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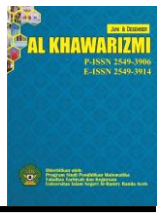

THE EFFECT OF A DEEP LEARNING APPROACH ASSISTED BY INTERACTIVE MEDIA BASED ON ARTICULATE STORYLINE AND CANVA ON STUDENTS' UNDERSTANDING OF SOCIAL ARITHMETIC CONCEPTS

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Abstract

This study examines the effect of a deep learning approach assisted by interactive media based on Articulate Storyline and Canva on students' understanding of Social Arithmetic concepts. Using a quantitative pre-experimental one-group pretest–posttest design, the study involved 22 seventh-grade students at SMP Negeri 27 Medan. Data were collected through essay-type tests administered before and after the learning intervention. The interactive media were designed according to deep learning principles emphasizing meaningful, mindful, and joyful learning. The findings reveal a significant improvement in students' conceptual understanding and a statistically significant difference between pretest and posttest results. These results indicate that the developed interactive media effectively enhance learning processes and outcomes by promoting active participation and cognitive engagement, thereby addressing the limitations of conventional teaching methods.

INTRODUCTION

Mathematics learning occurs at every level of education, and mathematics is an essential skill that students must master because it forms the basis for the development of various mathematical concepts (Hendriana & Fitriani, 2019). Mathematics is a subject that can enhance students' thinking abilities and has a strong structure and interconnected concepts; therefore, students must be skilled in rational and logical thinking (Depdiknas,

2003). Mathematics learning will be successful if there is alignment between the learning material and students' cognitive development. Students who have not yet reached the formal operational stage often experience difficulties in understanding abstract mathematical concepts (Sapitri et al., 2024). Learning difficulties thus become obstacles that affect students' success in mastering more complex materials, including mathematics.

One topic that frequently involves word problems related to everyday life is Social Arithmetic, as it includes understanding human economic activities such as buying, selling, profit, loss, interest, and other related concepts (Wahyuni, 2020). Social Arithmetic material covers subtopics such as profit, loss, discounts, taxes, and the concepts of gross, net, and tare, all of which are studied because of their close connection to real-life situations.

However, many seventh-grade junior high school students still experience difficulties in modeling word problems into mathematical forms and determining appropriate solution steps (Rahmawati, Fauziah, & Yanto, 2024). One-way teaching methods such as lectures tend to reduce students' motivation and willingness to actively participate, thereby hindering their logical and affective thinking abilities in understanding problem contexts (Ramadhani et al., 2023). This condition represents a core problem that needs to be addressed so that the targeted basic competencies in Social Arithmetic can be achieved.

Several aspects highlight the importance of addressing this issue in research. First, from a pedagogical perspective, the deep learning approach emphasizes meaningful, mindful, and joyful learning, enabling students not merely to memorize procedures but to understand concepts deeply and contextually (Feriyanto & Anjariyah, 2024). Second, in line with the Merdeka Curriculum policy that promotes the use of contextual and flexible learning media, the integration of digital technology particularly interactive media based on Articulate Storyline and Canva can facilitate more visual, auditory, and interactive presentations of learning material (Sari & Arta, 2025). Although previous studies have shown that interactive media can improve students' motivation and understanding of mathematics (Wahyuningrum, 2023; Ramadhani et al., 2023), quantitative research that explicitly examines the contribution of deep learning principles embedded in such media for Social Arithmetic at the junior high school level remains limited.

In this article, the authors address this issue by applying a one-group pre-experimental (one-group pretest–posttest) design. The interactive media developed using Articulate Storyline and Canva integrate the principles of meaningful learning (contextual problems), mindful learning (reflective guidance and layered understanding), and joyful learning (interactive exercises with immediate feedback). Students' understanding was measured before and after the learning intervention through essay tests, and learning improvements were analyzed using descriptive statistics and hypothesis testing. This study therefore seeks to demonstrate the extent to which a deep learning approach assisted by interactive media can enhance seventh-grade students' understanding of Social Arithmetic.

