Journal of Engineering Science and Technology
Special Issue on ISCoE2024 Vol. 20 No. 3 (2025) 81 - 88

THE DEVELOPMENT OF WORKSHEET BASED ON REALISTIC MATHEMATICS ASSISTED BY ONLINE FLIPBOOK

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Abstract

This study explored the development and implementation of student worksheets based on realistic mathematics, enhanced by online flipbooks. We did several steps, including analysis, design, development, and implementation as well as evaluation steps (ADDIE) as the development framework to provide a structured approach to instructional design. Validation results indicated that the developed worksheets are highly effective, particularly in terms of technological integration, earning a "very valid" rating. This is because the integration of online flipbooks enhances interactivity and engagement. The material validity assessment also received an excellent average score since the content was designed to align with both pedagogical and subject matter standards. A limited trial conducted with elementary teacher education students demonstrated that these worksheets effectively support mathematics instruction, especially in problem-solving contexts, because they combine technology, effective instructional strategies, and a systematic development process. The findings suggest that realistic mathematics-based worksheets, supplemented by online flipbooks, can serve as valuable tools in enhancing students' creative thinking skills when solving mathematical problems since they encourage active learning and conceptual understanding.

Keywords: Development, Flipbook, Realistic mathematics, Student, Worksheet.

1. Introduction

Realistic mathematics effectively enhances students' conceptual understanding and critical thinking [1] using real-world contexts to make learning engaging [2]. This approach can be applied to problem-solving-based worksheets [3]. As technology advances, digital media in mathematics education is increasingly essential. Online flipbooks, as interactive tools, enhance learning by boosting engagement, motivation, and comprehension [4]. Developing realistic mathematics worksheets with flipbooks prepares prospective teachers with the skills to implement contextual mathematics learning and adapt to digital-era challenges [5].

Several studies have been reported, such as the use of worksheets for improving critical thinking skills [6] as well as average student test scores [7], ICT-assisted learning trajectories for enhancing higher-order thinking skills [8], interactive media developed using Kvisoft Flipbook Maker [9], problem-based flipbooks for improving critical thinking skills [10].

This study developed realistic mathematics-based student worksheets for elementary teacher education students, enhanced by an online flipbook. The research followed several steps, including analysis, design, development, and implementation as well as evaluation steps (ADDIE) model for structured development. The novelties of this study include: (i) incorporating illustrations that depict real-life problems, (ii) featuring diverse characters representing students from different regions of Indonesia, and (iii) integrating the worksheets into an interactive flipbook format for enhanced engagement.

2. Literature Review

Figure 1 shows the realistic mathematics approach enhances learning by connecting mathematical concepts to real-world applications. To implement this approach effectively, worksheets provide structured exercises that guide students through contextual problem-solving, while online flipbooks introduce interactive elements such as animations and multimedia content, making learning more engaging [11, 12].

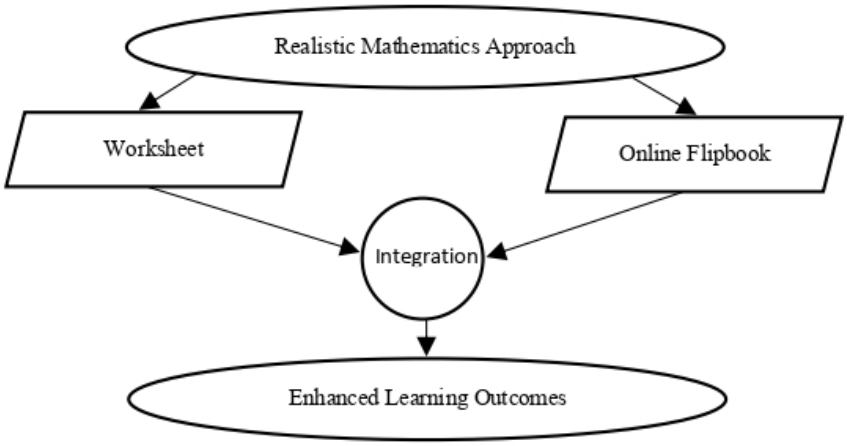

Fig. 1. The combination of worksheets based on realistic mathematics assisted by online flipbook.

