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Development of Mystery Box Learning Media to Improve Elementary School Students' Learning Outcomes

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Abstract: This study uses the Research and Development (R&D) method with the Borg & Gall development model, which has been adjusted by Sugiyono into eight main stages: identification of potential and problems, data collection, product design, design validation, design revision, product trial, product refinement, and usage trial. The subjects of this study were 27 fourth-grade students of SDN Purwoyoso 01. Data collection was carried out through questionnaires, observations, interviews, and documentation, which were analyzed using product data analysis techniques, initial data analysis, and final data analysis. The results of the study showed that: Mystery Box media is very feasible to use, with a feasibility level of 88% from media experts and 82.66% from material experts; Mystery Box has been proven to improve student learning outcomes, with a t-test value of 10.677 and an average increase (gain) of 0.71; and This learning media is effective and feasible to be applied in science learning, especially in the material of Indonesian Cultural Diversity. For further research, it is recommended that the development of Mystery Box be carried out on other materials, with design refinement and additional references to deepen the learning content.

Keywords: Indonesian cultural diversity; Learning outcomes; Mystery box

Introduction

Conscious efforts made by humans to expand knowledge and develop their potential can be called education. Learning is not only centered on scientific aspects alone, but also includes social values, including ethics in community life. Referring to Law (UU) No. 20 of 2003 concerning the National Education System, Article 1 paragraph 1, it is clearly stated that: "Education is a conscious and structured effort to create a learning atmosphere and learning process so that students actively develop their potential to have spiritual religious strength, self-control, personality and intelligence, noble morals and skills needed by themselves, society, nation and state". Indirectly, education is a step in realizing the ideals and national goals of a nation. As written in the Preamble to the 1945 Constitution, the fourth paragraph is to educate the nation. The quality of Human Resources (HR) can be improved by improving the quality of Education (Al Faruq et al., 2024). Education which is the national goal of the nation indirectly reflects the quality of the nation itself. Based on a survey conducted by PISA in 2018, Indonesia ranked 72 out of 79 countries in the Organisation for Economic Co-Operation and Development (OECD). The TIMS survey ranked Indonesia 44 out of 49 countries in the mathematics category and 44 out of 47 countries in the arts. Based on the UNESCO Global Education Monitoring (GEM) Report 2016, the quality of education in Indonesia is in the bottom fifth position out of 14 other developing countries.

Based on the data presented, research needs to be conducted on Indonesian education problems to be evaluated in an effort to improve the quality of Indonesian education. Educational problems in

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Indonesia are generally influenced by the learning environment such as lack of parental attention, student behavior, and the lack of interest in the learning process. In addition, the problems of Indonesian education that affect the quality of education are limited facilities and infrastructure. The limited learning media in the learning process is the main problem that occurs today (Ramadanti et al., 2023). Similar problems were also found in one elementary school. Observation results show that science learning carried out using conventional methods such as lectures tends to make students bored and uninterested. The use of other conventional media in the form of textbooks and LKS causes students to become passive in learning. Science learning is required to provide an overview of Indonesian history and culture. However, without effective learning media, science learning outcomes will not be optimal. Learning media should be a tool for students who have difficulty in the learning process (Destiani et al., 2023). Low student learning outcomes can be influenced by the limitations of learning media, especially in science subject matter.

The current independent curriculum presents a new subject, namely the subject of Social Sciences (Cahayani & Suastra, 2024; Rahmadani et al., 2023); (Novita et al., 2024). Social Sciences or Natural Sciences is a combination of Natural Sciences (IPA) and Social Sciences (IPS). The subject of Social Sciences is designed to foster curiosity and increase students' interest in learning. Students are expected to be able to play an active role, think critically, behave according to community ethics, and be able to develop an understanding of concepts in the subject of Social Sciences (Brun et al., 2023). Social Sciences learning requires special media facilities because this subject not only provides an understanding of nature but also critical thinking skills (Vodă et al., 2022). Based on the problem of less than optimals learning outcomes in Social Sciences, a solution is provided in the form of developing learning media that play a role in supporting the student learning process. The use of learning media can provide direct experience for students (Handayani & Dahlia, 2022; Abdulrahaman et al., 2020). In addition, the use of learning media is carried out to optimize the process of transferring information between the sender and the recipient of the message (Putra et al., 2023). Thus, learning media can make it easier for students to understand abstract concepts. Efforts that can be made by educators to facilitate student understanding are through learning media.

