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Development of Learning Media Based on Articulate Storyline 3 to Improve Numeracy Literacy Skills at SDN Kasembon 1 and 3 Kasembon District Malang Regency

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Abstract: The mathematics skills of elementary school students in Indonesia are still relatively below the expected level, especially in subject matter related to integers. The purpose of this study was to develop numeracy literacy learning media based on Articulate Storyline as a solution to solving problems in integer material that can be considered valid according to media and material experts and practical according to users. This study applies the ADDIE model which includes the following five stages: analysis, design, development, implementation, and evaluation. The subjects of the study were teachers and students at SDN 1 Kasembon and SDN 3 Kasembon. Data were obtained through observation, interviews and questionnaires. The results of the validation test of numeracy literacy media based on Articulate Storyline conducted by experts and users showed that the average overall results were considered very valid and very practical, motivating for teachers and students, and suitable for use in learning.

Keywords: Numeracy Literacy, Learning Media, Articulate Storyline, Integer Material

PRELIMINARY

Over the past 5 years, there have been various efforts to improve numeracy skills at various levels, especially in elementary schools, both from developing teaching materials, learning instruments, and even innovative media that support numeracy skills (Sakerani et al., 2022; Singh et al., 2021; Thomas et al., 2023). Numeracy skills are one of the skills that must be possessed by students in the 21st century and in Indonesia, the Numeracy Minimum Competency Assessment (AKM) is held every year in order to test the extent of students' numeracy skills starting at elementary school level (Asmara & Purnomo, 2023; Muhaimin et al., 2023). Numeracy skills play an important role in helping students solve various mathematical problems in everyday life (Bennison et al.,

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2020; Thomas et al., 2023). However, in reality in Indonesia, students' numeracy skills are still relatively low. This is proven based on the results of the 2022 PISA test where Indonesia is ranked 69th out of 81 countries and the 2022 National Education Report Results at the elementary school level that the numeracy skills of elementary school students are still in the moderate category with an achievement percentage of 46.67% (Kemendikbudristek, 2023; OECD, 2023).

Based on the results of observations at several schools in Kasembon District, Malang Regency, it was found that the results of the 2023 Numeracy AKM were not optimal, most students achieved an achievement score range of 50% - 60% and were included in the moderate category, and in the number domain had the lowest value in the achievement score range of 40% - 42% and were included in the moderate category (Kemendikbudristek, 2024). During the interview with teachers and students of grade V of SDN Kasembon 1 and 3, it was also found that in the number domain there is integer material that is considered difficult to understand by students because it has an abstract concept and consists of various rules, and requires the challenge of creativity and innovation of teachers in teaching so that it can be understood by students. Therefore, a solution is needed to improve students' numeracy skills, especially in integer material.

One of the factors that can improve numeracy skills in elementary school students is learning media (Ramadhan et al., 2023; Zaenal et al., 2022). This learning media functions to make it easier for teachers to deliver material to students and help teachers to convey abstract concepts more concretely, especially in number material (Çankaya et al., 2022; Singh et al., 2021). Currently, learning media must adapt to the needs of education in the 21st century which emphasizes digital-based learning media. One of the digital-based learning media creation software that can be used by teachers is Articulate Storyline 3.

Articulate Storyline 3 is an interactive digital learning media creation application that combines various media, be it video, images, and sound in one application and provides feedback for users in the learning process (Daryanes et al., 2023; Nissa et al., 2021; Pratiwi et al., 2023). This articulate storyline is in the form of software that can be used as a communication tool, presentation, and learning resource with templates designed by yourself or provided by this application by adjusting some of the characters in it, and the output of this application can be in the form of an Android application (APK)

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or HTML form that can be uploaded to the website (Daryanes et al., 2023; Erickson, 2020; Lestarani et al., 2023). Research on the development of numeracy literacy media has been conducted several times, both based on the development of numeracy literacy media based on board games, the development of numeracy literacy media based on tablet-based math games, the development of numeracy literacy media based on card games, the development of numeracy literacy media based on mobile applications, the development of numeracy literacy media based on educational games (Hendrix et al., 2020; Lee & Choi, 2020; Ramadhan et al., 2023; Singh et al., 2021; Zaenal et al., 2022). However, there is still little research on the development of numeracy literacy learning media based on Articulate Storyline 3.

