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Implementation of Unplugged-Based Student Worksheets (LKPD) to Improve Critical Thinking Skills in the Solar System Material for Elementary School Students

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ABSTRACT
Education is fundamental to the development of high-quality human resources and the creation of a brighter and more sustainable future. Science is one of the pivotal subjects for achieving this goal. Science learning extends beyond conceptual mastery; it also plays a critical role in cultivating students' critical thinking skills. These skills are essential for students to solve problems, analyze data, and make informed decisions in everyday life. However, science instruction in elementary schools remains largely teacher-centered and offers limited opportunities for students to engage in active thinking. The unplugged learning approach offers a promising alternative to address this issue. This method employs hands-on, technology-free activities such as contextual problem-solving, simulations, educational games, and collaborative discussions. By actively involving students in the learning process, this approach can deepen conceptual understanding while simultaneously enhancing critical thinking. In an unplugged science learning environment, students are encouraged to observe, question, experiment, reason, and communicate their ideas. This process enables them to develop analytical, evaluative, and reflective thinking skills. Moreover, unplugged learning fosters a fun, interactive, and meaningful learning atmosphere that can increase students' learning motivation. Consequently, unplugged learning holds significant potential for improving students' critical thinking skills in science, and it should be considered by teachers as an innovative, student-centered instructional strategy to create a more effective learning process.
Keywords: Critical Thinking, Unplugged, Coding, Science, Elementary School**.**

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INTRODUCTION

Education plays a crucial role in life, as it paves the way for everyone to attain their highest potential. Education is a means to eradicate ignorance and poverty. Science (IPA) is a compulsory subject at the elementary school level, aiming to provide students with organized knowledge, ideas, and concepts about the natural world through investigation, organization, and presentation of ideas (Sakila et al., 2023). The implementation of science-oriented science learning in elementary schools should also be tailored to students' cognitive, affective, and psychomotor development, thus aligning with the learning process (Suma, 2025). Science learning strongly supports critical thinking skills. Critical thinking is a must-have skill and is crucial in everyday life (Syahdilla & Fadhila, 2025). Basic thinking skills in critical education are among the 21st-century skills that students need to master, particularly in science (Nggusuwaru, 2026).

Critical thinking skills are mental activities carried out systematically and involve interpreting, applying, analyzing, synthesizing, and evaluating information obtained through observation, self-reflection, interaction, and concrete actions. In education, particularly in Natural Science (IPA) subjects at the elementary school level, these skills play a central role (Setiyadi, 2025). Critical thinking helps students observe natural phenomena, analyze experimental data, formulate scientific questions, draw conclusions, and solve problems based on concrete evidence. However, in science learning practices, these skills often remain underdeveloped due to the dominance of lecture methods and the use of teaching materials that lack context and do not encourage active student involvement (Dewi et al., 2025). Today, we live in a rapidly evolving world, where advances in digital technology have brought significant changes in various fields. Coding is one form of this progress. Coding is divided into two types: plugged coding and unplugged coding. Coding involves writing and operating code using computers and information and communication technology devices.

Unplugged coding, on the other hand, is a method of learning coding without computers that focuses on physical activity and fundamental activities to understand basic programming concepts. Unplugged Coding is not always about computers and programming but also refers to physical activities and simple activities without using a computer (Astutik et al., 2025). Facing the changing times, we can use Unplugged Coding which is then translated into the form of Student Worksheets (LKPD). LKPD is written teaching material in the form of assignment sheets or questions that will later be completed by students. Therefore, in line with one type of coding, namely Unplugged Coding, this combination can be used as a solution to problems that exist in elementary schools. This development is regulated and designed according to the needs to address the challenges and changes of the times. Even in printed form, students in elementary schools are expected to still be able to understand coding (Astutik et al., 2025).

LITERATURE REVIEW

1. The Transformation of Coding Education: From Digital Devices to Unplugged Approaches

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In today's era, the integration of technology into education has become a necessity. One of the fundamental competencies emphasized is coding skills, which are now being considered as an elective subject at the elementary school level. Conceptually, coding is often misunderstood as merely interacting with ICT devices to run code. In reality, the core of coding lies in the development of computational thinking—the ability to break down complex problems into systematic and logical steps.

