. Meanwhile, student responses to the learning media, on each aspect, scored above 90%. The Smart Apps Creator-based learning media in social arithmetic materials, therefore, was practical and could be used in learning as good and quality media.

The effectiveness test was performed using the test instrument with the one-group pre-test-posttest design. It was undertaken on 56 students from the VII AB class at SMP Negeri 1 Paleleh. Based on the pre-test results, 41 students (73.21%) were categorized as Poor and scored under Minimum Completeness Criteria, while 15 students (26.79%) were categorized as Acceptable and fulfilled Minimum Completeness Criteria. It demonstrated that many students had no sufficient understanding of the delivered materials. Grounded on the posttest results, student scores increased significantly. 20 students (35.71%) were categorized as Excellent, 30 (53.58%) were categorized as Good, and six (10.71%) were categorized as Acceptable. Predicated on the decided score range, all students met Minimum Completeness Criteria (≥ 70), exhibiting that Smart Apps Creator-based learning media was effective for enhancing student mathematics learning outcomes.

5. Conclusion

Based on the elucidated results, we could draw the following conclusion.

- Material and media experts gave validation scores of 97.9% and 98.2%, respectively.
- The practicality test results indicated that teacher responses to Smart Apps Creator-based learning media scored 97.8%, and student responses to the learning media, on every assessed aspect, scored above 90%. In conclusion, the developed learning media was very practical and reliable for mathematics learning
- The effectiveness test results pointed out a significant increase in student mathematics learning outcomes on social arithmetic materials: the pre-test results showed students who did not fulfill Minimum Completeness Criteria (73.21%), while the posttest ones stated that all students met Minimum Completeness Criteria, and most students were categorized as Good.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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