JPPIPA 11(2) (2025)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

Development of Smart Box Learning Media on Earth Layers Material to Improve Student Learning Outcomes

Faradhila Khairunnisa[1*], Desi Wulandari[1]

[1] Elementary School Teacher Education, Faculty of Education and Psychology, Universitas Negeri Semarang, Semarang, Indonesia.

Received: November 18, 2024
Revised: January 11, 2025
Accepted: February 25, 2025
Published: February 28, 2025

Corresponding Author:
Faradhila Khairunnisa
faradila2803@students.unnes.ac.id

DOI: 10.29303/jppipa.v11i2.10642

Abstract: Based on the results of observations conducted by researchers at SD Negeri Jatimulyo, Pati Regency, problems were found in the form of limited learning media and student learning outcomes that were still in the low category on the material of the earth's layers. Based on these problems, it aims to improve the learning outcomes of fifth grade students at SD Negeri Jatimulyo, Pati Regency. This study is based on constructivist theory and Vygotsky's learning theory, emphasizing the importance of peer interaction and cooperative learning in cognitive development. The Smart Box learning media, designed as a real learning tool, combines material summaries, images, experiments, and games to facilitate understanding and engagement among students. The type of research used is R&D research and development using the Brog and Gall model which was modified into 8 stages. The results of the product research showed that the Smart Box learning media was very effective, achieving a validation score of 86% and 87% from media and material experts. The effectiveness of the media using the T test obtained a significant value of 0.00. Student learning outcomes are evidenced by the results of the pretest and posttest. The results of the N-Gain calculation obtained a value of 0.61 with the criteria of "moderate". These findings indicate that the Smart Box learning media is a valuable resource for teachers and can significantly increase students' motivation and understanding in learning about the layers of the earth.

Keywords: Media development; Smart box; Student learning outcomes

Introduction

Education is considered as one of the main means in creating a learning environment that can encourage the development of students' skills, with the aim of creating a quality next generation of the nation. To achieve this, the Indonesian government has taken various steps, one of which is by making changes and improvements to the curriculum to overcome challenges and adapt to changes that occur in the world of education. According to Government Regulation No. 13 of 2015 Article 1 paragraph 16 concerning National Education Standards, the curriculum is defined as a set of plans and provisions that include objectives, content, learning materials, and methods used as guidelines in carrying out learning activities in order to achieve certain educational goals. As explained by Rachman et al. (2024), the Independent Curriculum was initially only applied to a number of pioneering schools, but has now been expanded to be applied in all schools, adjusted to their respective conditions. In Permendikbud No. 21 of 2016 which discusses the Content Standards for Elementary and Secondary Education, it is explained that competencies in science learning at the elementary education level include several things, including: demonstrating a scientific attitude that includes curiosity, critical, logical, honest, and disciplined through science; asking questions related to the surrounding environment using the formulas what, why, and how, conducting observations of natural

How to Cite:
Khairunnisa, F., & Wulandari, D. (2025). Development of Smart Box Learning Media on Earth Layers Material to Improve Student Learning Outcomes. *Jurnal Penelitian Pendidikan IPA*, *11*(2), 388–397. https://doi.org/10.29303/jppipa.v11i2.10642

science objects through the use of the five senses and simple tools; recording and presenting data from observations of the surrounding environment simply; reporting the results of observations of the surrounding environment both verbally and in writing in a simple manner; explaining the concept of science based on the results of observations.

One of the updates contained in the independent curriculum is the change from learning science and social sciences to IPAS (Natural and Social Sciences), with the aim of developing inquiry skills and understanding of oneself and the surrounding environment, which is expected to develop deeper knowledge and concepts in learning. This change is based on certain reasons, as stated by Luh De et al. (2024); namely: MI/SD students are expected to be able to see everything as a whole, develop holistic thinking related to the relationship between the natural and social environments, and strengthening the profile of Pancasila students. According to Stamenkovic (2023), science itself is a group of sciences that specifically studies natural phenomena with a factual approach. In addition, Nur'ariyani et al. (2023), stated that science is a way of thinking to gain knowledge by applying scientific skills to discover and investigate natural phenomena. Science learning consists of three components, according to Bramastia et al. (2023), science as a product, process, and attitude.

