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DEVELOPMENT OF ENVIRONMENT SMART BOX MEDIA TO IMPROVE SOCIAL SCIENCE LEARNING OUTCOMES

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Abstract

This research is motivated by the fact that there are still many students who do not understand environmental materials and various forms. This research aims to develop smart box media and test the feasibility and effectiveness of smart box media. The research method used is the research and development method with the Borg and Gall development model. The methods used in this research are interviews, observation, questionnaires, tests and documentation. The subjects of this research were 5th grade students of elementary school 2 Banteran, Banyumas Regency. The instruments used were interview guidelines, documentation, needs and feedback questionnaires, pretest and posttest questions, and validation sheets. Data analysis using normality test, t test, and n-gain test. The results obtained are that the smart box media is suitable for use with a feasibility percentage from the material validator of 87.7% and the media validator of 86.6%, an average of 87.15% in the Very feasible category. The results of the small scale normality test are 0.415 and the large scale is 0.155, the data is normally distributed. The small scale n-gain test result was 0.4517, the large scale was 0.4880, including the medium category with an average of 0.46985. This research concludes that smart box media is suitable and effective for use as a science learning media in the classroom.

Keywords: *smart box; environment and various forms; learning outcomes*

Abstrak

Penelitian ini dilatarbelakangi oleh masih banyaknya siswa yang belum memahami materi lingkungan dan aneka ragam bentuk. Penelitian ini bertujuan untuk mengembangkan media smart box dan menguji kelayakan serta efektivitas media smart box. Metode penelitian yang digunakan adalah metode penelitian dan pengembangan dengan model pengembangan Borg and Gall. Metode yang digunakan dalam penelitian ini adalah wawancara, observasi, angket, tes, dan dokumentasi. Subyek penelitian ini adalah siswa kelas 5 SD N 2 Banteran Kabupaten Banyumas. Instrumen yang digunakan adalah pedoman wawancara, dokumentasi, angket kebutuhan dan umpan balik, soal pretest dan posttest, serta lembar validasi. Analisis data dengan uji normalitas, uji t, dan uji n-gain. Hasil diperoleh media smart box layak digunakan dengan persentase kelayakan dari validator materi 87,7% dan validator media 86,6% rata-rata 87,15% kategori sangat mungkin. Hasil uji normalitas skala kecil 0,415 dan skala besar sebesar 0,155 data berdistribusi normal. Hasil uji n-gain skala kecil sebesar 0,4517, skala besar sebesar 0,4880 termasuk kategori sedang dengan rata-rata 0,46985. Penelitian ini menyimpulkan bahwa media smart box layak dan efektif digunakan sebagai media pembelajaran IPAS di kelas.

Kata Kunci: *smart box*; lingkungan dan aneka ragam bentuk; hasil belajar

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Introduction

The 21st century is identified as an era of openness and globalization that is characterized by changes, breakthroughs in thought, conceptualization, and actions in human life that are different from previous times to compete in a more advanced world (Muhali, 2019; Rahmadayanti, & Hartoyo, 2022). This century is considered to demand quality in all aspects of life, including in the aspect of education. Education to develop physical and spiritual potential in accordance with existing values in facing the complex dynamics of life (Anaktototy et al., 2024; Zuhdi., 2021). Education can strive to continue to improve the existing curriculum. A curriculum is a set of programs that students must follow in several subjects to achieve a specific goal (Cholilah et al., 2023).

The self-paced curriculum gives teachers and students greater freedom to explore. In the independent curriculum, Natural and Social Sciences (IPAS) learning becomes a unit that aims to develop inquiry skills and understanding of oneself and the environment (Goliah et al., 2022). Teachers are expected to emphasize their role as guides for students, according to the views of the Ministry of Education and Culture (Rahmadayanti & Hartoyo, 2022). The purpose of learning IPAS is to foster students' curiosity about the phenomena around them (Fuadati & Wilujeng, 2019). To achieve this, teachers must keep up with current educational trends and create an inclusive environment where teachers and students can learn together (Triwoelandari et al., 2023). One of the things that can increase comfortable learning is by using learning media.