Infrastructure limitations, such as the lack of internet access and computer labs in many schools, often pose major obstacles to the implementation of coding. As a solution, the Unplugged Coding approach has emerged to teach basic programming concepts without relying on computers, but rather through physical activities and simple exercises. This approach has proven effective in building students' logical thinking and collaboration skills without the need for digital devices.

2. Unplugged Coding-Based Student Worksheets as an Innovative Teaching Tool

Student worksheets (LKPD) serve as written instructional materials containing tasks for students to complete. The integration of unplugged coding into student worksheets adds a new dimension to learning, making it more enjoyable and interactive. Previous research by (Astutik et al., 2025), indicates that the development of unplugged coding-based LKPDs achieved a very high level of validity and met criteria for being highly practical for use by elementary school students.

Pedagogically, the use of this type of LKPD enables students to understand abstract concepts through concrete activities. Previous studies have shown that this medium has a positive impact on student engagement and conceptual understanding, particularly in the field of science.

3. The Relationship Between Unplugged Coding and Critical Thinking in Science*

Students' science literacy in Indonesia consistently scores low according to PISA standards. This is often due to science curriculum content that is difficult or abstract. The implementation of unplugged coding in science education serves as a bridge to strengthen digital literacy and critical thinking skills from an early age.

Coding activities require students to engage in analysis, interpretation, and inference key components of critical thinking. While previous research has explored the use of unplugged coding in topics such as the five senses, plant parts, and animal classification, there remains a research gap regarding its implementation in subjects with higher levels of abstraction and requiring strong spatial visualization, such as the Solar System. Most studies still focus on the general validity of the medium but have not specifically examined the extent to which this approach can enhance students' critical thinking skills in understanding the dynamics of celestial bodies that cannot be directly observed in the classroom

PROBLEM FORMULATION

Based on the gaps identified above, this study aims to answer the following questions:

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1. How effective is the implementation of LKPD based on unplugged coding in improving the critical thinking skills of sixth-grade elementary school students on the subject of the Solar System?

METHOD

This study aims to determine the improvement in elementary school students' critical thinking skills through the implementation of Unplugged-based Student Worksheets (LKPD) on the solar system. Therefore, the type of research used is quantitative research with a pre-experimental design approach, using a one-group pretest-posttest design. The variables in this study include independent and dependent variables. The independent variable is the Unplugged-based Student Worksheet, and the dependent variable is critical thinking skills. Research methods are essentially scientific ways to obtain data for specific purposes and uses. This study uses a pre-experimental design with a one-group pretest-posttest design. This allows for more accurate results, as it allows for comparison with the pre-treatment situation. The stages of implementing the research design are as follows: 1) Conducting an initial test (pretest) to determine the average score before the subjects receive the treatment, namely learning. 2) Providing treatment using the Direct Instruction model assisted by Unplugged-based Student Worksheet media. 3) Conducting a final test (posttest) to determine the average score after the subjects receive the treatment using the Direct Instruction model assisted by Unplugged-based Student Worksheet media. The population of this study was all sixth-grade students. The sampling technique used was non-probability sampling. Non-probability sampling is a sampling technique that does not provide an equal opportunity for each member of the population to be selected as a sample. All members of the population were used as samples. Therefore, the sampling technique used was saturated sampling.

Data collection techniques used in this study included tests, observation, and documentation. Observations were conducted through classroom observation of solar system learning to identify initial learning issues. Tests were administered to measure students' critical thinking skills before and after learning. Observations were conducted to observe students' activities while using student worksheets (LKPD). Documentation was used as authentic evidence during the research, in the form of photographs depicting activities during the research (Sonjaya et al., 2025). Data analysis techniques are methods used to process research data to draw conclusions. The data analysis techniques used were the initial normality test (pretest) and the final normality test (posttest). The data normality test is a prerequisite for determining whether the data is normally distributed. The technique used for the normality test is the Shapiro-Wilk test. The test criteria are: if the significance value (Sig.)>0.05, the data is normally distributed; if the significance value (Sig.) <0.05, the data is not normally distributed. To measure the effectiveness of a learning process, we use learning completion criteria that refer to students' science learning outcomes. Learning outcomes are considered effective if the average score is greater than or equal to the Minimum Competency (KKM), which is 75, and if classical learning completion reaches 80%.