By developing this learning media, teachers and students can access the results of this learning media using an Android cellphone by installing the application first or using another device to access the website where the results of the learning media are uploaded. Of course, teachers will find it easier to convey integer material and students can improve their numeracy skills, especially in the 21st century era which is all digital and flexible. Therefore, it is necessary to develop numeracy literacy learning media based on Articulate Storyline 3 on integer material in Elementary Schools. The purpose of this study is to develop numeracy literacy learning media based on Articulate Storyline as a solution to solving problems in integer material that can be considered valid according to media and material experts and practical according to users.

METHOD

This research includes using the type of development research or Research and Development (R&D) with the ADDIE development model consisting of five stages, namely analysis, design, development, implementation, and evaluation (Branch, 2009). The selection of this model is based on each stage that is implemented has a systematic, simple, and complete model flow and can be evaluated at each stage.

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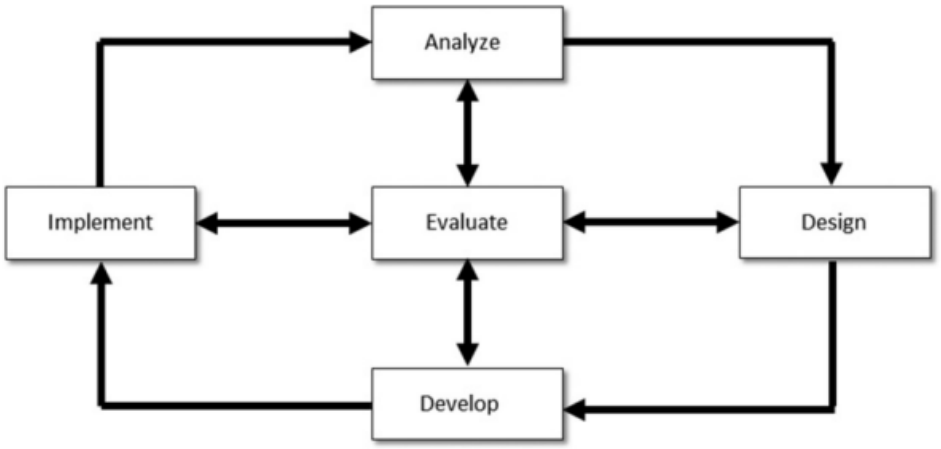

Picture 1. ADDIE Development Model, Source: Branch, 2009

To test the validity of the learning media is carried out by media experts and material experts, namely lecturers in their fields. To test the practicality of the learning media is carried out by teachers and students. The test subjects in this study were grade V teachers and 17 grade V students of SDN 1 Kasembon, as well as grade V teachers and 15 grade V students of SDN 3 Kasembon. The types of data used are quantitative and qualitative data. Quantitative data were obtained through the results of the questionnaire validation sheet in the form of numbers by media and material expert validators and user response questionnaires (students and teachers). Qualitative data were obtained from the results of suggestions and criticisms submitted by media, material, and user experts. The data collection technique for this study used observation, interviews, and questionnaires. Document observation was also carried out to see the results of the Education Report regarding students' numeracy abilities. Unstructured interviews were conducted to explore initial data related to learning problems, student characteristics, and learning needs. The questionnaires used were closed questionnaires and open questionnaires, namely closed questionnaires containing answer choices in the form of assessments of the results of product validity and practicality tests, and open questionnaires containing criticism or suggestions from media, material, and user validators. Data analysis was carried out to analyze based on the acquisition of product validity and practicality scores using a Likert scale with a range of 1-4 on each closed questionnaire. The open questionnaire used the Miles & Huberman model data analysis, namely data collection, data reduction, data presentation, and drawing conclusions (Miles et al., 2014). The scores

