

Development of Digital Pop-Up Book Learning Media with Contextual Teaching and Learning (CTL) Approach to Improve Social Science Learning Outcomes for Grade IV Elementary School Students

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Abstract: The results of the pre-research conducted by researchers at SD Negeri Jontro show that there are two main problems, namely the limitations of learning media and low student learning outcomes, especially in the science and science subject grade IV. This study aims to develop, evaluate, and test the effectiveness of digital pop-up book media with the Contextual Teaching and Learning (CTL) approach, with a focus on improving the learning outcomes of grade IV elementary school students. The method applied in this study is Research and Development (R&D), which is modified into eight stages, namely potential and problem identification, data collection, product design, design validation, design revision, product trial, product revision, and application trial. The results of the assessment from media experts showed a percentage of 86% and material experts showed a percentage of 90%, which is classified as very feasible. In addition, the response from the classroom teacher reached 92.85% and the student response was 94%, both of which were also considered very feasible. The media effectiveness test carried out by T test analysis showed a significance value of 0.000. In addition, the N-Gain calculation yields a value of 0.84 which is included in the high category. Thus, digital pop-up book media with the Contextual Teaching and Learning (CTL) approach can be considered very feasible and effective to improve the learning outcomes of social studies students in grade IV.

Keywords: Contextual teaching and learning; Digital pop-up book; IPAS; Learning outcomes

Introduction

Education is a human need in the process of developing potential in oneself so that they are ready to interact with the surrounding environment. Education provides a learning atmosphere so that students can actively develop their potential, especially in religious and spiritual strength, self-control, ethics, intelligence, student morality, knowledge about life, general knowledge, skills needed in creating a process.

Permendikbudristek Number 47 of 2023 also explains the importance of planning, implementing, and supervising educational activities which are carried out by educational units, including early childhood education, primary education, and secondary education. Each level has a great role and influence on student development. One of the initial foundations for students in the world of education that is influential is the level of basic education, especially elementary school. Elementary school students need a proper education to

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support optimal learning processes and outcomes. Learning is a process that lasts forever and is carried out by everyone. Learning is the same as making changes in behavior. Behavior changes here include knowledge, skills, and competencies in each individual.

Based on several understandings put forward by experts (Darling-Hammond et al., 2024; Vettori et al., 2024), the study concluded that learning does not only involve cognitive aspects such as reading, listening, writing, doing assignments, and exams. More than that, learning also involves permanent behavioral changes, which arise as a result of active interaction between individuals and their surroundings. Learning is related to the learning process that is carried out in the classroom. The learning process requires the existence of an expert or teacher to clarify what he is learning. However, learning is not only done indoors or in the classroom, but can also be done outdoors. According to Duarte et al. (2022) and Chakravarty (2023), natural science or science is an effort to produce knowledge. The process of learning natural sciences is highly dependent on careful observation of existing phenomena, and in addition to that, the formation of theories which are expected to be able to make conclusions based on the results of the observations made.

IPAS learning is applied in elementary schools or Madrasah Ibtidaiyah by paying attention to the fact that children at that age see the world in a simple, comprehensive, and natural way. In this phase, children are still in the stage of concrete or simple thinking, which is holistic, comprehensive, and lacks attention to detail. Therefore, the subjects of Natural Sciences and Social Sciences are united into one, because the two can be related in the phenomena of daily life (Lewis et al., 2023). Based on this description, it can be concluded that IPAS learning requires teachers to apply innovative and creative ways of learning. So that students become more familiar with the learning materials studied. But in reality, there are still many teachers who have not innovated teaching methods that suit the learning needs of their students (Goyibova et al., 2025; Bhardwaj et al., 2025). So that this will certainly affect student learning outcomes.

In today's era, learning requires the latest innovations in the learning process, namely with learning tools (Kwangmuang et al., 2021; Vieriu & Petrea, 2025). Innovative learning tools are expected to increase students' interest in learning. A teacher is required to be able to create learning media innovations that are interesting to his students, and can help make it easier for students to understand the learning material delivered by the teacher through the learning tool. One of the innovations that is quite effective is the development of learning media (Amelia et al., 2024). Based on the results of field observations and interviews

with grade IV teachers of SD Negeri Jontro, the value of knowledge of the learning content of science science class IV is currently still relatively low. Especially in the content of landscape material and its relation to community professions, teachers explained that students still have difficulty in connecting the state of the landscape in Indonesia with the appropriate livelihoods of the population.