Media in learning has an important role as a tool to convey messages and learning materials for teachers to students, so it can be an effective and efficient tool (Ardiansyah, 2021; Wafi, & Saitri, 2023;Wulandari et al., 2023). Learning media can create a supportive learning environment in the form of distributing messages (Firmadani, 2020; Tri Hesti Shinta Dewi et al, 2019; Wayan Kandia et al, 2023) to realize the achievement of learning goals. (Kandia et al., 2023). This learning medium can also increase students' creativity and cognitive abilities (Lin & Wang, 2021; Puspitarini & Hanif, 2019). Illustration, image, or digital tools that can convey verbal and visual explanations are learning media. Interesting learning media has an impact on student learning outcomes (Ahyanuardi, Hambali, & Krismadinata, 2018; Sumiharsono & Hasanah, 2017). In elementary schools, media is necessary to ensure the process of learning is successful (T. Humaira & Ninawati, 2023).

The use of learning media is a very significant factor in improving learning outcomes and student learning motivation because it helps in developing knowledge, especially for students in the learning process (Audie, 2019). In elementary schools, media is indispensable to ensure a successful learning process (S. Humaira et al., 2023). Based on the results of observations and interviews conducted by researchers at elementary school 2 Banteran, several problems arise in the learning process of Natural and Social Sciences (IPAS) in grade V, including (1) Student learning outcomes are not by expectations; (2) The use of learning media has not been maximized; (3) The learning process is not student-oriented so that many students

lack concentration during the learning process and do not pay attention when the teacher explains; (4) Students experience saturation which results in the class becoming unconducive.

According to the results of observations at elementary school 2 Banteran, problems were found related to the limited learning media used by teachers. Of these limitations, the 5th grade teachers at elementary school 2 Banteran do not use learning media to the maximum. Based on this, eating affects the learning outcomes of students. The data obtained by the researcher found that in the learning outcomes of the Final Assessment of the first semester of the Social Sciences (IPS) learning content, namely 87.5% of students did not complete and 12.5% of students who completed, meaning that out of 24 students, there were 3 students who scored below the KKM and 21 students who scored above the KKM with a Minimum Completeness Criterion (KKM) of 70.

To answer the problems that occur, one of them is through learning media. One of the learning media that can support solving these problems is Smart Box media (Sukaryanti et al., 2023). Media Smart Box is the basic concept of Explosion Box and a type of graphic media that is so that the inside of the box is filled with various interesting constructions when the lid is opened (Islamy & Saputra, 2022; Sipnaturi & Farida, 2020). Smart Box is in the shape of a box, when opened, its four sides form a network of boxes that display writing or images according to the theme or material (Nasriya et al., 2021). Through the media, Smart Box can create a dynamic and creative learning environment (Desiyanto et al., 2024). Based on this opinion, Smart Box media provides a very innovative nuance in the learning process so that students do not experience boredom during the learning process.

This research is relevant to previous research (Mahya & Setiawan, 2024)through learning media with percentages of 92.5% and 95% by media experts and materials can improve student learning outcomes. This is also in line with the research (Oktavia et al., 2024)obtained the percentage of completeness of pre-cycle (64%), cycle I (36%), and cycle II (89%). Looking at the percentage in cycle II of 89% indicates that the previous success of 85% has been fulfilled, so the success of the research is in cycle II. Based on research (D. Wulandari, 2024), the use of smart box media can have a huge influence on learning at RA Amal Bakti Muslimin with a case study research method. The results of the research (Sukaryanti et al., 2023) obtained from the development of diversity smart box learning media in Indonesia for grade IV elementary school students are proven to be valid, feasible, and have the potential to have an impact. The ASEAN smart box learning media obtained an average score assessment of 80.92% which is included in the valid criteria (Siti, S et al., 2022). The research by (Yuliastri et al., 2021) using smart box media obtained a result of 80.4% with very good category development. The results of the use of smart box media in science and science learning have a positive response from students and teachers with the effective category to improve learning outcomes, as evidenced by the results of the t-test test of sig scores. 0.000 there is a significant difference between the learning outcomes in the pretest and posttest data (Failasufah & Setyasto, 2023).