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obtained from the Likert scale can be analyzed in percentage form using the formula (Akbar, 2017),

$$V = \frac{Tse}{Tsh} \times 100\%$$

Information:

V: Validity of experts and users

Tse: total empirical score sum

Tsh: maximum total scorel

The results of the media percentage can be declared feasible if the assessment is more than 70%. These results can be concluded by looking at the table of criteria for the level of validity and practicality of the product in Table1.

Tabel 1. Product Assessment Criteria

Value Criteria	Validity and Practical Level Qualifications
86% - 100%	Very valid/practical, can be used without revision/improvement
71% - 85%	Valid/practical, can be used, needs minor revision/improvement
56% - 70%	Quite valid/practical, and needs major revision
41% - 55%	Less valid/practical and cannot be used
25% - 40%	Tidak valid/praktis dan tidak boleh digunakan

Sumber: Akbar (2017)

RESULTS

In the first stage, namely the analysis stage, researchers analyzed the needs, problems, and characteristics of students in the learning process and reviewed previous research (Asmianto et al., 2024; Jais et al., 2022). Based on the results of observations in the 2023 Education Report, it was found that the results of the AKM numeracy in both schools had not yet achieved the expected results and one of the domains/materials that had low scores was the number domain with integer material (Kemendikbudristek, 2024). This is supported by the results of interviews conducted with grade V teachers at SDN 1 Kasembon and SDN 3 Kasembon that teachers did not provide students with enough practice questions based on numeracy literacy and teachers had not developed learning media that supported numeracy literacy, so that the results of literacy and numeracy in the school were still not optimal. Then, one of the materials that is considered difficult for students to understand is the material on integers because in this material students not

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only learn about the concept of integers, but also have to learn about the rules of integer arithmetic operations and calculate integers that are related to the context of everyday life. The results of this study are supported by Çankaya et al. (2022), Defa (2022), and Mustika et al. (2023) which state that the material on integers is considered difficult by most students because the material has abstract concepts that must be given concretely by the teacher either through learning media or the context of students' daily lives. In the second stage, namely the design stage, the researcher carried out the design by determining the framework or initial description (prototype) of the media and preparing the material contained in the interactive media that was developed to facilitate the process of developing the media (Meliana, 2020; Nabilah & Komariah, 2022). After determining the initial framework and determining the material contained in the media, the researcher formulated indicators that were adjusted to the material in the Numeracy AKM that had been determined, namely integers based on learning achievements that had been made by the government (Kemendikbudristek, 2022).

The researcher continued to design the outline of the Articulate Storyline learning media design such as the login front page, user identity, media usage guide, materials, sample questions, quizzes, tips, integer materials, games, learning outcomes in the form of printable certificates, and learning videos. The creation of learning media is adjusted to the characteristics of students who like interesting things such as the use of clear fonts, various colors, animations, and others. In addition, the researcher also prepared an instrument to measure the validity and practicality of learning media for media experts, material experts, and users. At this stage, not only designing the product, but the researcher must also prepare an instrument to measure the validity and practicality of the product made for experts and users (Firdawela & Reinita, 2021; Ismiranda & Ariani, 2020). In the third stage, namely the development stage, the media can be realized according to the previously made design. The interactive learning media developed uses Articulate Storyline 3 software which contains various interesting features and animations to create interactive media (Erickson, 2020). Files can be published online and offline in the form of website links, animation files (swf), applications for CD (exe.) and others. In addition, this media can be accessed via an Android mobile application with Google Chrome or a browser. This Articulate Storyline software is similar to Microsoft Powerpoint which can help educators create interactive learning media in the classroom,