One of the learning media used to explore critical and creative thinking skills is related to the Mystery Box media. Mystery Box is a concrete learning media that can provide a real picture on a small scale. The uniqueness of this Mystery Box media can attract students' attention. In addition, the Box media is in the form of a small 3D display to show real situations (Korisky & Mudrik, 2021; Kang et al., 2022). Previous research findings on the use of cultural information map learning media showed an increase in learning outcomes for cultural diversity (Suswandari et al., 2024; Stahl & Maznevski, 2021). Similar research on the use of learning videos for cultural diversity material can motivate students (Rodiyana et al., 2023; Maryani & Aguskin, 2019; Yassin, 2024). Increasing student learning motivation shows an increase in student interest in a material. Another study by Nurulita et al. (2024) proved that concrete learning media are effective in improving student learning achievement. Learning media is a tool that can increase learning effectiveness. The use of interactive media such as Mystery Box can facilitate students' understanding of abstract concepts through a more real approach. Therefore, the focus of this study is on the development, feasibility, and effectiveness of Mystery Box media in improving student learning outcomes.

The formulation of the problem raised in this study is: How is the development of Mystery Box learning media on the material of Indonesian cultural diversity? How is the feasibility of Mystery Box learning media? and How is the effectiveness of using Mystery Box media in improving student learning outcomes? This study aims to design and develop Mystery Box learning media, assess its feasibility based on expert validation, and test its effectiveness in the process of improving the learning outcomes of fourth grade students of SDN Purwoyoso 01.

Method

This study applies the research and development (R&D) method with a descriptive design referring to the Borg & Gall model modified by Sugiyono. Thus, the goal is to produce valid, effective, and efficient learning media. The product developed is a Mystery Box learning media that focuses on science and science material regarding the diversity of Indonesian culture. The locus of this research is at SDN 01 Purwoyoso, Semarang City, involving 27 students as samples from various levels of achievement. In the product development process, researchers follow the steps that have been modified from the Borg & Gall model, including finding problems and potentials at the research location, data collection, product design, design validation, design refinement, product trials, and final revisions (Elviana et al., 2024). Data were

obtained through observation, interviews, questionnaires, and documentation, with primary data sources obtained from student and teacher responses, while secondary data were obtained from relevant literature. Product testing was carried out using questionnaires from teachers and students, to measure aspects such as language clarity, material regularity, ease of use, and the level of motivation generated by the media.

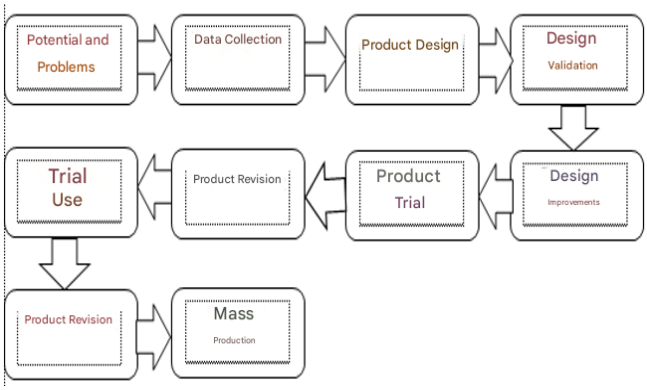

Figure 1. Borg & Gall development model

In addition, learning outcome tests are used to evaluate the extent to which the use of this media affects the achievement of student learning outcomes. Data analysis is carried out by testing the normality of the data, followed by appropriate statistical tests, such as If the data is normally distributed, use the Paired Sample T-Test, while if the data is not normally distributed, use the Wilcoxon test. The researcher also used the N-Gain test to determine whether there was a significant increase in student learning outcomes after using the Mystery Box media. Through validity and reliability tests that include the point-biserial correlation coefficient, Kuder Richardson 20, and discrimination index, this study aims to ensure that the instruments used can measure accurately and consistently. Based on the results of the analysis, this product is expected to provide insight into the effectiveness of learning media in improving students' understanding of Indonesian cultural diversity and contributing to creating more interesting and motivating learning.

Result and Discussion

Referring to the research results, the development of Mystery Box media is based on the Borg and Gall model that has been modified by Sugiyono. Validation was carried out by media and material experts with results that are very suitable for use in learning. The theory that supports the development of this learning media is the constructivist theory which emphasizes that students must build their understanding through active learning experiences. In addition, cognitive theory also plays a role in explaining how Mystery Box media can help students process information better. This study developed a Mystery Box media product for the material on Indonesian Cultural Diversity in the science learning content. The results of the study explain several things, namely the development of Mystery Box learning media, assessment of the feasibility of the media, the effectiveness of the learning media, and responses from teachers and students through questionnaires. Based on the results of observations and interviews, it was found that the learning media used in class IV of SDN Purwoyoso 01 was still less varied and innovative. Monotonous media makes it difficult for students to understand the material, especially related to the diversity of Indonesian culture.

