

The Effectiveness of Developing STEAM-Based E-Booklets as an Effort to Improve Poster Writing Skills of Lower-Grade Students

Anindhitya Yudhanta Prasetya^{1✉}, Haryono Haryono², Panca Dewi Purwati

¹SDN Kalibanteng Kidul 01, Kota Semarang, Jawa Tengah, Indonesia

²Sekolah Pascasarjana, Universitas Negeri Semarang, Indonesia

Article Info

History Articles

Received:

05 April 2024

Accepted:

10 May 2024

Published:

30 Juny 2024

Keywords:

E-booklet Media,
Learning Media,
STEAM Learning
Approach, and
Writing Skills

Abstract

The form of innovation currently developing rapidly is the development of learning media. One form of innovation in designing learning media today is digital learning media. Digital learning media is a learning medium that is in digital form and can be accessed through various platforms. One example of digital learning media is e-booklet learning media. The purpose of this study was to measure the effectiveness of the development of STEAM-based e-booklet media in improving the writing skills of grade 3 students. This study uses the research and development (R&D) method with the ADDIE research model. The subjects of this study were 29 students in grade 3A. This research was conducted at SDN Kalibanteng Kidul 01, Semarang. The results of this study show that the development of e-booklet media is efficacious in improving the writing skills of lower-grade students, as evidenced by the results of the normality test, homogeneity test, T-test, and N-gain test. So, it can be concluded that the development of e-booklets effectively improves the writing skills of lower-grade students.

✉ Correspondence address:

Tumpang VIII, Kecamatan Gajahmungkur, Kota Semarang

E-mail: yudhantaprasetya@students.unnes.ac.id

p-ISSN 2252-6404

e-ISSN 2502-4515

INTRODUCTION

Education is integral to human life and achieving a nation's development. Education plays a vital role in determining and changing the life of every human being (Safitri, 2022). Every human being has the right to get a decent education. Humans with a qualified education will undoubtedly be able to improve the quality of human resources in a nation (Ichsan, 2021). If a nation has quality human resources, it will develop and advance in all fields.

Along with the development of information and communication technology, the world of education must adapt by using more varied and interactive learning media. Learning media has a strategic role in increasing motivation, understanding of concepts, and active involvement of students in the learning process (Muntamah, 2024). One form of innovation currently developing rapidly is the development of learning media.

Learning media has a vital role in increasing the effectiveness of learning. Learning media can help students understand learning concepts more easily and interestingly (Permana, 2024). According to constructivist learning theory, students will understand the material more easily if they are directly involved in a meaningful learning process. Therefore, developing learning media that is interesting and relevant to students' needs is a must (Sari, 2025).

In reality, many teachers still use conventional learning methods without being supported by the application and development of innovative learning media. This will, of course, indirectly have an impact on the low level of motor skills of students. The lack of creative and innovative media variations makes students quickly bored, less motivated, and less likely to explore their creative ideas, so their motor skills also decrease (Indriani, 2023).

Based on the observations and interviews conducted by researchers, it can be concluded that third-grade students have problems with their writing skills. Writing skills are one of the basic skills in learning Indonesian that students must master from an early age. This ability is important

in supporting students' academic and communication success. However, various studies show that the writing skills of students in lower grades are still relatively low. Difficulty in expressing ideas, lack of motivation, and the lack of innovative learning media are some of the factors that cause low writing skills in students.

This is also supported by quantitative data in the form of their writing skills scores in the first semester, where students are still unable to achieve the learning objective achievement criteria, with a score of 70. The average student writing skill score is 78, which is still in the low category. Of the 29 students, only 9 or 31% got scores in the "good" range (score 80-89). Meanwhile, 20 students or 69% got scores in the "sufficient" range (score 70-79).

Based on the results of the quantitative data, it can be concluded that students in the third grade have problems with their writing skills. Of course, technology should be used because learning media have an important role in developing increasingly advanced technology. One thing that can be developed is digital learning media. Digital learning media in learning can make it easier for students to learn anywhere and anytime (Amelia, 2022).