According to Kaushik et al. (2019), the fourth grade teacher, students still have difficulty understanding the meaning of the material and how to remember its connections. From the observation results obtained, the causative factor of the lack of students in the ability to understand landscape material and its relation to the profession of the community, namely the models and methods used during learning by grade IV teachers are still monotonous. This greatly affects students' interest in learning. Moreover, in learning the content of science and science, it prioritizes reading material that must be remembered and understood by students. In addition, the use of media in social studies learning is also rarely applied. The use of technology in learning is still less than optimal. As a result of these factors, students do not explore pleasant learning experiences. This has a great influence on student learning outcomes on landscape materials and their relationship with community professions.

The problems described above are the reason for researchers to solve these problems by developing digital pop-up book media with a Contextual Teaching and Learning (CTL) approach to improve the learning outcomes of grade IV students of SD Negeri Jontro, Pati Regency. The development of this digital pop-up book media can facilitate students during learning activities (Fauziyah & Mulyani, 2024). The media developed involves technology so that students' enthusiasm and interest in learning in participating in science and technology learning increases (Haleem et al., 2022). The digital pop-up book learning media is considered new and has never been applied at SD Negeri Jontro in learning activities. Because previously there had been no innovation from teachers in developing learning tools during teaching. This research is also strengthened by several previous studies that are relative, including according to Yahzunka et al. (2022) and Febriyanti et al. (2024), in the Digital pop-up book be Digital pop-up book is a book designed with three-dimensional visual technology. The design allows the images to appear as if they are off the page, moving, and provide a stunning visual impression for the reader.

Inside view Digital pop-up book can attract students' attention so that they want to try to understand the content of the book. This is in agreement with Ulfa et al. (2020a) and Rusanti et al. (2023) that there is an element of surprise on each page pop-up book It can also

give an interactive impression to students so that it gives a curious impression to students. Based on the background and supporting research, the researcher will develop a media with the title "Development of Digital Pop-Up Book Learning Media with a Contextual Teaching and Learning (CTL) Approach to Improve Social Science Learning Outcomes for Grade IV Students of SD Negeri Jontro, Pati Regency". The objectives of this study are : developing a Digital Pop-Up Book design with a Contextual Teaching and Learning (CTL) Approach to Improve Science and Technology Learning Outcomes, testing the feasibility of Digital Pop-Up Book media with a Contextual Teaching and Learning (CTL) Approach to Improve Science and Technology Learning Outcomes, testing the effectiveness of Digital Pop-Up Book media with a Contextual Teaching and Learning (CTL) to Improve the Learning Outcomes of Science and Science for Grade IV students of SD Negeri Jontro, Pati Regency.

Method

The type of research is research and development or Research and Development (R&D). (Sugiyono, 2016)



Figure 1. Research procedure

The research technique uses test and non-test techniques. The test was carried out in the form of a pretest and posttest through the work of 25 multiple-choice questions. Non-test techniques through observation, interviews, document studies, and questionnaires. The analysis of the feasibility data of the Digital Pop-Up Book media with the Contextual Teaching and Learning (CTL) Approach was assessed by expert validators using a feasibility questionnaire. The results of the expert questionnaire are known through the following calculations.

$$NP = \frac{R}{SM} \times 100\% \quad (1)$$

Information:

P = eligibility percentage

research Research and Development (R&D) which aims to produce a specific product and test the effectiveness of the resulting product. According to (Lee et al., 2017), research and development methods are a type of research that aims to produce a product, design, or a certain process. The main focus in this development research is to examine the media design and product design that will be produced. So, in essence, this method is used to develop or create something, be it media, products, or processes by emphasizing the design or design aspect. This research is modified from the development model with ten stages including: potentials and problems; data collection; product design; design validation; design revision; product trial; product revision; trial use; product revision; mass product manufacturing. However, in media development research Pop-Up Book Digital with an Approach Contextual Teaching and Learning (CTL) applies 8 out of 10 stages or up to the product revision. The following is the procedure for media development research Pop-Up Book Digital.

R = Raw score obtained
BC = Maximum number of scores

The results of the feasibility assessment percentage obtained from expert validators are then interpreted within certain criteria.