Based on the results of previous research, this study has novelty in the form of text information, images, videos, quizzes, and website addresses that are directly related to learning materials, precisely the environment, and various forms with the development of smart box media in IPAS Class V at elementary school 2 Banteran. The material used in this study has never been done before. Furthermore, the place where the research was carried out

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was also used for the first time in research. Based on this background, the researcher will discuss three research objectives, including: (1) the design of smart box learning media, (2) the feasibility of smart box learning media, and (3) the effectiveness of smart box learning media for environmental materials and various forms and to improve the learning outcomes of science students in grade V of elementary school 2 Banteran.

Research Methods

The type of research used is research and development (Research and Development). The research and development method is a research method that aims to produce a product and the product is tested for effectiveness (Sugiyono, 2021). The steps of using the Research and Development (R&D) method are as follows:

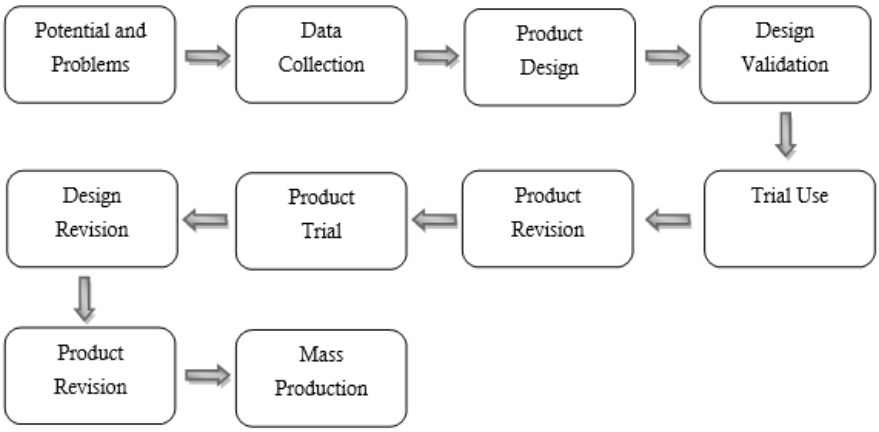

Figure 1. Steps to the Research and Development (R&D) method according to Borg and Gall's theory

In this research and development of Smart Box media, researchers only used 8 steps out of 10 steps in Sugiyono's development model because this research was only carried out to test the effectiveness of the media, given the limited time, needs, and costs for mass production. The following 8 steps were carried out by researchers, namely: (1) potential and problems; (2) data collection; (3) product design; (4) design validation; (5) design revision; (6) product trial; (7) product revision; and (8) trial use. This research was carried out only to test the effectiveness and feasibility of the media at stage 8. Due to limited time and costs to carry it out to mass production.

The research was conducted on fifth grade students at elementary school 2 Banteran, Banyumas Regency in May 2024. The methods used in this research were interviews, observation, questionnaires, tests, and documentation. The interview method was carried out to collect data with the teacher as a resource, the observation method was carried out in class V during learning activities to collect various data from class V students, and the questionnaire method was used to determine the validity of the product. and teacher and student responses to the media developed, test methods are used to measure product effectiveness. The instruments used were interview guidelines, documentation, needs and feedback questionnaires, pretest and posttest questions, and validation sheets The instruments used are interview guides, documentation, needs questionnaires, response questionnaires, pretest and posttest questions, as well as validation sheets conducted by 2

experts, namely material experts and media experts. This instrument uses a Likert scale with a score interval of 1-5 (Pranatawijaya et al., 2019) which is calculated with the following scoring guidelines.

$$P = \frac{R}{SM} \times 100\%$$

Description:

P = Percentage of Feasibility

R = Number of scores

SM = Maximum score

Then grouped based on the eligibility criteria in Table 1 below.