The combination of worksheets based on realistic mathematics assisted by an online flipbook leads to enhanced learning outcomes, improving students' problem-solving skills [13]. This method encourages self-paced learning while maintaining engagement, making mathematics education more dynamic and practical [14]. The development of worksheets assisted by online flipbooks represents an innovative step toward modernizing mathematics education with both traditional and digital resources.

3. Method

This study used the ADDIE model to develop realistic mathematics-based worksheets with online flipbooks for elementary teacher education students. The analysis stage identified key worksheet components through instructional material evaluation and student interviews. The design phase created problem-solving tasks with real-life illustrations. The development stage refined content using Canva and uploaded it as a PDF and flipbook. Implementation involved student testing and expert validation. The evaluation stage analysed feedback, confirming the worksheet's effectiveness in improving problem-solving skills.

4. Results and Discussion

Figure 2 presents the flowchart for developing realistic mathematics-based worksheets assisted by flipbooks, starting from the analysis, followed by evaluation, and the design phase, which also includes an evaluation. The development stage involved validation by experts, ensuring quality. The process concluded with the implementation stage, followed by a final evaluation. The ADDIE model was selected because it incorporates an evaluation step at the end of each main stage. This systematic approach ensures quality control at every step, consistent with findings from other worksheet development studies [15, 16].

The analysis stage began with evaluating instructional materials and interviewing students about realistic mathematics problem-solving. After reviewing learning resources and lectures, key worksheet components were identified: (i) real-life situational contexts, (ii) trigger questions, (iii) student activities, and (iv) conclusions. This aligned with research findings, indicating that students using a realistic mathematics approach perform better in solving mathematical problems compared to those who do not [17, 18].

Figure 3 presents a draft sketch of daily activities illustrated at the beginning of each chapter, developed during the design stage. The worksheet follows a realistic mathematics approach by incorporating problem-solving elements, including: (i) representations of elementary teacher education students from various regions of Indonesia, (ii) illustrations of daily student activities followed by trigger questions, and (iii) problem-solving tasks rooted in real-life contexts. This approach equips future teachers to implement realistic mathematics in elementary schools, helping students overcome difficulties with abstract mathematical concepts [19, 20].

Figure 4 displays the integrated worksheet in a flipbook format, accessible via smartphones and laptops. During the development stage, fourteen images were refined, coloured, and formatted into a worksheet using Canva. Activity graphics and trigger questions were added at the beginning of each chapter. The final worksheet was saved as a PDF and uploaded to an online flipbook platform for

digital access (https://online.fliphtml5.com/iujty/qgff/#p=1), which is available in both printable PDF and digital flipbook formats, ensuring flexible access. Students can either print the PDF version or use the online flipbook, allowing for accessibility across multiple devices. This aligns with the evolving learning landscape, where educational resources should be readily accessible from various locations at any time [21-23]. Once the worksheet is fully developed and displayed in the flipbook format, the validation process will begin. This involves presenting a draft of the worksheet to material and design experts for evaluation. In the fourth stage, implementation, the worksheet was tested with elementary teacher education students. After using the worksheet, students completed a feasibility questionnaire via a Google Form link to assess its effectiveness and usability.

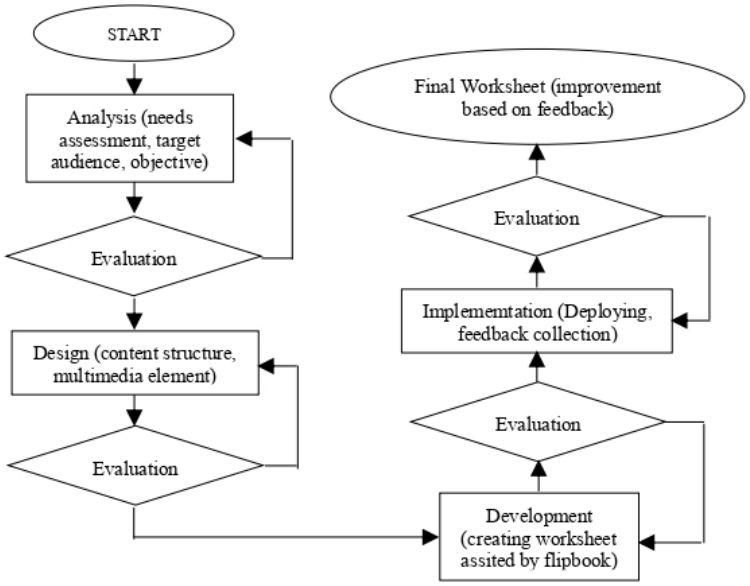

Fig. 2. Flow chart of the worksheet development.