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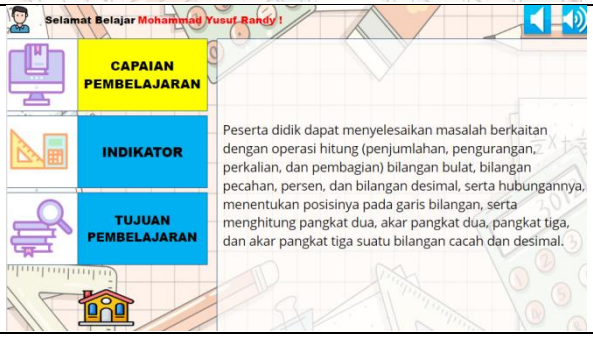
but Articulate Storyline has the advantage that it can be run on various devices such as tablets, laptops, and smartphones and can be accessed online via the web (Kurnisar et al., 2023; Putri et al., 2022). The results of the development of numeracy literacy media based on Articulate Storyline can be seen in Table 2.

Tabel 2. Articulate Storyline 3 Media Development Results

No	Display Name	Media Images
1.	Media log in view	
2.	Successful login display	
3.	Main menu page view	
4.	CP menu display, indicators, and learning objectives	

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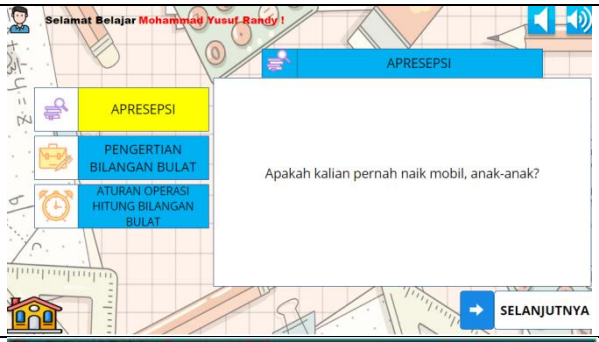
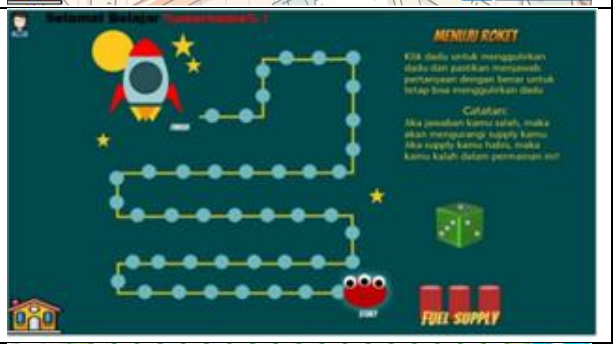
5.	Material view	
6.	Question View	
7.	Certificate of Completion	
8.	View while working on the quiz	
9.	Student Activity Sheet	

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After the media development process is realized, the media that is made is then subjected to a validation test process using a questionnaire by media experts and material experts. The media expert validation questionnaire is to see the design and suitability of the media developed with student characteristics, while the material expert validation questionnaire is to review the suitability of the material contained in the media (Daryanes et al., 2023; Nabilah & Komariah, 2022). In the final validation questionnaire, comments and suggestions are produced from media experts and material experts that researchers can use to revise or improve the shortcomings of the media products developed before being tested in the field (Ismiranda & Ariani, 2020; Lestarani et al., 2023). The results of the media expert validation and the results of the material expert validation can be seen in Table 3.

Tabel 3. Media Expert Validation Results

Aspect	Percentage (%)	
	Per aspect	Overall
Display Quality	92,83% (Very Valid)	92,21% (Very Valid)
Use of Writing	91,50% (Very Valid)	
Easyness	92,30% (Very Valid)	

Based on Table 3, it can be seen that the validation results of the two media experts on the numeracy literacy learning media based on Articulate Storyline obtained an average of 92.21% which is included in the very valid category (Akbar, 2017). The results of this percentage can be said that the learning media created is suitable for use in research because it has an average percentage of more than 70% (Akbar, 2017). However, there are notes in the form of suggestions from media experts, namely improving the use of terms in the media, adding an exit button to the game, adding a background to the username column, and fixing errors in the game.

