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Developing Funnel-Based Visual Media for Teaching Integer Addition to Third Grade Elementary Students

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Abstrak: *Penelitian ini berfokus pada pengembangan media pembelajaran visual berbasis corong hitung pada pembelajaran matematika untuk mengajarkan penjumlahan bilangan bulat siswa sekolah dasar kelas tiga dengan menggunakan model ADDIE (Analisis, Desain, Pengembangan, Implementasi, dan Evaluasi). Penelitian ini berawal dari observasi di SD Negeri 89 Palembang yang mengungkapkan rendahnya keterlibatan siswa dalam pembelajaran matematika akibat penggunaan media konvensional dan kurang menarik sehingga menyulitkan siswa untuk memahami konsep matematika secara konkret. Oleh karena itu, diperlukan media pembelajaran inovatif yang sesuai dengan karakteristik dan kebutuhan belajar siswa sekolah dasar. Tujuan penelitian ini adalah untuk mengetahui validitas, praktikalitas, dan efektivitas media corong hitung dalam menunjang proses pembelajaran. Penelitian dilakukan melalui tahapan ADDIE yang meliputi analisis kebutuhan pembelajaran, desain media, pengembangan melalui validasi ahli, implementasi di kelas, dan evaluasi akhir. Hasil penelitian menunjukkan bahwa media dinyatakan valid berdasarkan penilaian ahli, praktis dalam penerapan di kelas, dan efektif dalam meningkatkan pemahaman siswa tentang penjumlahan bilangan bulat. Temuan tersebut menegaskan bahwa media corong hitung layak dan bermanfaat sebagai alat bantu pembelajaran. Implikasinya menunjukkan bahwa media visual ini dapat berfungsi sebagai solusi alternatif untuk meningkatkan pemahaman konseptual, motivasi, dan keterlibatan siswa. Secara keseluruhan, penelitian ini menyimpulkan bahwa media corong hitung efektif mendukung pembelajaran matematika yang bermakna dan menyenangkan bagi siswa sekolah dasar.*

Kata Kunci: media pembelajaran visual, corong hitung, ADDIE

Abstract: This research focuses on the development of visual learning media based on counting funnels in mathematics lessons to teach integer addition to third-grade elementary school students using the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). The study originated from observations at SD Negeri 89 Palembang, which revealed low student engagement in mathematics learning due to the use of conventional and less attractive media that made it difficult for students to understand mathematical concepts concretely. Therefore, innovative learning media suited to the characteristics and learning needs of elementary students were needed. The purpose of this research was to determine

the validity, practicality, and effectiveness of the counting funnel media in supporting the learning process. The research was conducted through the ADDIE stages, including analysis of learning needs, media design, development through expert validation, classroom implementation, and final evaluation. The results showed that the media was declared valid based on expert assessments, practical in classroom application, and effective in improving students' understanding of integer addition. The findings confirmed that the counting funnel media is feasible and beneficial as a learning aid. The implications indicate that this visual media can serve as an alternative solution to enhance conceptual understanding, motivation, and student engagement. Overall, this study concludes that counting funnel media effectively supports meaningful and enjoyable mathematics learning for elementary school students.

Keywords: visual learning media, counting funnel, ADDIE

INTRODUCTION

Education is the primary foundation for human resource development and the progress of a nation. Through education, humans are shaped into individuals who possess not only knowledge but also skills, attitudes, and values that can improve the quality of life and contribute positively to society. Education serves as a strategic tool for building character, instilling moral values, and developing critical and creative thinking skills. Therefore, education must be designed to optimally cultivate the full potential of students, especially at the elementary level, which serves as the initial foundation for the development of children's thinking skills and personality (Maghfiroh & Suryyana, 2021, p. 8)

Elementary education plays a crucial role in preparing children for the next level of education (Al Ayyubi et al., 2025, p. 12). At this stage, children are in a concrete cognitive development phase, where they more easily understand concepts through direct experience and visualization. One field of study that plays a significant role in developing children's logical and analytical thinking skills is mathematics. Through mathematics learning, children learn to recognize patterns, relationships, and regularities, which are the foundation of rational thinking skills. However, some students often find mathematics difficult, especially when it comes to understanding abstract concepts such as adding integers. This difficulty arises because many teachers still use conventional, teacher-centered methods that lack engaging, concrete activities for students. The use of media or tools may be necessary to make the concept of integers more concrete and less abstract (Annisa, 2024, p. 30).