According to Kelana et al. (2022), science basically consists of products, processes, attitudes, and technology. There are many learning theories applied in learning consisting of behaviorism theory, cognitive theory, humanism, constructivism, and Vygotsky's theory. In this study, the researcher applied constructivism theory and also Vygotsky's learning theory. Constructivism theory is a theory that argues that learning occurs by prioritizing logical skills and conceptual understanding (Jemberie, 2021). Meanwhile, according to Erbil (2020), Vygotsky views that children will develop much more if they interact with others. According to Taner-Derman et al. (2020), Vygostky argues that in addition to teachers, peers also play a very important role in supporting children's cognitive development, and cooperative group work can improve children's development and accelerate the child's development process. According to Kuo et al. (2024), learning outcomes are certain abilities or skills obtained by students by following the teaching and learning process which includes affective, cognitive, and psychomotor skills.

According to Cheng et al. (2021), classifies the level of cognitive learning outcomes from the lowest to the highest. The higher a person's level of cognitive ability, the more complex their way of thinking will be. Yanti (2022) explained that learning media is designed with the aim of transferring knowledge from educators to students, so that the learning process becomes more effective and efficient. In addition, Mitchell et al. (2018) stated that learning media includes all aids that can be used to convey messages that aim to achieve learning objectives. In Dale's view quoted by Radianti et al. (2020) the cone of experience or Dale's Cone of Experience describes the level of media abstraction that affects the level of student learning experience. Abdulrahaman et al. (2020) argue that concrete media are objects or imitations that exist in real form that function as learning resources in conveying information. The selection of learning media is an activity that involves the process of sorting and arranging media that are relevant to the message or information to be conveyed, as expressed by Neuvonen et al. (2022), one of the media used in this study is the Smart Box Media. According to Łątka et al. (2022), the media is in the form of blocks or cubes made of cardboard and filled with materials, images, or other elements. Van Leeuwen et al. (2019), reported that the use of Smart Box Media increased student activity and obtained good responses in the desired category. Smart Box Media has a number of advantages that can attract students' interest, especially in terms of guessing the contents. This makes this media relevant to current student development. With an attractive display of images and colors, the main purpose of using this media is to attract students' attention, encourage them to be more active in the learning process, and help them understand the material being taught, which in turn can improve their cognitive learning outcomes.

In addition, Smart Box Media is also easy to understand, especially because the material discussed is related to the layers of the earth, making it easier for teachers or researchers to deliver lessons. However, there are several shortcomings that need to be considered, including: the cost of making Smart Box Media is quite large, and this media is difficult to carry anywhere because of its large size. Problems in Science Learning were also found at Jatimulyo State Elementary School, Pati Regency. Based on data obtained from interview and observation activities and documentation data with resource persons, grade V teachers of Jatimulyo State Elementary School, namely Mrs. Ifatul Istianah, S. Pd. Various problems were found in Learning. From the results of observations, it is known that during teaching, the class teacher uses the PBL (Problem Based Learning) learning model using discussion methods, peer tutors and question and answer methods. By using these models and methods, most students have been able to follow the learning well, but there are also 26 students who are passive in learning because they use the PBL (Problem Based Learning)

model and pay less attention to the material so that the learning process cannot run conducively. The availability of learning media is also an obstacle for teachers in carrying out learning activities.

Based on the results of the interview, teachers have used learning media in the form of learning videos from Youtube. However, the use of learning videos from YouTube is rarely used because of the less than optimal use of IT and the lack of availability of LCDs, making it difficult for teachers to use digital learning media such as learning videos. Based on the learning outcomes of grade V students of Jatimulyo State Elementary School, Pati Regency in the Science subject, student learning outcomes were obtained which had quite a large difference between the highest and lowest scores. For the KKTP (Learning Objective Achievement Criteria) set by Jatimulyo Public Elementary School, Pati Regency for the subject of Social Studies is 75. The number of fifth grade students of Jatimulyo Public Elementary School, Pati Regency is 31 students with the highest Daily Test learning outcomes of 79 and the lowest of 25. Based on previous data, it can be concluded that in the subject of Social Studies, especially in Science, learning outcomes are low.

This study is supported by several relevant previous studies. One of them is a study by Rawlings et al. (2024), which found that to produce valid, practical Smart Box Media that has a potential effect on fourth grade elementary school students. That Smart Box Media has a good level of feasibility for elementary school students. In addition, Media is very suitable for use and implementation in learning, and is effective in attracting students' interest to improve their learning outcomes. Further research by Aiman et al. (2024) showed that learning outcomes increased significantly, as evidenced by the results of the t-test which showed a Sig. value of 0.000, which means there is a significant difference between the pretest and posttest results. This is also supported by the N-Gain test which showed a score of 0.44 in the moderate category, which indicates an increase in the average learning outcomes before and after using Smart Box Media. Another study by Maryana et al. (2024) revealed that students' interest in learning science subjects showed positive results and there was a significant influence of the use of Smart Box Media on students' interest in learning.