Tabel 4. Material Expert Validation Results

Aspect	Persentase (%)	
	Per aspect	Overall Value
Material Suitability	86,50% (Very Valid)	86,71% (Very Valid)
Material Quality	84,50% (Valid)	
Presentation	83,33% (Valid)	
Linguistics	92,50% (Very Valid)	

Based on Table 4, it can be seen that the validation results of the two material experts on the numeracy literacy learning media based on Articulate Storyline obtained an average of 86.71% which is included in the very valid category (Akbar, 2017). The

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results of this percentage can be said that the learning media created is suitable for use in research because it has an average percentage of more than 70% (Akbar, 2017). However, there are notes in the form of suggestions from material experts, namely improving the order of the material from easy to difficult, adding cognitive levels to indicators and learning objectives, and sample questions need to be added. The researcher made revisions according to the notes and suggestions from media experts and material experts for the perfection of the development of numeracy literacy media based on Articulate Storyline before being tested on teacher and student users (Daryanes et al., 2023; Lestarani et al., 2023). At this implementation stage, the researcher prepared the media product that had been created to be tested on the trial subjects. The trial of numeracy literacy learning media based on Articulate Storyline was conducted on grade V teachers and grade V students of SDN 1 Kasembon and SDN 3 Kasembon. Questionnaires for students and teachers were distributed directly. The results of the questionnaire from teacher users can be seen in Table 5, while the results of the student user questionnaire can be seen in Table 6 and Table 7.

Tabel 5. Teacher Response Results

Aspect	Persentase (%)	
	Per aspect	Keseluruhan
Suitability of Teaching Materials	90,75% (Very Practical)	91,43% (Very Practical)
Media Display Quality	90,62% (Very Practical)	
Material Suitability	90,62% (Very Practical)	
Media Effectiveness	93,75% (Very Practical)	

Based on Table 5, it can be seen that the results of the responses of the two teachers to the numeracy literacy learning media based on Articulate Storyline as a whole obtained a percentage of 91.43% which is in the very practical category (Akbar, 2017). The percentage results obtained are suitable for use in learning supported by the opinions or suggestions of the two teachers. The suggestions related to media publication can be done in various schools and especially use in front of the class using a projector, the display should be enlarged again.

Tabel 6. Student Response Results 1:1 Scale and Small Scale

Aspect	Persentase (%)	
	Per aspect	Overall
Use of teaching materials	91,07% (Very Practical)	94,12% (Very Practical)
Appearance	94,64% (Very Practical)	
Efisien	96,64% (Very Practical)	

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Based on Table 6, it can be seen that the results of student responses on a 1:1 scale and a small scale to the numeracy literacy learning media based on Articulate Storyline overall obtained a percentage of 94.12% which is in the category of very practical and interesting for students (Akbar, 2017). These results are supported by comments and suggestions from students who gave a positive impression, such as the media is fun, the media is exciting, the media increases insight, and there are students who do not understand the instructions on the learning media. Based on the responses given by the users, it shows that numeracy literacy learning based on Articulate Storyline can be tested on a large scale and stated without making revisions or improvements, so that it can be directly tested in a large-scale field trial..