In an effective learning process, teachers need to use learning media that can help students understand the material more easily. Learning media functions as a visual aid that can concretize abstract concepts, attract attention, and increase students' learning motivation (Kumarasari et al., 2025, p. 122). Through the use of media, teachers can bridge the gap between theory and practice, between the symbolic world and students' real-life experiences. One type of media proven effective in helping students understand arithmetic concepts is

visual learning media. Visual media plays a crucial role in transforming abstract concepts into concrete, easily understood forms. Furthermore, visual media can stimulate student interest and concentration because it involves direct observation and practice (Nurfadhilah et al., 2021, p. 15). Active learning media also plays a crucial role in creating interactive and enjoyable learning experiences for students. Through direct involvement in the learning process, students not only receive information but also play an active role in building understanding. According to (Ningsih & Hartono, 2025, p. 83), the use of interactive learning media can increase elementary school students' learning motivation because it provides a more engaging, participatory, and easily understood learning experience compared to conventional methods.

One visual media that can be used in elementary school mathematics learning is the counting funnel. This media uses a funnel or tube as a visual aid to explain the process of adding numbers. Through this medium, students can see how two numbers are combined into a single sum. Students not only listen to the teacher's explanation but also engage in manipulative activities such as inserting objects into a funnel to represent numbers. These activities make students more active, engaged, and better understand the concept of addition. Thus, funnel media not only facilitates conceptual understanding but also fosters student motivation and curiosity (Hasanah, 2020, p. 9).

Although the use of visual media has great potential, observations at SD Negeri 89 Palembang indicate that teachers still face difficulties in developing and maximizing learning media. In mathematics lessons, particularly on integer addition, teachers tend to use conventional lecture methods and exercises on the whiteboard. Active students are given simple rewards in the form of stars, but the majority of students appear passive and lack participation. This situation indicates that the media and methods used are not yet capable of creating interactive and engaging learning. Learning evaluation results also show that of 22 students, only 7 (45%) achieved the Minimum Completion Criteria (KKM) of 70, while 15 (55%) did not achieve completion. This situation indicates that the ongoing learning process is not running optimally, both in terms of student engagement and the effectiveness of the media used.

This problem demonstrates the need for innovative learning media that are more engaging, interactive, and appropriate to the developmental characteristics of elementary school students. Effective learning should provide opportunities for students to actively participate, experiment, and discover the meaning of what they are learning. Therefore, developing a counting funnel media is an alternative solution that can help teachers explain the concept of adding integers in a more concrete and enjoyable way. The counting funnel media allows students to understand the gradual process of addition through hands-on

activities that involve observation and interaction. Furthermore, this media can be made from simple materials, making it easy to implement in elementary school learning activities (Rahmawati & Wulandari, 2021, p. 18).

Several previous studies have examined the use of funnel media in mathematics learning. Research by (Noer & Anggit, 2019, p. 25) indicates that funnel-based media can improve students' numeracy skills, while research by (Lubis, N. 2020, p. 11) confirms that such media can improve learning outcomes in integer addition. However, most of these studies are limited to aspects of media validity and improved learning outcomes, without delving deeper into how these media influence students' active engagement during the learning process. Furthermore, previous research has not fully considered the local context, such as student characteristics and infrastructure in elementary schools in Palembang. Thus, there remains a research gap that needs to be addressed by developing funnel media that is not only valid and practical, but also effective in increasing student motivation, engagement, and learning outcomes.

Based on this description, the development of funnel-based visual learning media for integer addition in grade III of SD Negeri 89 Palembang is important. This media is expected to help students understand the concept of addition more deeply through an active and enjoyable learning experience. Furthermore, this research is expected to contribute to the development of mathematics learning media that are appropriate to the characteristics of elementary school students and serve as a reference for teachers in creating innovative and effective learning.