Method

This study uses a research and development approach, which is expressed by Stewart (2019) as a scientific method that includes the process of research, design, manufacture, and testing the validity of the resulting product. The main purpose of R&D is to bring about significant changes in the field of education, by providing positive benefits through the development of products that will be tested to determine the level of effectiveness and validity. In this study, researchers developed a product in the form of learning media called the Smart Box, which was designed to improve student learning outcomes in grade V of Jatimulyo Elementary School, Pati Regency. The feasibility of this product will be tested through evaluations by experts, both media experts and material experts. To measure the effectiveness of the product, researchers will conduct trials using the pretest and posttest methods, including data normality testing, average difference testing, and analysis of changes in pretest and posttest results.

In the research and development of Smart Contact learning media for the material of the earth's layers in grade V of elementary school, researchers used the Borg and Gall model only up to step 8 of the 10 steps in the Borg and Gall development model, namely because the researchers who developed it were only carried out to test the level of media effectiveness so that researchers experienced limitations that were adjusted to the time and cost of making mass products. The following are 8 steps that researchers have taken: potential and problems, data collection, product design, design validation, design revision, product trial, usage trial, Mass Product. The following are the procedures for research and development of Smart Box learning media:

Figure 1. Research procedure

The following is an explanation of the research and development procedures based on the research image above, the first potential problem in the form of observation, interviews and documentation data of student learning outcomes, so that it can identify problems in class V of Jatimulyo Elementary School, Pati Regency. After that, the researcher collected some information or data through a questionnaire of teacher and student needs. The design of the Smart Box learning media was developed in the form of a cube-shaped space from cardboard so that it is practical in its use. The next

step is the validation activity of material and media experts carried out by filling out the validation questionnaire to provide an assessment or validation using the validation instrument for assessing the feasibility of the Smart Box learning media. The researcher revised the product design based on the suggestions of material and media experts. A small-scale trial of 6 students with 2 students in the upper ranks, 2 students in the middle ranks, and 2 students in the lower ranks.

A large-scale trial was conducted on 22 students in class V of Jatimulyo Elementary School, Pati Regency. This research was conducted at Jatimulyo Elementary School. Jl Wedarijaksa - jetak Km 02, Jatimulyo, Kec. Wedarijaksa, Kab. Pati, Central Java. This research was conducted in May - June 2024, namely conducting interviews, identifying problems, collecting data, then in October - November 2024, namely compiling research proposals, then in December 2024, namely compiling product designs, compiling products, and validating products by expert validators of material and media, and in January - February 2025, namely compiling reports. In the data collection technique stage, a test is a collection of questions or exercises and other tools used to measure skills, knowledge, intelligence, abilities or talents possessed by individuals or groups. Researchers use data collection techniques using tests and non-tests. The first test technique the researcher uses is a formative test, namely pretest and posttest. The pretest and posttest in this study were given to students to measure cognitive learning outcomes.

The pretest was given to students before using the media developed. While the posttest was given to students after the trial use of the media. While the first researcher's non-test technique using observation techniques was carried out in class V of Jatimulyo Elementary School, Pati Regency, this interview technique was carried out with class V teachers by preparing interview instruments related to the learning process, then the questionnaire technique, the researcher used a needs analysis questionnaire shown to teachers and students, an expert validation questionnaire filled out by expert lecturers and media experts with the aim of assessing the feasibility of the Smart Box learning media product which includes learning aspects, language aspects, material content aspects, presentation feasibility aspects, interactivity aspects, display aspects, media aspects, and module accuracy, in addition, the media response questionnaire was filled out by teachers and students with the aim of finding out the responses of teachers and students after using the Smart Box learning media. The last documentation technique used was a list of student names, mid-term exam scores and daily tests of science learning content for class V of Jatimulyo Elementary School, Pati Regency.