Tabel 7. Large Scale Student Response Results

Aspect	Persentase (%)	
	Per aspect	Overall
Use of teaching materials	90,17% (Very Practical)	91,66% (Very Practical)
Appearance	93,75% (Very Practical)	
Efficient	91,07% (Very Practical)	

EfficientBased on Table 7, it can be seen that the results of large-scale student responses to numeracy literacy learning media based on Articulate Storyline overall obtained a percentage of 91.66% which is in the category of very practical and interesting for students (Akbar, 2017). In this trial, many positive feedbacks were obtained, such as learning integer material is not dizzy and enjoyable because there are interesting games, the media is good and interesting, like learning using this media because there are games, quizzes and getting certificates, and quite understand the material because there are fun videos. The results of user responses assessed that the Articulate Storyline media can provide insight, make it easier for students to understand the material, interesting and fun to learn about Integer material. The final stage in the ADDIE model development research is evaluation. This evaluation stage is to determine the quality of the feasibility and weaknesses of the numeracy literacy learning media product based on Articulate Storyline that has been created (Daryanes et al., 2023; Jais et al., 2022). Evaluation is obtained from the assessment results by media expert validators, material expert validators, and teacher users as well as student response questionnaires during the trial.

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Based on the results of the media expert validators and material experts, the numeracy literacy learning media based on Articulate Storyline is very valid and suitable for use in research because it has a value criterion of 86% - 100% (Akbar, 2017). Based on the results of trials with teachers, small-scale students, and large-scale students, the numeracy literacy learning media based on Articulate Storyline is very practical and suitable for use in research because it has a value criterion of 86% - 100% (Akbar, 2017). The results of user tests conducted on students show that the numeracy literacy learning media based on Articulate Storyline can increase practicality, time efficiency, and visualization, making it easier for students to understand the concept of integers. This is evidenced by a fairly large percentage stating that it is very practical. In addition, during the implementation process, students showed a positive response to the media, expressed pleasure and interest, and stated that it was easy to understand material related to integers. This shows that Articulate Storyline media facilitates conceptual understanding while reducing the potential for student misconceptions, thereby increasing motivation and learning outcomes (Ismiranda & Ariani, 2020; Kurnisar et al., 2023). Articulate Storyline media as interactive multimedia can combine various audio-visual elements such as photos, videos, and sounds, thus facilitating students' understanding of learning materials (Erickson, 2020; Lestarani et al., 2023; Putri et al., 2022).

DISCUSSION

Based on the data presented in Table 3, media expert validation shows that the Articulate Storyline 3-based learning media managed to get an average percentage of 92.21% which is included in the very valid category. Validation on the aspect of display quality got a percentage of 92.83%, the aspect of writing usage 91.50%, and the aspect of user convenience got a percentage of 92.30%, which shows that the media has met the visual and design standards that are attractive to students. These results are consistent with the principle that learning media must be made interactively and in accordance with student characteristics, especially to attract the attention of elementary school students who usually like animation and bright colors. However, there are several suggestions for improvement from media experts, namely to add an exit button to the game and improve the use of terms and errors that appear. This shows that although the media has been

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assessed as very good, the media still needs improvement, especially in technical aspects to ensure a more optimal user experience so as not to encounter obstacles.

The validation results from the material experts reached an average percentage of 86.71% which is in the very valid category as seen in Table 4. The percentage of the material suitability aspect and the material quality aspect scored high, respectively 86.50% (very valid) and 84.50% (valid). The percentage of the presentation aspect and the language aspect also scored high, respectively 83.33% (valid) and 92.50% (very valid) indicating that the content presented in this media is in accordance with the curriculum and is easy for students to understand. This finding is important because integer material is often considered difficult by students, so good presentation and appropriate language can help minimize misconceptions. In addition, the material experts provided suggestions to improve the order of the material presented from easy to difficult levels, and add questions with more varied cognitive levels based on Bloom's Taxonomy. This indicates that the development of learning media must be adjusted to the level of students' cognitive abilities to ensure a more effective and gradual learning process.