Seeing the phenomena in the field, the researcher feels that the problems found are interesting and important to study. It can be concluded that the problems obtained by the researcher based on the results of observations and interviews with third-grade students of SDN Kalibanteng Kidul 01 Semarang are that there is no development of digital learning media from teachers that can integrate the context of concrete and abstract learning materials, resulting in low levels of writing skills in students.

Then, the researcher tried to design a needs analysis based on the problems found. The needs analysis design includes determining what learning media is appropriate to be developed and how to improve students' writing skills. The result of the needs analysis design is that the researcher tries to design and develop a learning medium that can integrate abstract and concrete concepts and is in line with students' learning materials, to improve students' writing skills.

In today's digital era, using technology in learning has become unavoidable. One innovation that can be applied in learning to write is using interactive digital media, such as e-booklets. This media can potentially increase students' interest in writing by presenting material engagingly and variedly.

In addition, integrating the science, technology, engineering, art, and mathematics (STEAM) approach in developing these learning media can help students think critically, creatively, and systematically in writing. STEAM is a part of constructivist learning, which trains the students to build their knowledge and understanding through projects (Nurseta, 2024)

Based on the results of the needs analysis design that has been made, the researcher will develop a digital learning medium, namely, an e-booklet. An e-booklet is a digital book containing a guide or material equipped with attractive and colorful images (Arqiya, 2025). The researcher chose an e-booklet as the learning medium to be developed because an e-booklet is a form of learning media that can integrate concrete learning concepts and abstract learning for students.

E-booklet learning media is also closely related to students' verbal and fine motor development, namely writing skills (Musarwan, 2022). Then, e-booklet learning media is also in line with the material that will be taught in learning Indonesian language subjects, namely, material on making a poster, where later the e-booklet contains material on how to make a poster.

Then, for the design of the development of e-booklet media, the researcher will develop an e-booklet learning media, where later the e-booklet will contain material on how to make a poster. Based on the description above, it can be concluded that the researcher tries to solve the existing problems by developing an e-booklet learning media with the help of a project-based learning (PjBL) learning model based on the science, technology, engineering, art, and mathematics (STEAM) approach which aims to improve the writing skills of simple texts of grade III elementary school students.

The STEAM approach focuses on mastering concepts in five fields of science and connects them to everyday life. In the context of writing learning, this approach can help students develop writing skills in a more enjoyable and meaningful way. However, to date, little research has developed STEAM-based e-booklets as a medium to improve the writing skills of lower-grade students (Ilhami, 2022).

Based on the explanation given by the researcher, this study aims to develop an e-booklet based on the STEAM approach to improve simple text writing skills in lower-grade students. It is hoped that the development of this media can be one of the innovative solutions in writing learning that is more effective, interesting, and meets the needs of students in the digital era.

METHOD

This study uses the type of research and development (R&D) research using the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model. The research design used is a pre-test post-test control group design using a writing test for students. R&D (Research and Development) research aims to develop and validate a particular product or method to be used effectively (Okpatrioka, 2023). In education, R&D research is often used to develop media, modules, or learning methods that suit the needs of students and teachers.

One of the models often used in R&D research is the ADDIE model. In R&D research, there are three substantive stages, namely the design stage, the development stage, and the testing stage. This R&D research model is a systematic framework consisting of three main stages, namely the design stage, the development stage, and the testing stage. The visualization of the research procedure can be seen in Figure 1 below.

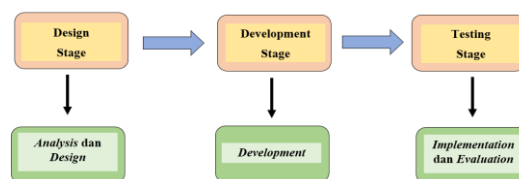


Figure 1: The Research Procedure

The design stage is the first stage in R&D research. This stage is a stage that includes the design of the learning media product that will be made based on the results of the needs analysis. In the ADDIE model, the design stage consists of the analysis and design stages. Next is the development stage, the second stage in R&D research. This stage includes the development of learning media products based on the previous design stage. In the ADDIE model, the development stage consists of the following.