METHOD

This study uses the Research and Development (R&D) method which aims to produce and test the effectiveness of an educational product in the form of a counting funnel learning media on the topic of adding integers for third-grade students of SD Negeri 89 Palembang. This research design refers to the ADDIE model which consists of five systematic stages, namely analysis, design, development, implementation, and evaluation. In the analysis stage, the researcher identified students' needs and problems in understanding the concept of adding integers through observations and interviews with class teachers. The design stage was carried out by designing the form, appearance, and content of the counting funnel media to suit the characteristics of elementary school students, while simultaneously compiling research instruments such as validation sheets, practicality questionnaires, and learning outcome tests. Furthermore, in the development stage, the media was produced and validated by material, media, and language experts to ensure the appropriateness of the content, appearance, and use of language. After the media was declared valid, the implementation stage was carried out by

testing the media on third-grade students in the learning process to determine the level of practicality and effectiveness. The final stage, namely evaluation, aims to assess the quality of the media based on the results of expert validation, teacher and student responses through practicality questionnaires, and improvements in student learning outcomes after using the media. Data in this study were obtained through observation, interviews, questionnaires, learning outcome tests, and documentation. Primary data sources came from teachers and third-grade students of SD Negeri 89 Palembang, while secondary data sources were obtained from school documents and relevant theoretical references. The research instruments included expert validation sheets, teacher and student practicality questionnaires, student activity observation sheets, and learning outcome tests to measure the effectiveness of the media. The collected data were analyzed descriptively quantitatively by calculating the average scores of validity, practicality, and effectiveness of the media. The results of this analysis were then categorized into very valid, valid, fairly valid, less valid, and invalid criteria, and were used to determine the feasibility of the counting funnel media as a means of learning mathematics in elementary schools.

RESULTS AND DISCUSSION

The presentation of development data in this study uses the research & development (R&D) method with the ADDIE model, which consists of stages such as analysis, design, development, implementation, and evaluation. This research aims to produce innovative and effective learning media, namely integer counting funnels. The results of this research are the development of counting funnels. This learning media is designed specifically to meet the needs of 3rd grade elementary school students in understanding the concept of integers. Through a comprehensive R&D process, the results of this development are expected to make a significant contribution to improving the quality of mathematics learning at the elementary school level. The following are the R&D stages:

Analysis Stage

In this analysis stage, the researcher conducted an in-depth analysis of three main factors, namely needs analysis, material characteristics analysis, and student needs analysis. Below is an explanation of the analysis of these three factors:

Needs analysis was carried out by interviewing the 3rd grade mathematics teacher at SD N 89 Palembang. In the interview, several main problems were identified, namely the lack of development of innovative counting learning media. Based on this needs analysis, it was found that the learning media used so far has not been effective in increasing student engagement and understanding. Therefore, it is necessary to develop more innovative and interesting learning media, such as counting funnels, which are expected to increase students'

motivation, involvement, and understanding in learning mathematics. This analysis is an important foundation for the development of counting funnel learning media, ensuring that the media can overcome the problems faced and meet the needs of students and teachers.

Material analysis: the researcher analyzed the material that would be used in the learning process. The selection of this material was based on the difficulties experienced by students in understanding the concept of integer addition. In addition, the researcher ensured that the material developed for the learning media focused on the concept of integer addition, in accordance with curriculum needs and to support students' understanding of the mathematics material of integer addition. By conducting this analysis, the researcher ensured that the material selected to be included in this counting funnel learning media was relevant, appropriate, and supported the achievement of the desired learning objectives

Student analysis was carried out by observing 3rd grade students at SD N 89 Palembang while they were working on integer addition material. The results stated that students needed additional encouragement in learning mathematics, especially in integer addition material. The learning methods currently used are less motivating for them to be actively involved in the learning process.

Design Stage

The next stage is the design stage, which is based on several activities, namely instrument design and media selection.

In the instrument design stage, observations were made of students to obtain a series of designs for the product to be developed. These observations were carried out based on three aspects including the media aspect, content aspect, and language aspect. And at the media selection stage, various important aspects were considered to ensure that the learning media was appropriate for the children's achievement level and the indicators listed in the curriculum. This process includes adjusting the media to the children's abilities and needs, as well as the selection of colors, shapes and additional tools that serve to create media that is not only relevant and effective in supporting the learning process, but also attractive and fun for children. With a unique and interactive design, counting funnel media is expected to increase children's interest and motivation to learn, making the learning experience more enjoyable and engaging. The following is a table of counting funnel media selection.