METHODS

This study employed a quantitative pre-experimental approach with a one-group pretest–posttest design. The research subjects were 22 students of class VII-5 at SMP Negeri 27 Medan, selected through purposive sampling based on recommendations from the mathematics teacher due to students' difficulties with Social Arithmetic material. The primary data sources consisted of pretest and posttest scores as well as observations of students' interactions with the interactive learning media. The research instruments included pretest and posttest essay questions (seven items) designed to measure students' initial understanding and changes in understanding after the implementation of the deep learning approach assisted by interactive media based on Articulate Storyline and Canva.

Data collection began with administering a pretest to assess students' initial understanding, followed by instruction using the deep learning approach supported by interactive media in the classroom, and concluded with a posttest to measure students' final understanding. Prior to conducting comparative analysis, data normality was tested using the Shapiro–Wilk test to determine the appropriate statistical procedure, with a significance value > 0,05 indicating normal distribution. As the data were found not to be normally distributed, further analysis was conducted using the paired Wilcoxon test to examine significant differences between pretest and posttest scores, with a probability value < 0,05 used to reject the null hypothesis (H_0) and accept the alternative hypothesis (H_a). In addition, normalized gain (g) analysis was conducted, median pretest and posttest scores were calculated, and percentage improvements were reported to describe learning outcomes before and after the intervention.

RESEARCH RESULTS AND DISCUSSION

The study was conducted in a seventh-grade class at SMP Negeri 27 Medan, and data analysis employed both descriptive and inferential statistical methods. Descriptive analysis was used to evaluate learning outcomes before and after the intervention based on the average pretest and posttest scores.

The following data present the average pretest and posttest scores of students after using the learning media:

Table 1. Students' Average Scores (Pretest and Posttest)

Category	Pretest	Posttest
Min	53.00	66.00
First Quartile (Q1)	58.00	81.00
Median	65.00	84.00
Mean	64.77	84.05
Third Quartile (Q3)	72.00	85.75
Max	80.00	97.00
% Increase in Mean Score	29,8%	

Based on data from 22 students, the descriptive statistics indicate that the mean pretest score was 64.77, while the mean posttest score was 84.05, reflecting an average increase of 19.28 points or 29.8%. According to Sugiyono (2017), this level of improvement falls within the "moderately effective" category. Furthermore, the first quartile (Q1) increased from 58.00 (pretest) to 81.00 (posttest), and the third quartile (Q3) increased from 72.00 to 85.75, indicating a rightward shift in the overall distribution of posttest scores compared to pretest scores.

1. Shapiro–Wilk Normality Test

Table 2. Shapiro–Wilk Normality Test Results

Category	W-value	p-value	Description	Data Distribution
Pre-test	0.94592	0.2616	p-value > 0.05	Normal
Post-test	0.8893	0.01826	p-value < 0.05	Tidak Normal

Based on Table 2, the normality of the pretest and posttest data was examined using the Shapiro–Wilk test. The results indicate that the pretest data are normally distributed, while the posttest data are not. Therefore, subsequent analysis was conducted using the paired nonparametric Wilcoxon test.

2. Paired Wilcoxon Test

Table 3. Paired Wilcoxon Test Results

Wilcoxon Matched-Pairs Signed-Rank Test			
V-value	p-value	Median interval	Pseudo median
253	4.207e-0	17.50003 -21.49998	19.5

The Wilcoxon matched-pairs signed-rank test is a nonparametric test used to determine whether there is a significant difference between two paired (dependent) samples. The results show a statistically significant difference between pretest and posttest scores. The p-value ($p < 0.001$) confirms that the observed improvement is not due to chance but is attributable to the deep learning approach assisted by interactive media based on Articulate Storyline and Canva. Thus, the null hypothesis (H_0) is rejected, indicating that the developed approach significantly enhances students' understanding of Social Arithmetic in seventh-grade junior high school.