Table 1 Eligibility Criteria

Percentage	Criteria
0 – 20%	Very unfeasible
21% - 40%	Not feasible
41% - 60%	Quite feasible
61% - 80%	Feasible
81% - 100%	Very feasible

The research was conducted on a small scale and a large scale. Small-scale trials were carried out to obtain a qualitative evaluation of the media that had been designed by material expert validators and media experts and were carried out to see student responses regarding the appearance design test and test that it functioned well as expected. A large-scale trial was carried out to determine the effectiveness of smart box learning media with environmental materials and various forms and to improve science and science learning outcomes for class V students at elementary school 2 Banteran. The small scale amounted to 6 students and the large scale amounted to 18 students. Sampling of small-scale tests using purposive sampling techniques, namely two upper-level students, two middle-level students, and two lower-level students. The independent variable in this study is smart box media and the dependent variable is the learning outcomes of IPAS on environment and various forms in class V elementary school 2 Banteran. The data obtained from the test questions were then analyzed by validity test, reliability test, and difficulty test. The method of analyzing pretest and post-test learning outcomes is the normality test then continued with the t-test and n gain test to ascertain the rise in learning results for students.

The normality test that part used in this determination before understanding whether the principal distributed inputs or not (Priyatno, 2018) channeling that verification of input normality is important before it is done because input that is distributed in the subject matter of written input can be representative of the population.

Table 2 Normality Test Test Criteria

Result	Information
If the significance value is 0.05≤	Ho was rejected
If the significance value > 0.05	Ho accepted

(Priyatno, 2018)

Then there is *the Paired Samples T-Test* or paired sample t-test which is done to find out the average difference test between two paired samples (Priyatno, 2018) states that paired

samples are used on sample groups that include the same subject but receive two different treatments (e.g. before and after treatment). In this study, researchers used SPSS version 23 to test students' *pretest* and *posttest* results with *paired samples t-tests*. This t-test can be used on parametric normally distributed data.

Table 3 Test Criteria Paired *Samples T-Test*

Result	Information
If -t calculate -t table or t calculate t greater table greatergreatertable≥≤	Ho accepted
If -t calculates -t table or t catheners t table<>	Ho was rejected

(Priyatno, 2018)

Table 4 Decision Making Based on the Significance of the *Paired Samples T-Test*

Result	Information
If the significance value is 0.05≤	Ho was rejected
If the significance value > 0.05	Ho accepted

(Priyatno, 2018)

Gain index analysis is used to calculate the score between the pre-test and post-test results. In this research, the profit in question is normalized profit (N-gain). N-Gain is a normalization obtained by comparing the differences in pretest and posttest scores on environmental material and various forms after using smart box learning media. The normalized strengthening formula is as follows:

$$N - Gain = \frac{Skor\ posttest - skor\ pretest}{Skor\ maksimal - skor\ pretest}$$

(Lestari &; Yudhanegara, 2018)

Information:

N-gain	= magnitude of gain factor
Posttest score	= final test score after treatment
Scoreposttest	= initial value before treatment
Maximum score	= maximum value

Table 5 Test Average Gain (N-Gain)

Interval	Criterion
N-Gain 0.7≥	Tall
0.3 N-Gain 0.7≤≤	Keep
N-Gain < 0.3	Low

(Lestari, & Yudhanegara, 2018

Result and Discussion

The development of Smart Box learning media developed by the criteria, namely through 8 stages, has been successfully carried out by researchers through the stages of potential and problems, data collection, product design, design validation, design revision, product trials, product revision, and trial use. By using the Borg and Gall model adapted by Sugiyono.

The first stage was analyzing potential and problems, based on the results of observations and interviews, namely at elementary school 2 Banteran problems were found related to the limited learning media used by teachers, this meant that teachers had not used learning media optimally and had an impact on student learning outcomes. Seeing ineffective and efficient learning situations. Researchers state that to achieve operational goals in learning, good media design is needed, so that student learning achievement can be improved. Based on the problems

that have been obtained in learning Natural and Social Sciences (IPAS) in class V of elementary school 2 Banteran, researchers tried to find solutions to these problems. The solution is in the form of developing innovative, interesting, and interactive learning media

The second stage is data collection, at this stage, the researcher collects data that will be used as material in planning the product to be made to overcome these problems. Data collection in the form of analyzing the needs of teachers and students related to the lack of use of learning media in learning Natural and Social Sciences (IPAS). Needs analysis using a questionnaire or questionnaire filled out by teachers and students, with the questionnaire the researcher can find out the learning media needed and appropriate to overcome the problems in learning Natural and Social Sciences (IPAS). The researcher together with a fifth grade teacher then discussed the material that would be presented in the learning media that would be developed. The material chosen is environmental and various forms, because this material requires media to make it easier for students to learn it. Several needs must be met by researchers in creating media, namely that the media must be interesting, innovative, interactive, and able to inspire students to be more active in learning.