FINDINGS

The pretest and posttest scores for students' critical thinking abilities are compared in the bar chart that follows. This information is utilized to track how students' skills have changed both before and after receiving treatment in the form of learning through unplugged student worksheets.

After unplugged-based Student Worksheets (LKPD) were implemented, the average posttest score rose to 97.93 from the average pretest score of 85.52. After engaging in unplugged learning activities, students' critical thinking abilities improved, as seen by the rise in the average score. Students showed improved problem-solving, information-evaluation, and logical conclusion-making skills in relation to the Solar System content.

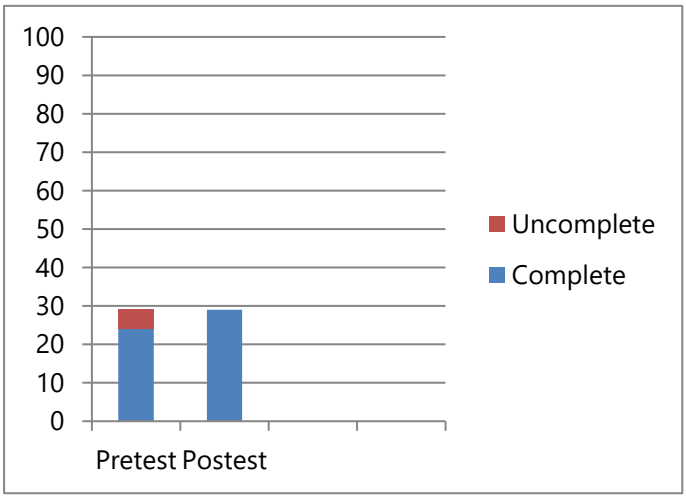


Figure 1. Students' Pretest and Posttest

Students' critical thinking abilities seem to have greatly improved following the introduction of unplugged-based learning, based on the pretest and posttest findings displayed in the diagram. In comparison to the pretest, more students attained mastery learning on the posttest. This suggests that prior to receiving the learning intervention, pupils' critical thinking abilities still need development. Following the introduction of unplugged learning, the posttest results showed a definite improvement. The number of students who met the learning objectives decreased while the number of students who attained mastery learning increased. Because students are actively engaged in tasks that call for analysis, problem-solving, teamwork, and exploration without the aid of technology, this improvement suggests that the unplugged approach can offer a more successful learning experience.

The unplugged approach promotes critical thinking, information evaluation, concept discussion, and the development of logical conclusions. As a result, students' critical thinking abilities and comprehension of the Solar System content have increased, as evidenced by the posttest's enhanced learning outcomes.

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DISCUSSION

In everyday life, humans cannot be separated from thinking. Thinking is the process of talking to oneself in the heart. Thinking is an active personal activity that results in discoveries directed towards a certain goal (Wasahua, 2021). Meanwhile, according to (Kusuma et al., 2024), critical thinking is an active and careful thought process, which includes activities of analyzing, synthesizing, evaluating, and reflecting on acquired information. This ability is very important as it forms the basis for developing individuals who are able to face various complex challenges in everyday life. Within this framework of critical thinking, students are not only asked to merely understand and remember a concept, but also actively interact to understand it more deeply (Dilla, 2024). In various literature reviews, there is agreement that developing critical thinking skills from the elementary school level has a positive impact on improvement improving the quality of education and preparing students to face the changes of a dynamic world. In the learning process, students' critical thinking skills can be developed by enriching meaningful experiences in problem-solving. The use of unplugged activities in the learning process can enhance students' critical thinking skills.