Result and Discussion

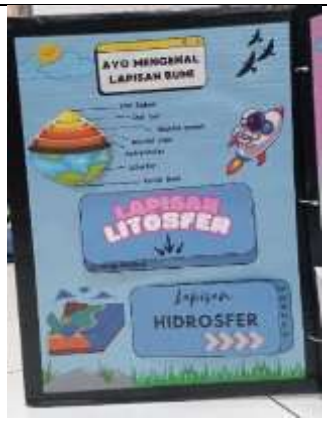
This development research produces a product in the form of Smart Box learning media on the science learning content, this learning media was developed by focusing on grade V students of Jatimulyo State Elementary School, Pati regarding the material of the earth's layers. The media design is made attractive and in accordance with student needs. The initial step that must be taken by the researcher is to collect information about the potential and problems that exist in Jatimulyo State Elementary School, Pati Regency. Data collection is carried out by means of observation, interviews, and document data. Based on the results of the interview, the teacher has implemented the PBL (Problem Based Learning) learning model which is supported by discussion methods, peer tutors, lectures, and questions and answers.

By using this method, learning has run smoothly, it's just that there are some students who pay less attention to the material because the learning process carried out is more centered on the teacher. The teacher confirmed that the learning resources used were very limited, namely using teacher books, student books, as accompanying teaching materials (Kristi & Andriani, 2023). In addition, the problem that occurs in the learning process, namely the availability of learning media, is also an obstacle for teachers in carrying out learning activities. Teachers have used learning media in the form of learning videos from Youtube. However, the use of learning videos from YouTube is rarely used because of the less than optimal use of IT and the lack of availability of LCDs, making it difficult for teachers to use digital learning media such as learning videos (Sari et al., 2022). By using concrete learning media, it can increase students' learning motivation in participating in learning. In addition, it can also facilitate understanding of the science learning material being implemented (Risniawati et al., 2020).

Based on the learning outcomes of grade V students of Jatimulyo Elementary School, Pati Regency in the Science subject, student learning outcomes were obtained which had quite a large difference between the highest and lowest scores. At the data collection stage, researchers collected various information related to product development, so that the resulting product was able to overcome the problems that existed at Jatimulyo Elementary School, Pati Regency and was in accordance with the needs of teachers and students. Product design was carried out based on the results of the media needs questionnaire analysis for teachers and students. At this

stage, researchers designed an attractive Smart Box learning media product. Smart Box learning media in a concrete form that can be done by students contains a summary of the material equipped with learning images, experiments and games by displaying several problems to be analyzed, working on questions and experiments. The appearance of the Smart Box learning media is as follows.

Table 1. Pitar Box Learning Media

Before Revision	After Revision
	 
Before the revision, there was no QR Code containing the video and PPT for learning 1 and examples of natural phenomena and appearances in the earth's layers.	Add an envelope to fill in the QR Code containing the video and PPT for learning 1 and another envelope containing examples of natural phenomena and appearances in the earth's layers and added decorations.
	
The initial writing is still for learning purposes and has no embellishment.	Changing the sentence of learning objectives to experimental objectives and giving it a decorative form and adding color at the bottom for the place of tools and materials to black so that it can match the color of the asphalt elements that existed before the revision.
	

Before Revision	After Revision
Before the revision, there was no QR Code containing the video and PPT for learning 2 and examples of natural phenomena and appearances in the earth's layers.	Added an envelope containing a QR code for the video and ppt for learning 2 and enlarged it into 2 game section boxes.
	
The writing is still for learning purposes and has no decoration yet.	The sentence of learning objectives is changed to experimental objectives, adding variations in shape so that it can be opened and closed. In addition, a bottom box is added for the container of tools and materials with a green color to match the color of the grass element that was in the previous revision.

At the product validation stage, researchers conducted a trial of the Smart Box Learning media to material and media experts. Based on the assessment of material and media experts as follows. The first material validation feasibility assessment by material experts obtained a score of 49 with an assessment percentage of 81% in the feasible category. However, material experts suggested adjusting learning objectives, learning scenarios, question grids and trial questions. In addition, in addition to the inclusion of videos and ppts in the form of QR codes on the Smart Box, the final results of the material validation of the media developed by the researcher obtained a score of 52 out of a maximum value of 60 with a media assessment percentage of 86% in the very feasible category. The assessment of the final results of the media validation developed by the researcher obtained a score of 70 out of a maximum value of 80 with a media assessment percentage of 87% in the very feasible category.