Moreover, the last stage is the testing stage, the third stage in R&D research. This stage includes a feasibility test of learning media products (based on validity tests and internal evaluations) and product effectiveness tests (based on the achievement of research objectives with product development carried out and external evaluations). In the ADDIE model, the testing stage consists of the implementation and evaluation stages.

The population of this study was students of class III A SDN Kalibanteng Kidul 01 Semarang, totaling 29 students. The sample of this study was students of class III A SDN Kalibanteng Kidul 01 Semarang, totaling 29 students. In this study, researchers used data collection techniques through tests and non-tests, for non-test data collection techniques in the form of observation data, interviews, and questionnaires.

Researchers used observation techniques, namely data collection techniques, when they were concerned with work processes and human behavior that was carried out directly. The type of observation conducted by researchers is a structured observation. Then, interviews were conducted to explore information about the problems of existing phenomena for teachers and students. Moreover, questionnaires were conducted to find out the initial problems of teachers and students.

Then, the data analysis techniques used are qualitative and quantitative data analysis. We will use the normality test, the homogeneity test, the paired sample t-test, and the n-gain score test for quantitative data analysis.

RESULTS AND DISCUSSION

Data collection in this study was conducted in 3 meetings. The first meeting was conducted to see the progress of student poster making, namely the stage of determining the theme and the title of their poster. Then, at the second meeting, there was an assessment of the stages of formulating compelling and persuasive sentences on students' posters and the stages of editing sentences that students had formulated on their posters.

Moreover, in the third meeting, it was used to assess the stages of image integration on student posters and the final design. This meeting was also used to collect data that would be used as the post-test scores of this study. The students' pre-test scores were taken from their writing skills scores in the previous semester. The following is the design of the e-booklet learning media used in this study, shown in Figure 2.



Figure 2: E-booklet Media Design

The average results of the pretest and posttest scores for students' writing skills can be seen in Table 1.

Table 1: Average Pretest and Posttest Scores of Students

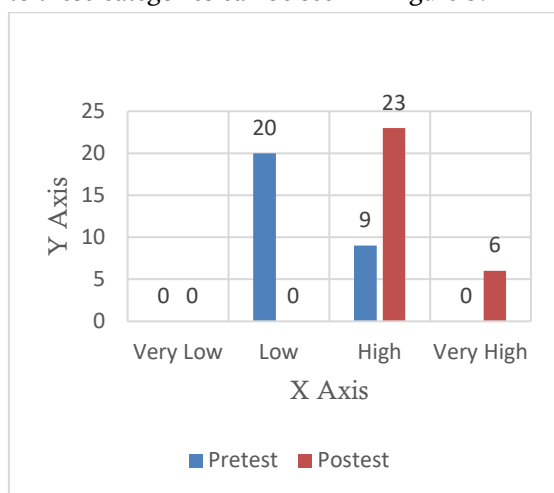
Test	Score
Pretest	78.55
Posttest	87.62

Then the results of all students' scores will be summarized and grouped based on the distribution of the score levels obtained. The distribution of the value levels can be seen in Table 2.

Table 2: Categories for Student Grade Level

Score	Categories
90-100	Very High
80-89	High
70-79	Low
<70	Very Low

The results of grouping students according to these categories can be seen in Figure 3.

**Figure 3:** Students' Writing Skill Level During Pretest and Posttest

Based on Figure 3, it can be concluded that the number of students included in the low category at the beginning of the study, or based on the pretest results, experienced a significant increase after using STEAM-based e-booklet media. After using the e-booklet media, the number of students increased to the high and very high categories. At the beginning of the study, data was obtained that the number of students included in the low category was 20, and those in the high category were 9.

Then, after the researcher applied the e-booklet media to students, the data showed that the number of students included in the high category increased from 9 students to 20 students. Moreover, it increased from 0 students to 6 for the very high category. Based on the graph, it can be concluded that the development of STEAM-based e-booklet media effectively improves the poster writing skills of lower-grade students.