Table 1. Eligibility Criteria

Percentage (%)	Criterion
86 - 100	Highly Worthy
71 - 85	Proper
56 - 70	Quite Decent
41 - 55	Not Eligible
25 - 40	Very Unworthy

The next stage after going through the expert validator is a small-scale test conducted by 6 fourth

grade students of SD Negeri Jontro. The test was carried out to obtain student and teacher responses to the use of digital pop-up book media with the Contextual Teaching and Learning (CTL) approach. A large-scale trial was carried out to determine the effectiveness of digital pop-up book learning media with the Contextual Teaching and Learning (CTL) approach. The subjects of the large-scale test were 22 students in grade IV of SD Negeri Jontro. In this use trial, the concept of pre-experimental designs is used with a one group pre-test - post-test design model, where pre-test is carried out before the treatment is given and post-test after the treatment. This trial aims to compare conditions before and after treatment. Here is the one-group pre-test - post-test design pattern.

Table 2. Research Design

Pretest	Treatment	Posttest
O1	R	O2

Information:

O1 : Pretest Value

O2 : Posttest Scores

R : Application of digital pop-up book media with a Contextual Teaching and Learning (CTL) approach

The results of the pretetest posttest of small and large-scale tests will be tested for normality. The next stage, determining whether there is a significant difference between two interconnected samples, will be paired t-test. In addition, data will be processed to measure the effectiveness of the media through the N-Gain test.

$$N\text{-Gain} = \frac{\text{skor posttest} - \text{skor pretest}}{\text{skor maksimal} - \text{skor pretest}} \quad (2)$$



Figure 2. Initial display of digital pop-up book media

The next stage is media design. This digital pop-up book media is shaped like a book that can be turned back

The N-gain value is used to determine the category of percentage increase in learning effectiveness.

Table 3. Interpretation of the N-Gain Index

Interval Gain	Criterion
$g \geq 0.7$	Tall
$0.3 \leq g < 0.7$	Keep
$g \geq 0.3$	Low

Results and Discussion

This research aims to develop a product in the form of a digital pop-up book with a Contextual Teaching and Learning (CTL) approach to improve student learning outcomes. In the initial stage, the researcher identified the problem through observation of the learning process in the classroom. The observation results showed that learning activities were monotonous, and students tended to be passive because the method used was lectures. This finding was reinforced by interviews with grade IV teachers, who stated that learning resources only come from textbooks and there is rarely an application of learning media innovation. This condition certainly affects students' motivation and interest in learning. This statement was supported by the results of a questionnaire that showed that 23 out of 28 students felt bored and bored when participating in science and science learning, especially landscape materials and their relationship with community professions. At the data collection stage, the researcher collected various information related to product development, so that the resulting product was able to overcome the problems that existed at SD Negeri Jontro and in accordance with the needs of teachers and students. So that researchers can design digital pop-up book media with the Contextual Teaching and Learning (CTL) approach.

and forth on the previous and next pages with a digital version. This digital pop-up book media also provides a

3D effect on the images that appear. With the digital version, it is hoped that it can add the nuance of the embossed effect that can beautify the appearance of this digital pop-up book. The selection of images and colors of the digital pop-up book display is clear, bright, and attractive according to the characteristics of elementary school students. The landscape image design contained on each slide can certainly make it easier for students to understand the material and connect the image illustration with real life. Where students can better imagine the shape and form of the surrounding landscape, and can connect with the activities and professions of their community.

On the initial display of the digital pop-up book, there is a clear title of the material, in addition to the title on the first page of the digital pop-up book display, there are also classes, logos, and the name of the compiler at the bottom of the book. In addition to the flat view, to create a 3D feel, the rotation of the book icon must be changed so that it looks like the position of the book to be opened.



Figure 4. Display of digital pop-up book material content



Figure 5. View of the book after closing

The next slide displays the content of landscape material and its relation to the profession of the community, which is supported by interesting illustrations. Colors and images are adjusted to be

The display on the next slide is the instruction for using digital pop-up book media. As a guide on how to operate digital pop-up book media, there are instructions for use to facilitate the use of media. Instructions for the use of this media are made in language that is easy to understand and adjusted to the characteristics of students, especially for grade IV elementary school students.

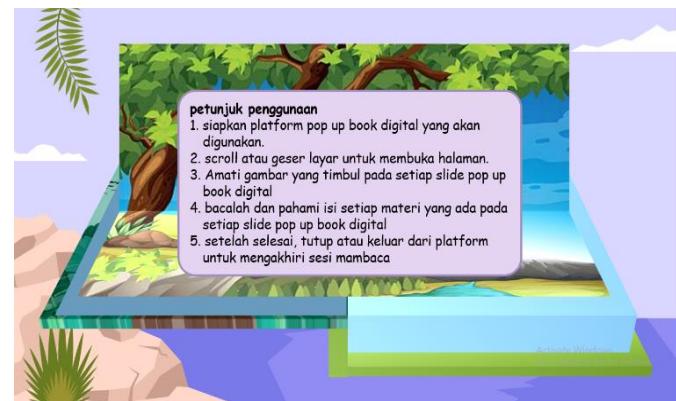


Figure 3. Instructions for use display



attractive to students. The placement of illustration images is useful to make it easier for students to understand the material and can attract students' interest in learning. The font size is adjusted, which is expected to allow students to clearly see the content of the material conveyed in the digital pop-up book (Mahendra et al., 2023).