Table 1. Student Needs Questionnaire

Question	Answer	
	Yes	No
Do you like science lessons?	26 (100%)	
Is the science subject material difficult to understand?	17 (65.30%)	9 (34.70%)
Do you like learning media in the form of boxes filled with interesting pictures?	18 (69.20%)	8 (30.80%)
Have you ever seen the Mystery Box learning media?	10 (38.40%)	16 (61.60%)
How does the color look on the developed Mystery Box?	20 (76.90%)	6 (23.10%)
Do you feel happy when the teacher gives assignments?	15 (57.60%)	11 (42.40%)
Do you feel happy when there are group activities?	20 (76.90%)	6 (23.10%)
Are you happy if teachers use learning media when teaching?	23 (88.40%)	3 (11.60%)
Does the teacher help you if you have difficulty understanding the material?	26 (100%)	
Do you understand the science lesson taught by the teacher?	9 (34.70%)	17 (65.30%)
Do teachers always use learning media when teaching?	8 (30.70%)	
I always do my assignments on time	19 (73.10%)	7 (26.90%)

Teachers want learning media that are more interesting, interactive, and effective in delivering material, and are able to motivate students to be more active in learning. Given these problems, researchers

formulated a solution in the form of developing innovative and interactive learning media, namely the Mystery Box media. To obtain the necessary data, researchers conducted observations in class IV of SDN Purwoyoso 01, Semarang City, to analyze the needs of teachers and students related to the learning media to be developed. This activity was supplemented with interviews and student learning outcome data. Findings from observations and interviews indicated that teachers supported the development of Mystery Box learning media for the IPS material on Indonesian Cultural Diversity.

Teachers expressed that the current media was not effective in improving students' understanding of the material, so that the learning outcomes obtained were less than optimal. Teachers wanted more innovative media to increase students' interest and understanding of Indonesian cultural diversity. The Mystery Box media desired by teachers must be equipped with clear descriptions of the material, relevant pictures from each province, and presentation of the material using simple language with concise and clear sentences. The media design must be designed as attractively as possible so that students can more easily understand the material presented.

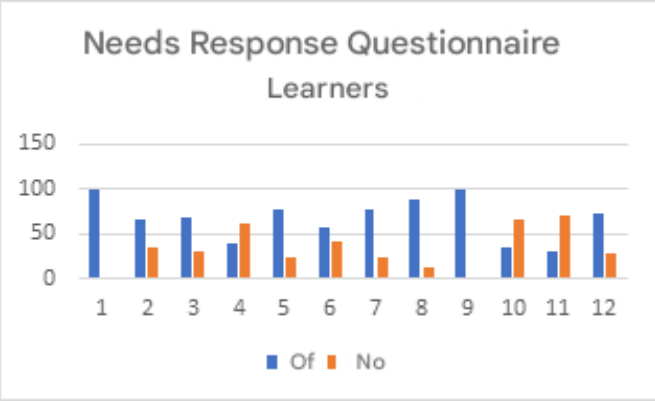

Figure 2. Recapitulation of students' media needs

Based on the data presented in Table 1, the majority of students face difficulties in understanding the material related to the diversity of Indonesian culture. The results of the questionnaire that have been distributed indicate that only a few students feel the use of learning media by educators during the learning process in class. This finding reveals that innovation is needed in more interesting learning media in order to improve the effectiveness of the learning process and outcomes. All students agree that the use of Mystery Box learning media can help them understand the material more optimally. In addition, this learning media is expected to be able to package the material in an interesting way, using pictures and bright colors to make it easier for students to understand. At the learning media design stage, the researcher began to compile the material that would be presented in the Mystery Box media. The material studied is the diversity of Indonesian culture, which is in accordance with the learning outcomes listed in the teaching module. The Mystery Box media is designed with several elements, such as instructions for use, learning outcomes, learning objectives, materials, pictures of Indonesian provinces, maps, and teaching modules in the form of scans.