Development Stage

The process of making this media involves several steps. First, is the development of the counting funnel as the main part of the media. Next, the preparation of red and blue buttons as important counting aids. This also includes expert testing to ensure quality and accuracy, as well as a trial to test the effectiveness of the media before it is widely used. Expert validation was carried out through material expert testing and media expert testing. The aim is to ensure

that the game meets high educational standards and is safe for children to use. The experts provided valuable input to improve the quality of the learning material and the effectiveness of the media, so that it could provide an optimal learning experience for users.

Material Validation Results

Based on the results of the material expert test, the validation results show that the counting funnel learning media is considered very feasible in terms of appearance, content, language, and presentation, with all indicators getting positive results. The content is clear and easy to understand, the language used is appropriate for the students' age, and the media is easy to use. The criticism/suggestion given was to change the color of the numbers to be brighter.

Media Expert Validation Results

The results of the media expert validation show that the counting funnel learning media is very feasible in terms of appearance, content, language, and presentation, with all indicators getting positive results. The criticism/suggestion given was to level the size of the holes in the funne.

Language Expert Validation Results

The results of the language expert validation show that the counting funnel learning media is very feasible in terms of appearance, content, language, and presentation, with all indicators getting positive results. The criticism/suggestion given was to add instructions on how to use the learning media.

Table 1. Presentation of media, material and language expert tests

No	Validator	Expert	Score obtained
1	Dewi Fatimah, S.Pd	Materi	73
2	Nora Surmilasari, M.Pd	Media	73
3	Aldora Pratama, M.Pd	Bahasa	74
	Total		220
	Score		81,4 %
			Very Valid

The validation test results from media, material, and language experts showed that the product obtained a very valid value with an overall score of 81.4%. Dewi Fatimah, S.Pd as a material expert and Nora Surmilasari, M.Pd as a media expert each gave a score of 73, while Aldora Pratama, M.Pd as a language expert gave a score of 74, so the total score obtained was 220. Thus, the developed learning media was considered very valid and suitable for use in the next stage.

Implementation Stage

In this step, the learning media is applied in the school learning process. A trial was conducted on small and large groups involving students to measure their response and the

attractiveness of the counting funnel learning media.

Small Group Respondent Results

The product that has been developed, validated, and revised will then be tested on a small group involving 6 students as respondents. This trial was conducted to find out the response to the product that had been developed. From the response questionnaire data obtained from the small group trial at SD N 89 Palembang.

Table.2. Small group questionnaire results

No	Student Name	Score
1	PA	9
2	FF	6
3	NIP	10
	Total	25
	Score	83%
	Criteria	Very Valid

Source: by researchers,2024

Based on the results of a small group trial involving three students, namely PA, FF, and NIP, the counting funnel product obtained a total score of 25 out of a maximum score of 30. With a validation value of 83%, this product is included in the "Very Valid" category. This assessment was obtained from filling out a questionnaire by the three students involved in the field trial, thus providing a positive picture of the quality and effectiveness of the product in the learning context.

Large Group Respondent Results

The product that has been tested on a small group will be continued to a wider trial or a large group. In this trial, 22 students from SD N 89 Palembang will be involved. Through this large group trial, it is hoped that the strengths and weaknesses of the product can be identified in more detail so that further improvements and refinements can be made. Based on the research results of 22 students, the counting funnel product obtained a total score of 188 out of the maximum score. With a validation value of 85%, this product is rated as "Very Valid". This score indicates that this product is effective in increasing students' understanding of the counting funnel material. The evaluation is based on assessment questionnaires filled out by the students, which as a whole gave positive feedback on the quality and effectiveness of the product in the learning process.

Evaluation Stage

Based on the implementation stage, the counting funnel needs to be evaluated. In this evaluation stage, a final revision of the developed product is carried out based on suggestions

and input from students obtained during the implementation stage. This validity is obtained through a series of tests that involve evaluation by experts and testing by students on the use of learning media. The expert test involves an assessment of the material, media, and language aspects by relevant experts, while the student test involves direct feedback from students who use the media in the learning process. Evaluation from both parties provides a comprehensive picture of the effectiveness and quality of the learning media developed.