Finally, on the display of the digital pop-up book when the content of the material has run out. As a marker of the completion of the material, the pop-up book display on the last page looks like a closed book. As is the case with the first slide display that displays the cover of the book containing the title (Kusuma et al., 2024). Then the last slide shows the back of the book. The next stage after designing the media is the assessment of the feasibility of the media by expert validators (Siswoyo

et al., 2020). The main purpose of this validation stage is to assess the quality of the media before it is used in the learning process (Neira et al., 2024; Fasihah et al., 2023). The validation process is carried out to ensure that the media developed meets the needs of both teachers and students (Jenahut & Lake, 2023). The following are the results of assessments from media experts and material experts.

Table 4. Eligibility Criteria

	Media Members	Material Expert
Scores obtained	69	72
Maximum score	80	80
Percentage criterion	86%	90%
	Highly Worthy	

The results of the assessment from the validators, media experts, and material experts were obtained with a percentage of 86% and 90%, so it can be concluded that digital pop-up book media is very worthy of being tested in the field. A small-scale product trial was carried out on several grade IV students at SD Negeri Jontro, Pati Regency, to test the effectiveness of the product being developed. Product effectiveness testing is carried out using testing instruments, so that comprehensive data related to product application is produced (Jairoun et al., 2023; Peretz-Andersson et al., 2024), which will later be used to improve digital pop-up book media to effectively comply with applicable standards. At this stage, there are 6 students taken from the top 2 rankings, 2 middle rankings, and 2 lowest rankings, with the aim that the implementation of small-scale trials can take place fairly and balanced.

Table 5. Small-scale Pretest and Posttest Normality Test

Result	Class	Tests of Normality					
		Kolmogorov-Smirnova				Shapiro-Wilk	
		Statistics	Df	Sig.	Statistics	Df	Sig.
Result	Posttest	.249	6	.200*	.908	6	.425
	Pretest	.237	6	.200*	.927	6	.554
	Posttest	.132	22	.200*	.950	22	.313
	Pretest	.174	22	.084	.929	22	.119

*. This is a lower bound of the true significance; a. Lilliefors Significance Correction

The results of the normality test of pretest and posttest scores used the Kolmogorov-Smirnova and Shapiro-Wilk tests assisted by the SPSS 25 application. The normality test criteria are said to be normal if the significance value is >0.05 so that the data is distributed normally. The results of the normality test above showed a significance of >0.05 , namely in the small-scale Kolmogorov-Smirnova pretest the significance reached 0.200 and the normalization test of the posttest value showed a significance of 0.200. Then, using Shapiro-Wilk, the significance results were pretest 0.554 and

The implementation of the trial on a small scale is carried out through a series of systematic three steps (Salguero-Pazos & Reyes-de-Cózar, 2023; Collins et al., 2021; Hiebl, 2023). In the first stage, students are given a pretest that aims to measure their level of understanding before the use of media. Then, in the second stage, the learning process is carried out by utilizing digital pop-up books that are integrated with the Contextual Teaching and Learning (CTL) approach. In the last stage, students are given a posttest to evaluate their learning outcomes, as well as being asked to fill out a response questionnaire that reflects their experience after participating in learning using the media (Hasanah & Muchlis, 2024; Ulfa & Nasryah, 2020b). In this phase, teachers also fill out questionnaires to provide feedback on the effectiveness of learning involving the use of digital pop-up book media combined with the Contextual Teaching and Learning (CTL) approach (Pratama & Yelken, 2024; Maharani & Suniasih, 2022).