Media experts gave a positive response regarding the media that had been developed by the researcher (Purington-Drake et al., 2023; Kapoor et al., 2018). Media experts provided notes to researchers to make improvements to the media that was developed and with the final results it was very feasible to be tested. Several previous relevant studies also strengthened this research, including research conducted by Snyder (2019), and O'Cathain et al. (2015). They found that in the initial stage of validation by media experts, the product obtained a percentage of 67.3%. However, after revision and going through the second stage, the validation percentage increased to 98.07%. Meanwhile, the validation results from material experts showed a percentage of 100%. In addition, according to Laksana (2024), the results of the assessment from the validator of media experts and educational materials showed a rating of 93%, which indicates that the content is valid and appropriate. However, based on the suggestions and comments received, revisions were made to the parts that were considered inappropriate (Khatri et al., 2017).

Learning practitioners gave a score of 91%, indicating that this media has proven to be practical and does not require further revision. Small-scale trials can be seen from the results of the recapitulation of student responses to the media developed, obtaining a score of 102 out of a maximum score of 102 with a percentage of 100% falling into the very feasible category. The results of the recapitulation of teacher responses to the media developed obtained a score of 17 out of a total score of 17 with a percentage of 100% falling into the very feasible category. Furthermore, the results of the recapitulation of students' responses to the developed media obtained a score of 371 out of a total score of 374 with a percentage of 99% falling into the very feasible category. So it can be said that the developed media can be used to support the success of learning and can increase students' learning motivation. The researcher also conducted a concept understanding test using pretest and posttest questions on grade V students. The

following are the results of the large-scale Normality Test.

Table 2. Results of Large-Scale Normality Test

	Tests of Normality					
	Kolmogrov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig	Statistic	df	Sig.
Pretest	.206	28	.004	.928	28	.056
Posttest	.159	28	.067	.929	28	.058
a. Liliefors Significance Correction						

Table 2 shows the results of the normality test for the pretest value, which shows that 0.056 > 0.050, so the data can be said to be normally distributed. Likewise, the results of the normality test for the posttest value show that 0.058 > 0.050, which also shows that the data is normally distributed. Thus, it can be concluded that both the pretest and posttest values are normally distributed, so further analysis uses parametric statistical techniques (Fatikasari et al., 2023; Putra-Suharnadi et al., 2024). This study is also supported by relevant previous studies, such as those conducted by (Hamasha et al., 2022), which revealed that the results of the normality test on a small scale showed a value of 0.415, while on a large scale it showed a value of 0.155, which shows that the data is also normally distributed. To calculate the average pretest and posttest and to test the differences in the average pretest and posttest results related to the use of the Smart Box learning media, the t-test was used. The following are the results of the t-test on a large scale.

Table 3. Results of Large-Scale Pretest and Posttest t-Test

	Paired Samples Test							
	Paired Differences							
				95 % Confidence Interval of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig.(2-tailed)
Pair 1 Pretest-Posttest	-26.67857	12.86124	2.43055	-31.66564	-21.69150	-10.976	27	.000

Based on table 3, it shows that the results of the t-test of the pretest and posttest values show that 0.00 <0.050, so there is a significant difference. Based on these data, it can be concluded that the pretest and posttest values in the large-scale test were accepted before and after using the Smart Box learning media. This study is also strengthened by several relevant previous researchers, including those conducted by Jisr et al. (2018), revealed that the results of the t-test showed that the value was 0.000 <0.05, so the conclusion is that there is an increase in understanding of numbers in children aged 4-5 years in group A of ABA Kemirikebo Kindergarten, after treatment using the math box learning media. Furthermore, the N-Gain Test was carried out to calculate the increase in pretest and posttest values before and after using the Smart Box learning media. The following are the results of the N-Gain test on a large scale.

Table 4. Large-Scale N-Gain Test Results

	Descriptive Statisdtics				
	N	Min	Max	Mean	Std. Deviation
NGain	28	.43	.76	.6181	.08777
	28				

Based on table 4, the results of the large-scale N-Gain pretest and posttest obtained an average difference of 0.6181 with moderate criteria. This means that there is an increase in the pretest and posttest results with moderate criteria. The moderate criteria indicate that students have gained a better understanding than before learning and students have understood the material on the layers of the earth in general, but have less understanding in answering questions on the Smart Box media (Abbas et al., 2019; Deng et al., 2025; Strat et al., 2024). This study is also strengthened by several relevant previous researchers, including those conducted by Suwandi et al. (2021) and Rosdiana et al. (2021), who revealed that the results of the pre- and posttest of students using the N-Gain Test obtained a score of 0.56 and the category showed a "Moderate" increase.