Validity

Tabel 3. Validity of small and large group trials

No	Group Type	Presentation	Criteria
1	Small Group	83%	Very Valid
2	Large Group	98%	Very Valid

Source: By Reserarchers,2024

Based on the evaluation results, the learning media product demonstrated a very high level of validity, with a score of 81.4% from media, materials, and language experts. Small-group and large-group trials also performed well, achieving 83% and 98% approval, respectively. These results confirm that this product is effective in supporting the learning process at various scales and meets the expected quality standards. The conclusion of this evaluation is that the systematic validation and testing methods successfully produced a product capable of making a positive contribution to the learning process.

Practicality

Practicality refers to the ease and convenience of using the media by students. The practicality aspect includes how the learning media can be accessed and operated without requiring additional help or in-depth technical knowledge. Practical media allows users to focus on the learning content without being distracted by technical complexities or difficulties in how it works.

Based on the practicality evaluation results involving 22 students, the counting funnel learning media showed a very high level of practicality. A total of 17 students gave scores with the criteria of "Very Practical" with a percentage of 90% to 100%, while the other 5 students rated the media as "Practical" with a percentage of 70% to 80%. Overall, this media obtained a practicality percentage of 97.2%, which shows that this learning media is very easy and comfortable for students to use. In conclusion, this counting funnel media is very practical and effective in helping the learning process, providing a positive experience and making it easier for students to access and understand the material taught.

Effectiveness

Effectiveness is carried out to see the extent to which a learning media or teaching method achieves the desired learning objectives. The assessment of effectiveness includes an evaluation of various aspects, including the extent to which the media or method helps students understand the concepts taught, master targeted skills, and apply knowledge.

It can be concluded that as many as 85% of students successfully reached or exceeded the established KKM of 70. The majority of students (17 out of 20 students) have reached the established standard, while 3 students still need to improve their achievement. This evaluation shows that the applied learning approach is quite effective in supporting students' academic success. With a high percentage of students completing the material, it shows that the learning and evaluation methods used are able to facilitate the achievement of expected learning outcomes.

Discussion

The development of a counting funnel learning media for integer addition using the ADDIE model showed positive results and was relevant to various previous studies that emphasized the importance of concrete media in improving elementary school students' understanding of mathematical concepts. The development process, through the stages of analysis, design, development, implementation, and evaluation, was carried out thoroughly and systematically to produce valid, practical, and effective media. During the analysis stage, it was found that most students still had difficulty understanding the concept of integer addition because learning tended to be abstract and lacked visual and kinesthetic activities. Therefore, during the design and development stage, a counting funnel media was designed to help students understand the concept of addition concretely through interesting and interactive manipulative activities. The implementation results showed that the use of the counting funnel media was able to increase students' activeness, motivation, and understanding of integer addition operations. This finding is in line with research by (Noer & Anggita, 2019) and (Hidayah & Prasetyo, 2021) which stated that learning media based on concrete teaching aids can significantly improve students' mathematics learning outcomes, because it provides them with the opportunity to directly experience the visual and kinesthetic learning process.

Furthermore, observations during implementation showed increased student engagement in the learning process. Students became more enthusiastic and more willing to express their opinions because the media provided a fun learning experience. The counting funnel media also helped teachers explain material more effectively because previously abstract concepts could be visualized in a concrete way. Another positive impact was improved student learning outcomes, as evidenced by the increasing number of students

achieving the Minimum Completion Criteria (KKM) after using the media. These results indicate that the counting funnel media not only functions as a visual aid but also strengthens students' conceptual understanding of integer addition.

However, several inhibiting factors were encountered during its implementation, such as limited classroom time, which forced teachers to adapt learning activities to ensure all students had the opportunity to directly use the media. Furthermore, the availability of materials and tools to create the media was also a constraint for schools with limited resources. Nevertheless, there were also significant supporting factors, such as the support of creative and enthusiastic teachers in adapting the media to various learning contexts, as well as positive responses from students, indicating increased interest in learning.