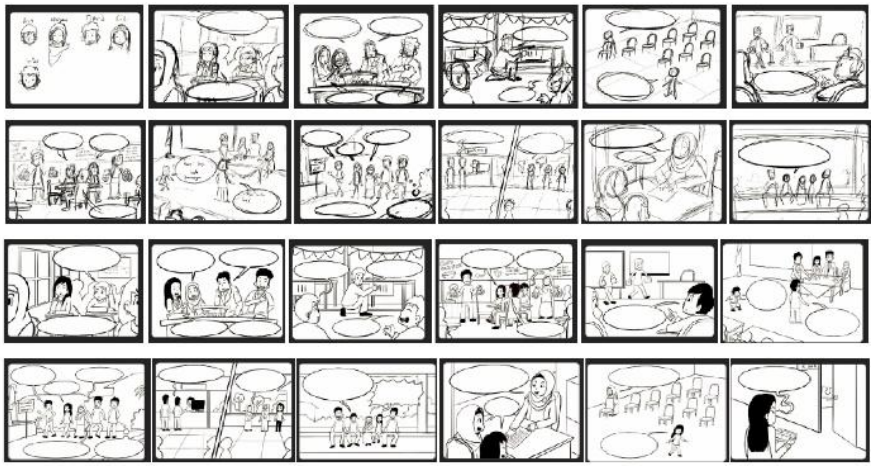

Fig. 3. Sketch of a draft of daily activities.

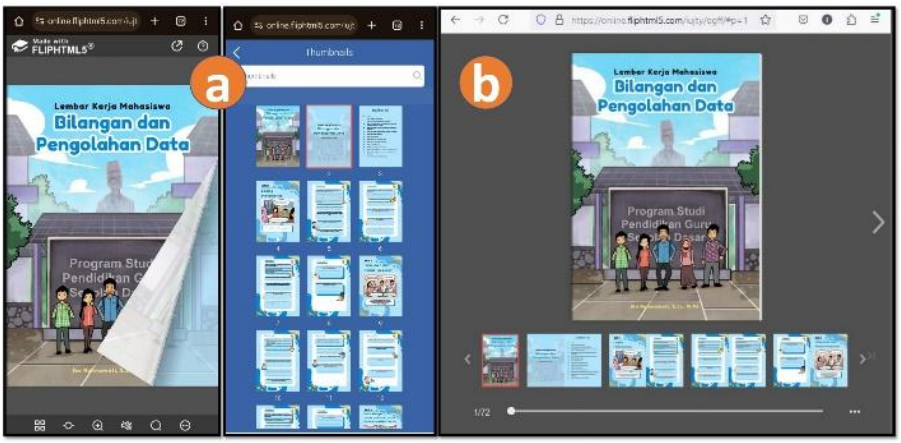

Fig. 4. Worksheet based on realistic mathematics assisted by online flipbook: (a) viewed by smartphone, (b) viewed by laptop.

Table 1 presents the validation results from material and technology design experts, along with the student questionnaire responses after testing the worksheet. The validation results from both material and design experts, as well as student feedback, indicate that the worksheet is highly suitable for elementary teacher education students. The design, readability, and presentation of mathematical problems - Supported by illustrations of daily activities - make the content easy to understand. This aligns with previous findings that using a realistic mathematics approach enhances students' problem-solving skills [24, 25]. This study adds new information regarding the use of flipbook, as reported elsewhere [26, 27]. This study also supports current issues in learning mathematics as reported elsewhere [28-32].

Table 1. The validation and questionnaire result.

Aspect	Score	Result
Media expert	89.7 %	Very valid
Technology design expert	93.2 %	Very valid
Student questionnaire	94.17 %	Appropriate for use

5. Conclusion

The realistic mathematics-based worksheets assisted by online flipbooks are valid and effective, particularly in enhancing problem-solving skills. Validation results confirm strong technological integration and material quality, making them a reliable teaching tool. A trial with elementary teacher education students demonstrated their effectiveness, highlighting their potential to foster creative mathematical thinking.

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