Conclusion

The results of the research and discussion related to the development of the Smart Box learning media to improve the learning outcomes of fifth grade students of Jatimulyo State Elementary School were developed through 8 stages, namely the potential and problem stages, data collection, product design, design

validation, design revision, product trial, product revision, usage trial. The media developed was adjusted based on the questionnaire of the needs of teachers and fifth grade students of Jatimulyo State Elementary School. The Smart Box learning media is equipped with learning images, games and several problems to be analyzed, questions, and experiments. The learning media developed by the researcher is packaged in the form of concrete media so that it attracts students' attention, makes them more active during the learning process, and helps them understand the material and improve their cognitive learning outcomes. The feasibility of the Smart Box learning media on the material of the earth's layers meets the criteria of very feasible based on the results of the assessment of material experts, media experts, teacher response questionnaires and student response questionnaires. The effectiveness of the Smart Box learning media on the material of the earth's layers is said to be effective based on the results of the pretest and posttest that have been carried out, which has increased with the results of the N-Gain calculation meeting the moderate criteria.

Acknowledgments
We would like to thank the principal, staff, and teachers of SD Negeri Jatimulyo, Pati Regency who have provided the opportunity and services during the research. We would also like to thank the supervisors who have guided us in completing this article.

Author Contributions
The contributions of the authors involved in the preparation of this scientific article consist of F. K (Author 1) who acted as a researcher who played a role in conducting observations at one of the schools that was the subject of the research and writing this scientific article. D. W (Author 2) as a supervisor who has guided, evaluated, and directed the author in the preparation of this scientific article.

Funding
Researchers do not accept external circumstances.

Conflicts of Interest
The author declares no conflict of interest.

References

Abbas, J., Aman, J., Nurunnabi, M., & Bano, S. (2019). The Impact of Social Media on Learning Behavior for Sustainable Education: Evidence of Students from Selected Universities in Pakistan. *Sustainability*, *11*(6), 1683. https://doi.org/10.3390/su11061683

Abdulrahaman, M. D., Faruk, N., Oloyede, A. A., Surajudeen-Bakinde, N. T., Olawoyin, L. A., Mejabi, O. V., Imam-Fulani, Y. O., Fahm, A. O., & Azeez, A. L. (2020). Multimedia tools in the teaching and learning processes: A systematic review. *Heliyon*, *6*(11), e05312. https://doi.org/10.1016/j.heliyon.2020.e05312

Aiman, U., Hasyda, S., Lasmawan, I. W., & Kertih, I. W. (2024). Effectiveness of the Team Quiz Method Assisted by Crossword Media to Improve Student Learning Outcomes. *Jurnal Penelitian Pendidikan IPA*, *10*(SpecialIssue), 266–271. https://doi.org/10.29303/jppipa.v10iSpecialIssue.8105

Bramastia, B., & Rahayu, S. (2023). Study of Science Learning Based on Scientific Literacy in Improving Critical Thinking: A Scoping Review. *Jurnal Penelitian Pendidikan IPA*, *9*(8), 499–510. https://doi.org/10.29303/jppipa.v9i8.5667

Cheng, Y., Cai, Y., Chen, H., Cai, Z., Wu, G., & Huang, J. (2021). A Cognitive Level Evaluation Method Based on a Deep Neural Network for Online Learning: From a Bloom's Taxonomy of Cognition Objectives Perspective. *Frontiers in Psychology*, *12*, 661235. https://doi.org/10.3389/fpsyg.2021.661235

Deng, R., Jiang, M., Yu, X., Lu, Y., & Liu, S. (2025). Does ChatGPT enhance student learning? A systematic review and meta-analysis of experimental studies. *Computers & Education*, *227*, 105224. https://doi.org/10.1016/j.compedu.2024.105224

Erbil, D. G. (2020). A Review of Flipped Classroom and Cooperative Learning Method Within the Context of Vygotsky Theory. *Frontiers in Psychology*, *11*, 1157. https://doi.org/10.3389/fpsyg.2020.01157

Fatikasari, A. N., Mustadi, A., Nugroho, I. A., & Kartono. (2023). The Influence of the Contextual Learning Model Type of Modeling Assisted by Role-Playing Techniques on the Storytelling Skills of PGSD Students at Sanata Dharma University. *KEMBARA Journal of Scientific Language Literature and Teaching*, *9*(2), 428–441. https://doi.org/10.22219/kembara.v9i2.26375

Hamasha, M. M., Ali, H., Hamasha, S., & Ahmed, A. (2022). Ultra-fine transformation of data for normality. *Heliyon*, *8*(5), e09370. https://doi.org/10.1016/j.heliyon.2022.e09370