The continued use of counting funnels in elementary schools is highly feasible, given that they are simple, easy to create, and can be reused repeatedly across a variety of basic mathematics learning topics, such as subtraction and multiplication. With the support of teacher training and integration into lesson plans, these tools have the potential to become part of sustainable learning innovations. Therefore, the results of this study not only contribute to improving student learning outcomes but also enrich mathematics learning strategies in elementary schools by presenting educational, engaging, and student-specific tools.

Validation Discussion Results

The validity of this learning media is proven through expert tests involving evaluation from material, media, and language experts with validity scores ranging from 73 to 74, and an overall percentage of 81.4%. In addition, the results of the small and large group trials showed a very high validity percentage, namely 83% and 98% respectively. This confirms that this learning media is effective because it is designed based on active and visual learning principles that engage students directly in understanding concepts concretely. Its development follows the structured ADDIE model, ensuring it aligns with learning needs and quality standards. Furthermore, this media is able to increase student motivation, participation, and understanding, making it effective in various learning contexts(Mayasari et al., 2021, p.29).

Practicality Discussion Results

The practicality of the counting funnel learning media was also proven to be very good with an overall percentage reaching 97.2%. This evaluation involved 22 students who considered this media very practical to use in learning, with most students giving a "Very Practical" rating (Setiawan et al., 2021, p.22). This learning medium is effective because it combines elements of learning and play, enabling students to more concretely grasp concepts through hands-on experience. Its interactive and engaging design increases engagement and

motivation, while the visual and hands-on process makes learning more efficient and enjoyable.

Effectiveness Discussion Results

The effectiveness of this learning media was evaluated by achieving a percentage of 85% of students who successfully achieved or exceeded the established Minimum Completion Criteria (KKM). This percentage is considered sufficient to measure the effectiveness of learning media because, according to (Kurnia et al, 2020, p.31), a learning method can be categorized as effective if at least 75% of students achieve the established competency standards. Thus, results exceeding this threshold indicate that the counting funnel media is effective in helping students understand the concept of adding integers. This also indicates that the learning process successfully increased student engagement, motivation, and understanding, proving that the media has a significant positive impact on achieving the desired learning objectives.

CONCLUSION

Research on the development of a counting funnel learning medium using the ADDIE model has demonstrated very positive results and is relevant to the goal of improving the quality of mathematics learning in elementary schools. Validity tests conducted by subject matter, media, and language experts showed an average score of 81.4%, categorized as highly valid. The results of small and large group trials yielded high feasibility ratings of 83% and 98%, respectively. Furthermore, the counting funnel media was deemed highly practical, with a score of 97.2%, and effective in achieving learning objectives, with 85% of students achieving or exceeding the established Minimum Completion Criteria (KKM). Therefore, it can be concluded that the counting funnel media is suitable for use as a learning aid capable of increasing student engagement, motivation, and learning outcomes in understanding the concept of adding integers.

The implications of this research indicate that developing visual and interactive learning media can have a positive impact on improving students' conceptual understanding and facilitate teachers' delivery of material in an engaging and effective manner. The counting funnel media can also be used as an innovative alternative in mathematics learning, especially for elementary school students who require a concrete approach to understanding abstract concepts. The results of this study are expected to form the basis for the development of more creative and applicable learning technologies, both through simple manipulative and digital-based media, which can be implemented in various educational settings.

Despite the encouraging results, this study has several limitations. First, the study involved only one class at SD Negeri 89 Palembang, so the findings cannot be broadly generalized to other elementary school student populations. Second, the scope of the material tested was limited to addition of integers, so the effectiveness of this media on other mathematical concepts such as subtraction, multiplication, or division has not been tested. Third, this study focused primarily on quantitative data in the form of test results and questionnaires, without an in-depth exploration of students' qualitative learning experiences. Furthermore, the duration of media implementation in learning was relatively short, so its long-term impact on student learning motivation and knowledge retention could not be fully measured.

Based on these limitations, further research is recommended to involve a wider sample, with a variety of materials and different grade levels, and to use mixed methods to gain a more comprehensive understanding of media effectiveness. In addition, further development can be focused on interactive media based on digital technology that maintains visual concrete principles such as counting funnels, so that it can support 21st-century learning that emphasizes creativity, collaboration, and active student involvement.

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