The third stage is product design, at this stage, researchers begin to design learning media by compiling materials and creating menus that will be displayed on Smart Box learning media. The material to be presented is the environmental materials and various forms, by the learning outcomes of students acting, making a decision, or solving problems related to daily life based on their understanding of the material that has been learned. Smart Box media is learning media made by combining elements of text, images, animation, and video, which consists of an information menu containing learning outcomes and learning objectives, instructions for use, developer identity, and then there are materials and quizzes. The media is made as interesting as possible to motivate students to learn. Figure 2 explains the profile of the developer of smart box media, environmental materials, and various forms. The profile consists of the profile of the student and supervisor. Figure 3 contains 3 important discussion topics related to the environment and its various forms. Where there are 4 types of diversity, namely biotic, abiotic, natural, and artificial environments. Figure 4 contains games related to several activities and the impact of environmental damage. Through this game, students get numbers randomly, then there is a mission that must be solved behind those numbers. Figure 5 contains ways they can reduce waste use. With picture 5, students can solve problems to determine the right way to reduce waste. The following is a prototype or design of the Smart Box media design on the learning content of Natural and Social Sciences (IPAS) material on the environment and various forms.

Figure 2. Author profile

Figure 3. Environment and variety

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Figure 4. environmental and various forms activities and impacts

Figure 5. How to reduce usage

In the fourth stage, design validation, the media developed is validated by media and material experts. The results of the assessment are as follows

Table 6 Product Validation Results

Validator	Score	Criteria
Material	87,7%	Worthy
Media	86,6%	Worthy
Average	87,15%	Worthy

This is in line with research conducted by (Humaira et al., 2023), which states that smart box media received 91% material expert assessment (very feasible category) and 90% media expert (very feasible). Another study by (Sulaedah et al., 2022) also stated that learning using the smart box media developed was feasible, with a media expert assessment score of 80.56% (valid) and a material expert of 81.25% (valid). Meanwhile, research conducted by (Marludia et al., 2020) shows that the shock box or magic box containing dental material is very feasible with an average validation result of 86.66. Based on this, it can be said that the smart box media can be categorized as suitable for testing.

The fifth stage is a design review, where improvements are made based on expert evaluation and feedback until the product developed is ready to be tested on a small scale. At the evaluation stage by expert figures, there were revisions regarding the font used which had to be attractive with the aim of making students more interested in the media. The sixth phase is product testing, and small-scale tests were carried out with 6 fifth-grade students from SDN 2 in Banteran, using a purposive sampling technique. Questionnaires were distributed to the teachers and the students to find out their reactions to the media developed. The seventh phase is the product review. At this stage, the Smart Box teaching support for environmental and various forms does not need to be revised because it has received positive responses from teachers and students. The next step is to test its effectiveness through product use trials. The eighth phase is the product use trial. The large-scale trial was carried out with all the fifth-grade students at

SDN 2 in Banteran, a total of 18 students, using the saturated sampling technique. The final design of the Smart Box learning aids developed in this study is shown in Figure 6.

Figure 6. Media development result

The effectiveness of smart box media on the environmental and various forms based on student learning outcomes. The design used is a pre-experimental design with a one-group pretest-posttest model. This model uses steps in the form of giving a pretest before being given treatment in the form of learning using smart box media and carrying out a posttest after treatment.

Table 7. Results of pretest and posttest trials on a small scale

Test type	Average	Mean difference
Pretest	68.00	11.33
Posttest	79.33	

Table 8. Results of pretest and posttest trials on a large scale

Test type	Average	Mean difference
Pretest	70.00	15.55
Posttest	85.55	

Based on Table 8, there was an average increase of 15.55 in the large-scale media trial. This data shows that there is a difference in student learning outcomes about the material of the environmental and various forms of class V at SDN 2 Sumampir before and after the use of the media smart box. The next effectiveness test was conducted using the t-test and the N-gain test.