Jemberie, L. W. (2021). Teachers' perception and implementation of constructivist learning approaches: Focus on Ethiopian Institute of textile and fashion technology, Bahir Dar. *Cogent Education*, *8*(1), 1907955. https://doi.org/10.1080/2331186X.2021.1907955

Jisr, N., Younes, G., Sukhn, C., & El-Dakdouki, M. H. (2018). Length-weight relationships and relative condition factor of fish inhabiting the marine area of the Eastern Mediterranean city, Tripoli-Lebanon. *Egyptian Journal of Aquatic Research*, *44*(4),

299–305. https://doi.org/10.1016/j.ejar.2018.11.004

Kapoor, K. K., Tamilmani, K., Rana, N. P., Patil, P., Dwivedi, Y. K., & Nerur, S. (2018). Advances in Social Media Research: Past, Present and Future. *Information Systems Frontiers*, *20*(3), 531–558. https://doi.org/10.1007/s10796-017-9810-y

Kelana, J. B., Robandi, B., & Widodo, A. (2022). Inquiry Model: How to Improve the Ability of the Nature of Science and Its Aspects in Elementary School? *International Journal of Elementary Education*, *6*(2), 325–332. https://doi.org/10.23887/ijee.v6i2.45611

Khatri, N., Varma, A., & Budhwar, P. (2017). Commonly observed shortcomings in manuscripts submitted to management journals. *IIMB Management Review*, *29*(3), 203–209. https://doi.org/10.1016/j.iimb.2017.07.001

Kristi, D., & Andriani, A. E. (2023). Pengembangan E-Book Berbasis Problem Based Learning untuk Meningkatkan Hasil Belajar IPA Siswa Kelas V. *Jurnal Penelitian Pendidikan IPA*, *9*(SpecialIssue), 828–835. https://doi.org/10.29303/jppipa.v9iSpecialIssue.6505

Kuo, Y.-K., Batool, S., Devi, S., Tahir, T., & Yu, J. (2024). Exploring the impact of emotionalized learning experiences on the affective domain: A comprehensive analysis. *Heliyon*, *10*(1), e23263. https://doi.org/10.1016/j.heliyon.2023.e23263

Laksana, D. N. L. (2024). Validation Instruments for Local Culture-Based Learning Media. *Journal of Education Technology*, *8*(2), 264–274. https://doi.org/10.23887/jet.v8i2.74446

Łątka, J. F., Jasiołek, A., Karolak, A., Niewiadomski, P., Noszczyk, P., Klimek, A., Zielińska, S., Misiurka, S., & Jezierska, D. (2022). Properties of paper-based products as a building material in architecture – An interdisciplinary review. *Journal of Building Engineering*, *50*, 104135. https://doi.org/10.1016/j.jobe.2022.104135

Luh De, L., & Suastra, I. W. (2024). Strengthening Pancasila Student Profile in Schools In Perenialism View. *Indonesian Journal of Educational Development (IJED)*, *5*(1), 101–113. https://doi.org/10.59672/ijed.v5i1.3380

Maryana, & Wulandari, D. (2024). Smart Box Learning Media Based on Problem Based Learning to Improve Science Environmental Learning Outcomes. *Jurnal Penelitian Pendidikan IPA*, *10*(6), 3141–3151. https://doi.org/10.29303/jppipa.v10i6.7244

Mitchell, K. M. W., & Manzo, W. R. (2018). The Purpose and Perception of Learning Objectives. *Journal of Political Science Education*, *14*(4), 456–472. https://doi.org/10.1080/15512169.2018.1433542

Neuvonen, K. A., Launonen, K., Smith, M. M., Stadskleiv, K., & Von Tetzchner, S. (2022). Strategies in conveying information about unshared events using aided communication. *Child Language Teaching and Therapy*, *38*(1), 78–94. https://doi.org/10.1177/02656590211050865

Nur'ariyani, S., Jumyati, J., Yuliyanti, Y., Nulhakim, L., & Leksono, S. M. (2023). Scientific Approach to Learning Science in Elementary Schools. *Jurnal Penelitian Pendidikan IPA*, *9*(8), 6659–6666. https://doi.org/10.29303/jppipa.v9i8.3680

O'Cathain, A., Hoddinott, P., Lewin, S., Thomas, K. J., Young, B., Adamson, J., Jansen, Y. Jfm., Mills, N., Moore, G., & Donovan, J. L. (2015). Maximising the impact of qualitative research in feasibility studies for randomised controlled trials: Guidance for researchers. *Pilot and Feasibility Studies*, *1*(1), 32. https://doi.org/10.1186/s40814-015-0026-y