The initial design of this media includes several important parts, such as the top cover section which displays the media title, learning outcomes, learning objectives, and the identity of the creator and supervising lecturer. The purpose of this section is for students to know the first steps in using learning media. In addition, on the outside of the bottom of the media cover there are instructions for use to help students understand how to use the media. This media also presents images that depict cultural diversity from various provinces in Indonesia. Based on the data presented in Table 1, the majority of students face difficulties in understanding the material related to the diversity of Indonesian culture. The results of the questionnaire that have been distributed indicate that only a few students feel the use of learning media by educators during the learning process in class. This finding reveals that innovation is needed in more interesting learning media in order to improve the effectiveness of the learning process and outcomes. All students agree that the use of Mystery Box learning media can help them understand the material more optimally. In addition, this learning media is expected to be able to package the material in an interesting way, using pictures and bright colors to make it easier for students to understand. At the learning media design stage, the researcher began to compile the material that would be presented in the Mystery Box media.

Figure 3. Mystery box media products

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Inside the media, there are several layers that explain the material about 38 provinces in Indonesia. In the middle or bottom of the box, there is a map with pockets where students can match and insert pictures of provinces into the existing pockets. The background of this media is designed in black to make it look attractive and focus on the material presented. After the media design was completed, the researcher developed the Mystery Box media product by utilizing duplex cardboard and the Canva application to design the material to be displayed.

This media includes instructions for use, learning outcomes, learning objectives, learning materials, maps, and typical images from each province of Indonesia. The outside of the box lid displays pictures of animals along with information about the topic of the material to be studied. Instructions for use of this media are also included to ensure that teachers and students can use this media easily and without confusion. Inside the media, the material is presented in the form of pictures and descriptions of the diversity of Indonesian culture in each province. Students can use this media by reading the material, looking at the pictures on the envelope, and matching the pictures with the maps provided. After that, students will work on their results in the LKPD and present the results with their groups. The results of the Mystery Box media feasibility assessment were carried out by a validator team consisting of material experts and media experts. This validation aims to measure the extent to which this media can be applied effectively in the learning process.

Material validation was carried out by a material expert, namely Mr. Galih Mahardika Christian Putra, S.Pd., M. Pd who works as a lecturer in the Elementary School Teacher Education study program. The evaluation carried out includes several aspects, including the completeness of the learning media, the suitability of the material to the needs of students, and the learning aspects in the media. This media includes instructions for use, learning outcomes, learning objectives, learning materials, maps, and typical images from each province of Indonesia. The outside of the box lid displays pictures of animals along with information about the topic of the material to be studied. Instructions for use of this media are also included to ensure that teachers and students can use this media easily and without confusion. Inside the media, the material is presented in the form of pictures and

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Table 2. Material Expert Assessment Provisions

Percentage (%)	Criteria
81-100	Very Eligible
61-80	Eligible
41-60	Quite Eligible
21-40	Less Eligible
0-20	Very Uneligible

In the material expert test instrument, each descriptor has a maximum assessment score of 5 so that the maximum total score that can be obtained is 75 and the minimum score is 15. The total score obtained is then converted into a percentage. The percentage of the material expert test instrument assessment consists of 4 criteria. Very feasible criteria with a score percentage of 81% - 100%, feasible criteria with a score percentage of 61% - 80%, quite feasible criteria with a score percentage of 41% - 60%, unfeasible criteria with a score percentage of 21% - 40%, and very unfeasible criteria with a score percentage of 0% - 20%. The recapitulation of the results of the material validation on the Mystery Box learning media is as follows.

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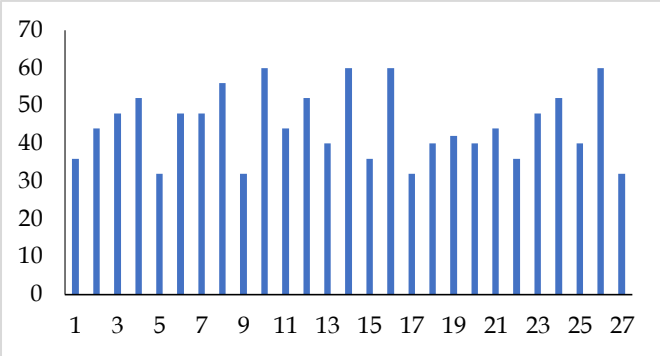