Then, the next step is the result of quantitative data processing from the pretest and posttest scores of students' poster writing skills. For quantitative data analysis, use normality, homogeneity, T, and N-gain score tests. The first test is the normality test. The normality test is conducted to determine whether the data in a sample comes from a normally distributed population. Because the population in this study is less than 50 samples, the normality test used is the Shapiro-Wilk test.

The Shapiro-Wilk normality test provides that if the Sig value > 0.05 , it can be concluded that the data is normally distributed. If the Sig value < 0.05 , then it can be concluded that the data is not normally distributed. The results of the normality test in this study can be seen in Table 3.

Table 3 Shapiro-Wilk Normality Test Results

	Statistic	df	Sig.
Pretest	0.944	29	0.131
Posttest	0.933	29	0.065

Based on the results of the normality test above, it can be seen that the Sig value of the pretest and posttest exceeds the provisions of 0.05. Because the Sig value > 0.05 , it can be concluded that the data in this study is usually distributed.

Next, the second quantitative data analysis is the homogeneity test. The homogeneity test is carried out to determine whether the data variants in this study are the same or homogeneous. The homogeneity test has a provision that if the Sig value > 0.05 , it can be concluded that the data in this study are homogeneous. If the Sig value < 0.05 , then it can be concluded that the data in this study are not homogeneous. The results of the homogeneity test in this study can be seen in Table 4.

Table 4 Homogeneity Test Results

	Lavene Statistic	df1	df2	Sig
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Based on the Mean	3.056	1	56	0.086
Based on the Median	2.184	1	56	0.145
Based on Median and with adjusted df	2.184	1	47.508	0.146
Based on the trimmed mean	2.851	1	56	0.097

Based on the results of the homogeneity test above, it can be seen that the Sig value exceeds the threshold of 0.05. Because the Sig value > 0.05, it can be concluded that the data in this study are the same or homogeneous.

Next, for the third test is the T-test. The T-test is carried out if the data in the study have met the requirements, namely, the data is normally distributed and the data is the same or homogeneous. The T-test can be carried out because the test results show that the data is normal and homogeneous.

The type of T-test conducted in this study uses the Paired Sample T-test type, which compares two averages from the same group at different times and conditions. The goal is to find out whether there is a significant difference between before and after treatment is given.

The Paired Sample T-test provides that if the Sig value (2-tailed) < 0.05, it can be concluded that there is a significant difference between before and after using e-booklet media. If the Sig value (2-tailed) > 0.05, then it can be concluded that there is no significant difference between before and after using e-booklet media. The results of the T-test in this study can be seen in Table 5.

Table 5: T-Test Results

	Score
Mean	9.06897
Std. Deviation	2.64482
Std. Error Mean	0.49113
Lower	10.07500
Upper	8.06293

t	18.465
df	28
Sig (2-tailed)	0.001

Based on Table 5, we can see that the Sig value (2-tailed) of this T-test is 0.0001, which is < 0.05, so it can be concluded that there is a significant difference between before and after using STEAM-based e-booklet media.

The last test is the N-gain Score test. The N-Gain Score test is used to measure the effectiveness of a learning or treatment based on the increase in student variables between before and after the treatment is given. The N-Gain test shows how much increase in value is achieved compared to the maximum increase that can be achieved. The results of the criteria for the N-gain Score test can be seen in Table 6.

Table 6: Criteria for N-gain Score Test

N-gain Score	Criteria
>70	High
30-69	Medium
<30	Low

The results of the N-gain test can be seen in Table 7.

Table 7 N-gain Test Results

	N-gain Score
N	29
Minimum	18.75
Maximum	60.87
Mean	41.7037
Std. Deviation	9.45119

Based on the table above, it can be seen that the test results from the N-gain test are at 41.70, which is included in the medium category. So it can be concluded that the development of STEAM-based e-booklet media effectively improves the poster writing skills of lower-grade students.