3. Normalized Gain (g) Test

Table 4. N-Gain Test Results

Data	N	Mean	
		gain	% gain
Pre-test & Post-test Scores	22	0,547	54.7%

Based on Table 4, according to Hake's (1998) classification, a gain value of 0.547 falls within the medium category ($0.3 \leq g < 0.7$). This result indicates that the deep learning approach assisted by interactive media based on Articulate Storyline and Canva provides a moderately effective improvement in students' learning outcomes.

DISCUSSION

The average score improvement of approximately 19.28 points (29.8%) is consistent with the findings of Wahyuningrum (2023), who reported that interactive learning videos significantly improved students' mathematics achievement in Social Arithmetic. Although Wahyuningrum employed video-based media, these findings support those of Ramadhani et al. (2023), which demonstrated that information technology–based interactive media enhance overall conceptual understanding in mathematics. The key difference lies in the platforms used; the present study integrates Articulate Storyline and Canva to deliver rich visual elements, audio narration, and interactive exercises such as drag-and-drop and short-answer tasks.

In particular, the integration of deep learning principles—namely meaningful, mindful, and joyful learning—is considered a major factor contributing to the effectiveness of the media. Meaningful learning is realized through contextual problems relevant to students' daily lives, facilitating connections between new knowledge and prior experiences (Feriyanto & Anjariyah, 2024). Mindful learning is reflected in reflective guidance and layered understanding, where students are not only encouraged to calculate but also to reconsider their problem-solving steps, such as evaluating whether their interpretation of the problem is appropriate before performing calculations, thereby enhancing cognitive and metacognitive awareness (Sari & Arta, 2025). Joyful learning is fostered through immediate feedback on students' responses and interactive activities such as drag-and-drop tasks, creating a more engaging learning environment and preventing boredom (Ramadhani et al., 2023).

Further discussion indicates that although there were variations in improvement among students (ranging from a pseudo-median of 19.5 to individual score differences reaching 30–35 points), the majority of students experienced moderate to high improvement based on Hake's (1998) gain classification framework. This result aligns with Ramadhani et al. (2023), who reported average N-Gain scores of approximately 0.50–0.60 (moderate category), consistent with the findings of the present study (class N-Gain of approximately 0.547). These results provide empirical evidence that a deep learning approach supported by interactive media not only improves test scores but also enhances students' thinking skills in modeling real-life situations into mathematical representations.

Moreover, the interactive media intervention successfully addressed the limitations of conventional lecture-based methods, which tend to be passive. In traditional instruction, students often struggle to identify key information in word problems, such as discount values or tax percentages, and to apply them mathematically, leading to misinterpretation.

Through interactive media, students are presented with visual illustrations of transactions, guided by audio narration that emphasizes key points, and engaged in direct activities through interactive questions. This structured and guided modeling process,

combined with immediate feedback, enables students to recognize errors promptly and adjust their thinking, thereby improving learning effectiveness (Wahyuningrum, 2023; Ramadhani et al., 2023).

Overall, the findings of this study address the research question concerning the effect of a deep learning approach supported by interactive media based on Articulate Storyline and Canva on students' understanding. The data demonstrate significant improvements both statistically ($p < 0.001$) and practically (average increase of 29.8%), consistent with the initial hypothesis that such media enhance students' understanding of Social Arithmetic. These findings align with previous literature and further emphasize the important role of integrating deep learning principles into the design of mathematics learning media, particularly for contextual topics such as Social Arithmetic.

CONCLUSION

This study concludes that a deep learning approach assisted by interactive media based on Articulate Storyline and Canva significantly improves students' understanding of Social Arithmetic. The media were designed to provide meaningful, mindful, and joyful learning experiences, thereby encouraging active student engagement in the learning process. The findings indicate that after using the media, students demonstrate a better understanding of concepts, are more capable of translating word problems into mathematical representations, and can solve problems in a logical and systematic manner. Therefore, this interactive media serves as a more engaging instructional alternative and yields more positive learning outcomes than conventional, passive teaching methods.

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