Figure 5. Results of student pretest scores

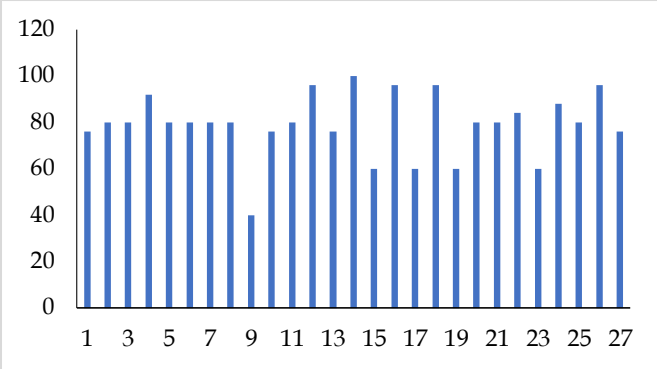

Figure 6. Large group posttest scores

In the media expert test instrument, each descriptor has a maximum score of 5, with the highest total score that can be obtained being 75 and the lowest score being 15. The scores obtained are then converted into percentages. The results of the media expert test instrument assessment are categorized into four criteria. Very feasible criteria with a score percentage of 81% - 100%, feasible criteria with a score percentage of 61% - 80%, quite feasible criteria with a score percentage of 41% - 60%, unfeasible criteria with a score percentage of 21% - 40%, and very unfeasible criteria with a score percentage of 0% - 20%. The recapitulation of the media validation results on the Mystery Box learning media is as follows.

Discussion

Innovation in Developing Mystery Box Media Learning

The results of the study show that before the implementation of Mystery Box media, the learning method used at SDN Purwoyoso 01 was still dominated by lectures, where interaction between teachers and students tended to be low. This resulted in limited student involvement in learning and a lack of opportunities to explore the material independently. Mystery Box was developed as a solution to increase student interaction, involvement, and understanding through experiential learning methods (Veldkamp et al., 2020; Utami et al., 2022). By using Mystery Box media, students are more active in the learning process,

because they are directly involved in exploring the contents of the box containing various materials related to Indonesian cultural diversity (Nuhaa & Witanto, 2024). This approach supports the concept of experiential learning, where students gain better understanding through direct activities rather than just receiving material passively (De Jong et al., 2023; Al Shloul et al., 2024; Kamalov et al., 2023).

Evaluation of the Feasibility of Mystery Box Learning Media

Based on questionnaire data collected from students, this media obtained an average score of 60.74, which indicates that Mystery Box is quite feasible to be used in the learning process. This finding shows that although there are still aspects that need to be improved, Mystery Box has met the standards as an interactive learning media according to student preferences. In addition, teachers who observed the use of Mystery Box in the classroom also revealed that this media facilitates the delivery of material in a more interesting and interactive way (Mikeska et al., 2022). This result is in line with previous research indicating that exploration-based learning media can increase student involvement and motivation in learning (Wahyudi et al., 2024; Susanti et al., 2022).

Effectiveness of Mystery Box in Improving Learning Outcomes

The effectiveness of Mystery Box was measured by comparing the results of the pretest and posttest and the calculation of N-Gain. The findings showed that the small group achieved an N-Gain of 0.71 (high category), while the large group obtained an N-Gain of 0.63 (medium-high category). This difference indicates that although this media has proven effective in improving student understanding, the number of students in one class can affect its level of effectiveness. In addition, the results of the t-test indicate that if there is a difference between the pretest and posttest scores, it means that the use of Mystery Box is statistically proven effective in improving student learning outcomes (Alina et al., 2024; Hardiansyah & Wahdian, 2023). This supports the theory that game-based learning and exploration can improve conceptual understanding and student memory compared to traditional lecture methods (Newman & DeCaro, 2019; Hu-Au & Okita, 2021; Darling-Hammond et al., 2020).

Research Implications for Learning and Media Development

The findings of this study support the theory of constructivism, which states that students can more easily understand and memorize material when actively involved in the learning process. The use of Mystery Box allows students to build their own understanding through exploration and discussion, which is in line with the main principles of constructivism (Dubinsky & Hamid, 2024; Suhendi et al., 2018; Kaldaras et al., 2024). Thus, this study adds empirical evidence that interaction-based learning methods can significantly improve learning outcomes. From a practical perspective, this study provides insight for educators regarding the importance of innovation in learning. Teachers can adapt Mystery Box for various subjects to increase student motivation and engagement in learning. The pedagogical implications of this study indicate that Mystery Box can enrich teaching strategies with a more creative approach (Kärner et al., 2021). With the increased effectiveness of learning shown by the results of the study, teachers can be more flexible in choosing teaching methods that are appropriate to student characteristics (Müller et al., 2023; Pho et al., 2021).