Purington-Drake, A., Masur, P. K., Bazarova, N. N., Zou, W., & Whitlock, J. (2023). The youth social media literacy inventory: Development and validation using item response theory in the US. *Journal of Children and Media*, *17*(4), 467–487. https://doi.org/10.1080/17482798.2023.2230493

Rachman, A., Putro, H. Y. S., Rusandi, M. A., & Situmorang, D. D. B. (2024). The development and validation of the "Kuesioner Tema Proyek Penguatan Profil Pelajar Pancasila" (KT P5): A new tool for strengthening the Pancasila Student Profile in Indonesian pioneer schools. *Heliyon*, *10*(16), e35912. https://doi.org/10.1016/j.heliyon.2024.e35912

Radianti, J., Majchrzak, T. A., Fromm, J., & Wohlgenannt, I. (2020). A systematic review of immersive virtual reality applications for higher education: Design elements, lessons learned, and research agenda. *Computers & Education*, *147*, 103778. https://doi.org/10.1016/j.compedu.2019.103778

Rawlings, B. S., & Cutting, S. J. (2024). Linking Disparate Strands: A Critical Review of the Relationship Between Creativity and Education. *Educational Psychology Review*, *36*(4), 135. https://doi.org/10.1007/s10648-024-09973-z

Risniawati, M., Serevina, V., & Delina, M. (2020). The development of E-learning media to improve students' science literacy skill in Senior High School. *Journal of Physics: Conference Series*, *1481*, 012075. https://doi.org/10.1088/1742-6596/1481/1/012075

Rosdiana, L., & Ulya, R. M. (2021). The Effectiveness of The Animation Video Learning Earth's Layer

Media to Improve Students' Concept Understanding. *Journal of Physics: Conference Series*, *1899*(1), 012172. https://doi.org/10.1088/1742-6596/1899/1/012172

Sari, D. I. P., Prayitno, H. J., Rahmawati, L. E. & Prastiwi, Y. (2022). Culture of Digital Literacy in Thematic Learning at the Basic Education Level. *Jurnal Ilmiah Sekolah Dasar*, *6*(3), 467–475. https://doi.org/10.23887/jisd.v6i3.46334

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, *104*, 333–339. https://doi.org/10.1016/j.jbusres.2019.07.039

Stamenkovic, P. (2023). Facts and objectivity in science. *Interdisciplinary Science Reviews*, *48*(2), 277–298. https://doi.org/10.1080/03080188.2022.2150807

Stewart, F. (2019). The Human Development Approach: An Overview. *Oxford Development Studies*, *47*(2), 135–153. https://doi.org/10.1080/13600818.2019.1585793

Strat, T. T. S., Henriksen, E. K., & Jegstad, K. M. (2024). Inquiry-based science education in science teacher education: A systematic review. *Studies in Science Education*, *60*(2), 191–249. https://doi.org/10.1080/03057267.2023.2207148

Suharnadi, P., Neviyarni, S, & Nirwana, H. (2024). The Role and Function of Learning Motivation in Improving Student Academic Achievement. *Manajia: Journal of Education and Management*, *2*(1), 1–8. https://doi.org/10.58355/manajia.v2i1.25

Suwandi, A. F., Sahidu, H., & Gunada, I. W. (2021). Effectiveness of Problem-based Learning Model Devices with Multiple Intelligences Approach to Improve Learners' Physics Problem-Solving Skills. *Jurnal Penelitian Pendidikan IPA*, *7*(SpecialIssue), 238–243. https://doi.org/10.29303/jppipa.v7iSpecialIssue.1064

Taner-Derman, M., Şahin Zeteroğlu, E., & Ergişi Birgül, A. (2020). The Effect of Play-Based Math Activities on Different Areas of Development in Children 48 to 60 Months of Age. *Sage Open*, *10*(2), 2158244020919531. https://doi.org/10.1177/2158244020919531

Van Leeuwen, A., & Janssen, J. (2019). A systematic review of teacher guidance during collaborative learning in primary and secondary education. *Educational Research Review*, *27*, 71–89. https://doi.org/10.1016/j.edurev.2019.02.001

Yanti, F. (2022). Innovative Learning Media in Era 4.0: Review. *Journal of Digital Learning and Distance Education*, *1*(4), 125–130. https://doi.org/10.56778/jdlde.v1i4.30