Education is a key factor in the development of a nation. In the era of globalization like today, of course, the challenges in the world of education are becoming

increasingly complex and require innovation in the learning process to improve the quality of student learning. In addition, education also has an important role in forming the quality of superior and highly competitive human resources (Sudarma, 2022).

A practical and innovative learning process is one of the primary keys to achieving educational goals. This process not only focuses on achieving cognitive learning outcomes, but must also be able to develop students' potential as a whole, including creativity, which is an important capital in facing the challenges of the 21st century (Sitepu, 2025).

Along with the development of information and communication technology, the world of education must adapt by using more varied and interactive learning media. Learning media has a strategic role in increasing motivation, understanding of concepts, and active involvement of students in the learning process (Nashikhah, 2025). One form of innovation currently developing rapidly is the development of learning media. Learning media has a vital role in increasing the effectiveness of learning.

Learning media is anything used as an intermediary or link from the information provider, namely the teacher, to the recipient of information, or students, to motivate students to follow the learning process better (Try, 2022). Learning media may be an instrument that can be used as a middle person in learning to extend productivity and viability in achieving instructional objectives, expanding inspiration and learning results of students within the learning process (Khoiriyah, 2022).

This means that learning media must include five main components, namely as a mediator of messages or materials in the learning process, as a learning resource, as a tool to stimulate students' desire to learn, as an effective tool to achieve complete and meaningful learning outcomes, and as a tool to learn and improve student skills (Hidayat, 2025). If these five components synergize well, of course, it will affect the success of learning in achieving the expected learning objectives.

Based on the background of the problem that has been explained, the researcher identified the problems in the field, namely the causal factors of the low level of students' writing skills, which include identification from teachers, students, and school facilities and infrastructure. The results of identifying the causes of the problem from teachers are the learning model that is usually used by teachers when teaching, namely the Problem-Based Learning (PBL) learning model with lecture, discussion, question and answer, and role-playing learning methods only.

Of course, to improve students' writing skills, teachers must apply other learning models and methods that are appropriate for students. One of the learning models that is appropriate for improving students' skills is the Project-Based Learning (PBL) learning model. The project-based learning model can teach students to create a project integrated with simple text writing activities.

Identifying the factors causing students' problems is that students tend to be more enthusiastic and motivated to follow learning when combined with the application of digital learning media. This can be seen from the results of the assessment of students' written work when writing a story or descriptive text in the first semester using only conventional learning media, where many students were found to be still not able to write their writing optimally, the writing is still not neat, the language used is still not standard, and also the choice of words is still not right.

The results of identifying the last factor causing the problem are factors from the facilities and infrastructure available at the school. The learning resources are limited to teacher books and student books, which means that teachers' learning is limited to these resources, resulting in less varied learning. Then the researcher also got the result that, there is no special learning media to support the subject here is no special learning media to support subject. In addition, teachers usually only use a whiteboard to support learning.

Then, based on the results of data analysis and testing that have been explained and presented by the researcher, it can be concluded that the development of e-booklet learning media based on the STEAM approach is efficacious in improving the poster writing skills of lower-grade students, which is indicated by an increase in students' writing skill scores.

CONCLUSION

One form of innovation in developing learning media today is digital learning media. Digital learning media is a learning medium that is in digital form and can be accessed through various platforms. In reality, those who use conventional learning methods are not supported by the application and development of innovative learning media. This will, of course, indirectly have an impact on the low level of motor skills of students. Based on the observations and interviews conducted by researchers, it can be concluded that third-grade students have problems with their writing skills. Difficulty in expressing ideas, lack of motivation, and the lack of innovative learning media are some of the factors that cause low students' writing skills. This makes it difficult for students to develop their writing skills while studying. The purpose of this study was to measure the effectiveness of the development of STEAM-based e-booklet media in improving the writing skills of grade 3 students. The results of this study show that the development of e-booklet media is efficacious in improving the writing skills of lower-grade students, as evidenced by the results of the normality test, homogeneity test, T test, and N-gain test. So, it can be concluded that the development of e-booklet learning media based on the STEAM learning approach effectively improves the writing skills of lower-grade students.

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