Conclusion

Referring to the research findings on the development and effectiveness of Mystery Box learning media in improving the learning outcomes of fourth grade students at SDN Purwoyoso 01, it can be concluded that this media has proven to be feasible and effective to use. The development process was carried out through the Research and Development (R&D) method using the Borg & Gall model which has been simplified into eight stages. The validation results by material experts and media experts showed a feasibility level of 82.66% and 88% respectively and the results of student and teacher questionnaires showed that this media was interesting, easy to use, and helped students understand the material on Indonesian cultural diversity. The results of statistical tests showed an increase in student understanding with an N-Gain of 0.71 for small groups and 0.63 for large groups, which means that this media contributed significantly to improving student understanding, participation, and motivation in the learning process. As a follow-up, it is recommended that the Mystery Box media be further developed by improving the design and appearance to make it more attractive and enrich the material presented. This media can also be applied to other subjects that require a visual and interactive approach to improve student understanding. Teachers are expected to be more active in utilizing innovative media such as Mystery Box to improve students' interest and learning outcomes, while schools are expected to provide adequate facilities for the development of interactive learning media. In addition, further research can be conducted on a larger scale or applied to different levels of education to test its effectiveness in various learning conditions. With wider

development and application, it is hoped that Mystery Box can become an alternative innovative learning that contributes to improving the quality of education, especially in science learning at the elementary school level.

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Author Contributions

Conceptualization, methodology, validation, formal analysis, investigation, resources, S. A. N.; data curation, writing—original draft preparation, writing—review and editing, visualization, F. D. P. All authors have read and agreed to the published version of the manuscript.

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Conflicts of interest

The authors declare no conflict of interest.

References

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

Al Faruq, M. S. S., Sunoko, A., Rozi, M. A. F., & Salim, A. (2024). Enhancing Educational Quality through Principals' Human Resources Management Strategies. *AL-ISHLAH: Jurnal Pendidikan*, *16*(2), 1108–1117. https://doi.org/10.35445/alishlah.v16i2.5042

Alina, K. F., & Fathurrahman, M. (2024). Pekendo Mystery Box Media to Improve Fourth Grade Science and Social Learning Outcomes for Elementary School Students. *Jurnal Penelitian Dan Pengembangan Pendidikan*, *8*(3), 528–537. https://doi.org/10.23887/jppp.v8i3.79076

Al Shloul, T., Mazhar, T., Abbas, Q., Iqbal, M., Ghadi, Y. Y., Shahzad, T., Mallek, F., & Hamam, H. (2024). Role of activity-based learning and ChatGPT on students' performance in education. *Computers and Education: Artificial Intelligence*, *6*, 100219. https://doi.org/10.1016/j.caeai.2024.100219

Brun, G., Herfeld, C., & Reuter, K. (2023). Introduction to the topical Collection: Concept formation in the natural and social sciences: empirical and normative aspects. *Synthese*, *201*(3), 89, s11229-023-04094–04096. https://doi.org/10.1007/s11229-023-04094-6

Cahayani, N. L. P., & Suastra, I. W. (2024). Implementation of Independent Learning Curriculum In The Perspective Of Progressivism Philosophy. *Indonesian Journal of Educational Development (IJED)*, *4*(4), 538–545. https://doi.org/10.59672/ijed.v4i4.3379

Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2020). Implications for educational practice of the science of learning and development. *Applied Developmental Science*, *24*(2), 97–140. https://doi.org/10.1080/10888691.2018.1537791

De Jong, T., Lazonder, A. W., Chinn, C. A., Fischer, F., Gobert, J., Hmelo-Silver, C. E., Koedinger, K. R., Krajcik, J. S., Kyza, E. A., Linn, M. C., Pedaste, M., Scheiter, K., & Zacharia, Z. C. (2023). Let's talk evidence – The case for combining inquiry-based and direct instruction. *Educational Research Review*, *39*, 100536. https://doi.org/10.1016/j.edurev.2023.100536

Destiani, F., Sujana, A., & Aeni, A. N. (2023). The Learning Media Application "BELIPARU" Oriented Towards the Mastery of Fifth-Grade Students' Concepts of the Water Cycle Material. *Mimbar Ilmu*, *28*(1), 156–165. https://doi.org/10.23887/mi.v28i1.57838

Dubinsky, J. M., & Hamid, A. A. (2024). The neuroscience of active learning and direct instruction. *Neuroscience & Biobehavioral Reviews*, *163*, 105737. https://doi.org/10.1016/j.neubiorev.2024.105737