Table 9. Small-scale normality test

Situation	Sig.	Criteria
Before treatment	0.110	Normal distribution
After treatment	0.415	Normal distribution

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Table 10. Large-scale normality test

Situation	Sig.	Criteria
Before treatment	0.083	Normal distribution
After treatment	0.155	Normal distribution

The normality test in this study used the Shapiro-Wilk test formula because the sample used was less than 40 samples (Ahadi & Zain, 2023). Based on the table, it can be seen that the test results show that the pretest and posttest values obtained a sig value of 0.110 and 0.415, with a probability value of 0.05, so the pretest and posttest groups are normally distributed. Based on the table, it can be seen that the test results show that the pretest and posttest values have a sig value of 0.083 and 0.115, with a probability value of 0.05, so the pretest and posttest groups are normally distributed.

The next step is a test to determine the significance of differences before treatment and after treatment. The test results on a small and large scale showed a significant difference because Sig. < 0.05 or t count < t table. The results obtained from the small scale are 0.002 and the large scale is 0.000 which means less than 0.05. Based on this, it can be seen that there is a significant effect of the difference between before treatment and after treatment.

Table 11. Small scale t-test

Mean difference	Sig. (2 tailed)	Criteria
-14.66667	0.002	Significant differences

Table 12. Large scale t-test

Mean difference	Sig. (2 tailed)	Criteria
-15.66667	0.000	Significant differences

The next step is to determine the criteria for the average difference that has been obtained using the N-gain analysis.

Table 13. Average results of small-scale N-Gain

Mean difference	N-Gain	Criteria
11.33	0.4517	Moderate

Table 14. Average results of large-scale *N-Gain*

Mean difference	N-Gain	Criteria
15.55	0.4880	Moderate

Based on Tables 13 and 14, the average difference in learning outcomes of small-scale students is 11.33 with an N-gain of 0.4517, which is in the medium category. On the large scale, the average is 15.55 with an N-gain of 0.4880 also in the medium category. This data shows that the smart box learning media on environmental and various forms in class V at SDN 2 Banteran, effectively improving student learning outcomes. One of the factors causing low n-gain results is due to time constraints, the duration of the study or the time allocated for the application of the new method may not be enough to see

significant changes. Learning is an ongoing process and the results may take longer to show. This is in line with previous research which showed (Failasufah & Setyasto, 2023) the results showed that the n-gain score showed a moderate increase, with class IV students at SDN Petompon 03 Semarang City experiencing an average increase of 0.44 and concluded that the development of audio-assisted Smart Box learning media on Animal Life Cycle material in grade IV science subjects at SDN Petompon 03 Semarang City was considered feasible and effective to use.

Trials have shown that media smart box learning is successful on both small and big scales. The success of the media created is evaluated not only based on the students' learning objectives, but also on the questionnaire responses supplied to both teachers and students. Smart box learning media has successfully helped students absorb environmental science topics in many forms.

Conclusion

The findings of a study and debate on the construction of smart box learning media to improve learning outcomes for environmental material and diverse kinds of class V pupils at elementary school 2 Banteran were deemed legitimate, practical, and effective. The learning media developed achieved an average efficacy of 87.15%. The small scale validity test yielded 0.002 < 0. 0.05, while the large scale test yielded 0.000 < 0. 0.05, indicating a substantial difference between pre- and post-smart box learning media findings. In addition, in the average increase test, the N value achieved for the average difference in small-scale student learning outcomes was 11.33, with an N-gain of 0.4517 This was placed in the middle category. On a larger scale, the average is 15.55 with an N-gain of 0.4880, which falls into the middle category.

Implications are the immediate repercussions or outcomes of scientific study findings. This study's findings are related to low-level learning outcomes elements in environmental materials and varied forms. According to research, the dependent and control factors have a major impact on improving learning outcomes in environmental materials and other formats.

Based on the outcomes of research and development of smart boxes, the creation of learning media is only restricted to material, namely the environment and varied forms, so researchers have not developed more thorough forms about examples of ecological variety. Further study should focus on deepening the development of smart box media and providing a wider range of material so that it may widen knowledge about science and science disciplines, environmental materials, and other forms while also improving student learning results.

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