The results of teacher responses to the developed Articulate Storyline 3 media show that this media is very practical to use in class, indicated by achieving an average percentage of 91.43% in the very practical category as shown in Table 5. The percentage of suitability of teaching materials reached 90.75%, the percentage of media display quality reached 90.62%, the percentage of material suitability reached 90.62%, and the percentage of media effectiveness reached 93.75% in the very practical category. Based on these results, this shows that this media is not only visually attractive but also able to support teaching effectiveness. Teachers recommend that the use of media can be more effective by using LCD projectors in class, which emphasizes the importance of the technology integration process so that learning takes place better in class. Another recommendation from teachers is the potential use of Articulate Storyline 3 media that can be used in other schools. This shows that this media can be further developed on a wider scale and can be used as an interactive learning model in other subject materials.

Based on the data shown in Tables 6 and 7, students gave a positive response to the use of teaching materials with a percentage reaching 90.17% and 91.07% in the very practical category. In terms of appearance, students gave a positive response with a percentage reaching 94.64% and 93.75% in the very practical category. In terms of

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efficiency, students also gave a positive response with a percentage reaching 96.64% and 91.07% in the very practical category. Students considered this learning media practical and interesting, and useful for understanding numbers more easily. Students considered that the combination of games and certificates significantly improved the learning experience, made learning more enjoyable, and motivated them to engage in learning. This media combines interactive components, such as quizzes and instructive videos, which increase student engagement in the lesson, thus positively affecting their learning outcomes. This shows that interactive media, such as Articulate Storyline, can increase students' motivation to learn and improve their understanding of mathematics subjects that are considered difficult.

Observation findings state that students' overall numeracy literacy skills, especially in integer material, are still at a low level. This is in accordance with the 2023 AKM report document and teacher interviews which also highlighted that this integer material is difficult for students, the concept is too abstract and the calculation procedure is difficult to relate to real-life contexts. An important difference between conventional classroom-based learning and Articulate Storyline 3-based learning media is that this media is able to overcome the limitations of learning media available in schools. The application of audio-visual learning aids and the use of games, quizzes, and videos help students understand integer material, which is usually considered difficult in an abstract way. This media also allows students to enjoy learning in other ways, such as interesting visualizations, playing games according to the unique characteristics of elementary school students. Validation from media experts and material experts stated that this learning media is very valid with a value of more than 86%, which means that this media can meet the needs and characteristics of students. In addition, trials conducted on students and teachers showed a high response, with an average of 91% for the percentage of practicality. The trial results show that the media is practical to use in class and visually appealing.

The use of this learning media has been proven to improve students' understanding of integer material, which can be seen from the positive responses of students when using the media. Students stated that they were excited to learn because of the interactive elements such as quizzes and game competitions that made learning more enjoyable. The use of media like this can be expanded even in other schools in the same area which of

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course will be beneficial for all students to understand and improve their numeracy literacy skills. This media tool has a higher potential not only in developing numeracy literacy materials but also facilitating other abstract materials that use a direct technological approach.

CONCLUSION

Based on the results of the assessment of learning media based on Articulate Storyline 3 to improve numeracy literacy skills at SDN Kasembon 1 and SDN Kasembon 3 on the Integer material using the ADDIE stages, it obtained a percentage value of 92.21% in terms of media and 86.71% in terms of material which is included in the very valid category. The results of user responses showed a percentage of 91.43% in the very valid and practical category by teachers, and 94.12% in the very practical and interesting category from students on a 1:1 scale and small scale. The results of student responses to large-scale field trials obtained a percentage of 91.66% in the very practical and interesting category. This Articulate Storyline 3-based learning media has succeeded in attracting students' interest through interactive visual displays, the use of animation, and games that are relevant to the integer material, so that it can facilitate the understanding of abstract concepts that students have not previously understood. Teachers also assessed that this media is able to support a more interactive and effective learning process, and is worthy of being implemented in other school environments. Overall, the development of Articulate Storyline 3 media is able to provide a significant impact on improving students' numeracy literacy skills in integer material. The implementation process on a wider scale is highly recommended to improve the quality of numeracy literacy learning at the elementary school level.

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