Elviana, V., Sundari, P. D., Hufri, H., & Hidayati, H. (2024). Development of Student's Worksheet Integrated with Predict Observe Explain (POE) Model to Facilitate Students' Critical Thinking Skills. *Jurnal Penelitian Pendidikan IPA*, *10*(3), 1255–1272. https://doi.org/10.29303/jppipa.v10i3.6032

Handayani, S. L., & Dahlia, I. (2022). ANIMA-LIE: Android-Based Learning Media on Animal Life Cycles Materials for Elementary School. *Jurnal Ilmiah Sekolah Dasar*, *6*(2), 287–294. https://doi.org/10.23887/jisd.v6i2.45359

Hardiansyah, F., & Wahdian, A. (2023). Improving Science Learning Outcomes Through the Development of the Magic Card Box Learning Media. *AL-ISHLAH: Jurnal Pendidikan*, *15*(1), 823–833. https://doi.org/10.35445/alishlah.v15i1.2711

Hu-Au, E., & Okita, S. (2021). Exploring Differences in Student Learning and Behavior Between Real-life and Virtual Reality Chemistry Laboratories. *Journal of Science Education and Technology*, *30*(6), 862–876. https://doi.org/10.1007/s10956-021-09925-0

Kaldaras, L., Wang, K. D., Nardo, J. E., Price, A., Perkins, K., Wieman, C., & Salehi, S. (2024). Employing technology-enhanced feedback and scaffolding to support the development of deep science understanding using computer simulations. *International Journal of STEM Education*, *11*(1), 30. https://doi.org/10.1186/s40594-024-00490-7

Kamalov, F., Santandreu Calonge, D., & Gurrib, I. (2023). New Era of Artificial Intelligence in Education: Towards a Sustainable Multifaceted Revolution. *Sustainability*, *15*(16), 12451. https://doi.org/10.3390/su151612451

Kang, D., Choi, J.-H., & Hwang, H. (2022). Autostereoscopic 3D Display System for 3D Medical Images. *Applied Sciences*, *12*(9), 4288. https://doi.org/10.3390/app12094288

Kärner, T., Warwas, J., & Schumann, S. (2021). A Learning Analytics Approach to Address Heterogeneity in the Classroom: The Teachers' Diagnostic Support System. *Technology, Knowledge and Learning*, *26*(1), 31–52. https://doi.org/10.1007/s10758-020-09448-4

Korisky, U., & Mudrik, L. (2021). Dimensions of Perception: 3D Real-Life Objects Are More Readily Detected Than Their 2D Images. *Psychological Science*, *32*(10), 1636–1648. https://doi.org/10.1177/09567976211010718

Maryani, M., & Aguskin, L. (2019). Incorporating Youtube Clips in the Classroom to Develop Students' Cultural Understanding of American Culture. *Lingua Cultura*, *13*(4), 265. https://doi.org/10.21512/lc.v13i4.5889

Mikeska, J. N., Howell, H., & Kinsey, D. (2022). Examining the usability and viability of using a simulated classroom environment to prepare preservice science teachers during and after the COVID-19 pandemic. *Disciplinary and Interdisciplinary Science Education Research*, *4*(1), 23. https://doi.org/10.1186/s43031-022-00054-1

Müller, C., Mildenberger, T., & Steingruber, D. (2023). Learning effectiveness of a flexible learning study programme in a blended learning design: Why are some courses more effective than others? *International Journal of Educational Technology in Higher Education*, *20*(1), 10. https://doi.org/10.1186/s41239-022-00379-x

Newman, P. M., & DeCaro, M. S. (2019). Learning by exploring: How much guidance is optimal? *Learning and Instruction*, *62*, 49–63. https://doi.org/10.1016/j.learninstruc.2019.05.005

Novita, L., Talitha, S., Rohimah, R., Sundari, F. S., & Purnamasari, R. (2024). Independent Curriculum Management Through Developing Teaching Modules on Style Materials. *AL-ISHLAH: Jurnal Pendidikan*, *16*(2), 1275–1288. https://doi.org/10.35445/alishlah.v16i2.4824

Nuhaa, F., & Witanto, Y. (2024). Mystery Box Media Increases Motivation and Learning Achievement of Fourth Grade Students in Civics Learning. *Jurnal Penelitian Dan Pengembangan Pendidikan*, *8*(3), 538–546. https://doi.org/10.23887/jppp.v8i3.79420

Nurulita, D. A., & Setiawan, A. M. (2024). Enhancing Student Achievement in the Measurement of Objects on Science Material by Developing 3D Hologram Learning Media. *Jurnal Penelitian Pendidikan IPA*, *10*(6), 3414–3422. https://doi.org/10.29303/jppipa.v10i6.5848