After a small-scale trial was carried out and the results of the small-scale trial showed a score of 100%, which indicates that the digital pop-up book is very good, so it can be continued for large-scale trials. The large-scale test was carried out on 22 students in grade IV of SD Jontro State. As is the case with small-scale trials, large-scale trials also show good results. Some students said that there was still confusion about understanding the material, but the results of the posttest work of all students were complete. The following are the results of normality tests in small and large-scale trials.

posttest 0.425, so, the data is distributed normally. Furthermore, for the pretest normality test on Kolmogorov-Smirnova, the significance reached 0.084 and the normality test of the posttest value showed a result of 0.200. Then, using Shapiro-Wilk, the significance results were pretest 0.119 and posttest 0.313, so that the data was distributed normally. To find out the significant difference between the pretest and posttest results, the researchers analyzed the data using the paired t-test after completing the small-scale trial.

Table 6. Results of the Mean Difference Test (Paired t-Test) Large-scale

Paired Samples Test						
	Mean	Std. Deviation	Std. Error	Paired Differences		t Df Sig. (2-tailed)
				Mean	95% Confidence interval of the difference	
Pair 1 Pretest - Posttest	-44.128	10.653	2.271	- 48.905	- 39.458 - 19.453	24 .000

Based on the provisions that have been mentioned, if $\text{Sig. (2-tailed)} < 0.05$, it is said that there is a difference between the results of the pretest and the posttest. In the table above, it can be seen that Sig. (2-tailed) above shows the number 0.000. Therefore, it can be concluded that there is a difference in the results of the pretest (before the use of digital pop-up book media with the Contextual Teaching and Learning (CTL) approach) and the posttest (after the use of digital pop-up book media with the Contextual Teaching and Learning (CTL) approach) in learning science and technology (Natharani et al., 2024; Syaifuddin et al., 2021; Riza et al., 2024).

landscape material and its relation to community professions during large-scale tests. Thus, digital pop-up book media with a Contextual Teaching and Learning (CTL) approach is effective to be applied to learning science and science of landscape materials and its relation to the profession of the community (Zaniyati & Rohmani, 2024; Ballard et al., 2023; Pyrko et al., 2019). Furthermore, the average score increases test (N-gain) by comparing the increase in pretest and posttest scores calculated using gain index analysis. The results are as follows.

Table 7. Results of Small-Scale Average Improvement (N-Gain) Test

Average Pretest	Average Posttest	Difference Average	N-Gain	N-Gain %	Criterion
57.33	90.66	33.33	0.83	83.56	Tall

Based on the table above, it can be seen that by processing the small-scale average increase (N-Gain) test, 83.56% of the high criteria were obtained. Strengthened by the results of the questionnaire of teachers' responses to the media, which is 92.85% and student responses, which is 94% with very feasible

criteria, and there is no criticism and suggestions for digital pop-up book media that can be tested on a large scale. The students used in the large-scale test were 22 students from grade IV of SD Negeri Jontro. The following are the results of the N-Gain test on a large scale.

Table 8. Results of a Large-Scale Average Increase (N-gain) Test

Average Pretest	Average Posttest	Difference Average	N-Gain	N-Gain %	Criterion
47.27	91.45	44.18	0.84	84.04	Tall

Based on the table above, it can be seen that by processing the average improvement test (N-Gain), the results were obtained that the fourth grades students of SD Negeri Jontro using digital pop-up book media with the Contextual Teaching and Learning (CTL) approach totaled 22 students, an increase of 0.8404 with high criteria. Then, the average difference between the pretest and posttest results was 84.04%. So that the digital pop-up book media with the Contextual Teaching and Learning (CTL) approach has succeeded in helping to improve the learning outcomes of science students in grade IV students of SD Negeri Jontro, Pati Regency in landscape material and its relation to community professions.

Learning (CTL). This media is stated to be very feasible and effective in improving student learning outcomes. This is based on assessments from experts, where media experts give a score of 86% and material experts give a score of 90%, indicating a very decent category. Further support came from teacher responses which reached 92.85% and student responses which reached 94%, both of which were classified as very feasible. The effectiveness of this medium is also confirmed through an increase in the average N-Gain test of 83.56% on a small scale and 84.04% on a large scales test, which shows that the medium Digital pop-up book with the approach Contextual Teaching and Learning (CTL) has proven to be effective in improving the learning outcomes of social studies students in grade IV, especially in landscape materials and related to community professions.

Conclusion

The results of the study have shown success in the development of digital media in the form of Digital pop-up book that implements the Contextual Teaching and

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Author's Contribution

The contribution of the author involved in the preparation of this scientific article consists of Anis S, who acts as a researcher who plays a role in making observations at one of the schools that are the subject of research and writing this scientific article.: S. S. A., (Author 2) as a supervisor who has guided, evaluated and directed the author in the preparation of this scientific article.

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Conflict of Interest

The author stated that there was no conflict of interest.

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