Pho, D. H., Nguyen, H. T., Nguyen, H. M., & Nguyen, T. T. N. (2021). The use of learning station method according to competency development for elementary students in Vietnam. *Cogent Education*, *8*(1), 1870799. https://doi.org/10.1080/2331186X.2020.1870799

Putra, I. P. A. S., & Paramita, M. V. A. (2023). The Use of Digital Educational Games as Learning Media: A Study on Elementary School Teachers. *International Journal of Elementary Education*, *7*(2), 212–219. https://doi.org/10.23887/ijee.v7i2.58432

Rahmadani, E. L., Ningsih, F., Khaikal, F., Fortuna, G., & Juniarti, H. (2023). Urgency of Strengthening Social Sciences Education in Elementary Schools in Forming Good Citizens. *MANDALIKA: Journal of Social Science*, *1*(2), 34–40. https://doi.org/10.56566/mandalika.v1i2.121

Ramadanti, A. R., & Bektiningsih, K. (2023). Pengembangan Media Pembelajaran Komik Digital Berbasis Flipbook Pada Muatan IPAS Untuk Meningkatkan Hasil Belajar Siswa. *Journal*

for Lesson and Learning Studies, *6*(3), 506–515. https://doi.org/10.23887/jlls.v6i3.68053

Rodiyana, R., Maftuh, B., Sapriya, S., Syaodih, E., Yanto, A., & Sofyan, D. (2023). Bringing Diversity Education to Life: The Impact of Learning Videos on Elementary School Students' Learning Outcomes. *Utamax : Journal of Ultimate Research and Trends in Education*, *5*(2), 166–178. https://doi.org/10.31849/utamax.v5i2.13134

Stahl, G. K., & Maznevski, M. L. (2021). Unraveling the effects of cultural diversity in teams: A retrospective of research on multicultural work groups and an agenda for future research. *Journal of International Business Studies*, *52*(1), 4–22. https://doi.org/10.1057/s41267-020-00389-9

Suhendi, A., & . P. (2018). Constructivist Learning Theory: The Contribution to Foreign Language Learning and Teaching. *KnE Social Sciences*, *3*(4), 87. https://doi.org/10.18502/kss.v3i4.1921

Susanti, D., Sari, L. Y., & Fitriani, V. (2022). Increasing Student Learning Motivation through the Use of Interactive Digital Books Based on Project Based Learning (PjBL). *Jurnal Penelitian Pendidikan IPA*, *8*(4), 2022–2028. https://doi.org/10.29303/jppipa.v8i4.1669

Suswandari, Qodariah, L., Rahmawati, M., & Azid, N. (2024). Maps as Collaborative Learning Media for Social Studies Learning on Imperialism and Colonialism in Indonesia. *International Journal of Social Learning (IJSL)*, *5*(1), 202–222. https://doi.org/10.47134/ijsl.v5i1.326

Utami, S., Anam, M., & Fatmawaty, R. (2022). Developing Mystery Box in Teaching Narrative Text for Speaking Class at Junior High School. *Jo-ELT (Journal of English Language Teaching) Fakultas Pendidikan Bahasa & Seni Prodi Pendidikan Bahasa Inggris IKIP*, *9*(2), 194. https://doi.org/10.33394/jo-elt.v9i2.5758

Veldkamp, A., Van De Grint, L., Knippels, M.-C. P. J., & Van Joolingen, W. R. (2020). Escape education: A systematic review on escape rooms in education. *Educational Research Review*, *31*, 100364. https://doi.org/10.1016/j.edurev.2020.100364

Vodă, A. I., Cautisanu, C., Grădinaru, C., Tănăsescu, C., & De Moraes, G. H. S. M. (2022). Exploring Digital Literacy Skills in Social Sciences and Humanities Students. *Sustainability*, *14*(5), 2483. https://doi.org/10.3390/su14052483

Wahyudi, S., Lubis, A., Jufri, & Chandra, D. A. (2024). Effectiveness of Using Digital Technology-Based Learning Media in Increasing Student Motivation at State Elementary School 012 Ujung Batu III Rokan Hulu. *Journal of ICT Aplications and System*, *2*(2), 41–49. https://doi.org/10.56313/jictas.v2i2.269

Yassin, B. (2024). Enhancing English as a Foreign Language (EFL) learning in Saudi Arabia: The academic contribution of YouTube in EFL learning and cultural awareness. *Frontiers in Education*, *9*, 1451504. https://doi.org/10.3389/feduc.2024.1451504