By providing relevant and interesting learning opportunities, unplugged learning successfully develops students' critical thinking skills (Syahdilla & Fadhila, 2025). This approach emphasizes practical exercises without the need for technology, allowing students to focus on analyzing problems, evaluating the material at hand, and coming up with logical solutions. This method is in line with constructivist learning theory, which maintains that students build their own knowledge and comprehension via firsthand experience. Students are given a variety of challenges when working on unplugged projects that need them to use critical thinking skills, identify pertinent information, and choose appropriate solutions. Additionally, this tactic encourages peer engagement.

Through group discussions, collaboration, and perspective sharing, students can improve their ability to reason and develop a deeper understanding of the material covered. This method helps them become more adept at critical thinking since they learn from each other as well as from their own ideas. In terms of instructional strategies, the unplugged approach allows students to investigate concepts and solve issues in a nurturing classroom environment. Additionally, learning without the use of technology reduces the possibility of interruptions, which keeps pupils concentrated on developing their critical thinking abilities and comprehending the material. The results of this study demonstrate that unplugged learning enhances students' critical thinking skills. As a result, this approach is a useful teaching strategy that promotes higher-order thinking, problem-solving, and meaningful learning at all educational levels.

CONCLUSION

Based on the study's findings, it can be said that employing student worksheets based on unplugged learning for the Solar System topic is highly successful in enhancing primary school pupils' critical thinking abilities. Higher results on the posttest relative to the pretest demonstrate this, showing that after engaging in the learning activities, students

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are more capable of issue analysis, information evaluation, and logical conclusion drawing.

Because students are actively involved in problem-solving, group collaboration, and discussion, worksheets that use this method make learning more relevant and interesting. Students are encouraged to think critically and develop their own comprehension of scientific ideas through these exercises. Additionally, because this type of instruction does not rely on technology, students are able to concentrate more on their ability to reason and develop a firm grasp of the subject matter.

In order to develop students' critical thinking abilities during scientific classes, unplugged-based student worksheets can be utilized as a creative and practical learning substitute. It is anticipated that its implementation will enhance elementary school learning and aid in the development of 21st century skills.

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REFERENCES

Astutik, L. S., Ana, R. F. R., Sari, N. N. (2025). *Pengembangan LKPD IPA Berbasis Unplugged Coding untuk peserta didik Kelas IV Sekolah Dasar*. *10*(October), 161–169.

Dewi, D. K. P., Suparya, I. K.,&Winangun, I. M. A. (2025). *Pembelajaran IPA SD Berbasis Digital Learning Untuk Meningkatkan Pemahaman Siswa Kelas VI SD Negeri Cepaka*. *23*(1), 449–460.

Dilla, M. (2024). *Pengembangan Keterampilan Berpikir Kritis Siswa Sekolah Dasar Melalui Model Pembelajaran Inkuiri*. *2*, 1–7.

Ferawati. (2026). *Implementasi LKPD IPA Terintegrasi Pembelajaran Berbasis Proyek Untuk Meningkatkan Kemampuan Berpikir Kritis Siswa*. *3*, 56–64.

Kusuma, E. S. J., Handayani, A., & Rakhmawati, D. (2024). *http://journal.upgris.ac.id/index.php/wp Pentingnya Pengembangan Kemampuan Berpikir Kritis Pada Siswa Sekolah Dasar: Sebuah Tinjauan Literatur. 4*(24), 369–379.

Sakila, R., Lubis, N. F., Saftina, Mutiara,&Asriani, D. (2023). *Pentingnya Peranan IPA Dalam Kehidupan Sehari-Hari*. *2*(1), 119–123.

Sonjaya, R. P., Aliyya, F. R., Naufal, S.,&Nursalman, M. (2025). *Pengujian Prasyarat Analisis Data Nilai Kelas : Uji Normalitas dan Uji Homogenitas*. *9*, 1627–1639.

Syahdilla, J., & Fadhila, F. (2025). *Meningkatkan Kemampuan Berpikir Kritis Siswa SD Melalui Pembelajaran Statistik.* 8753–8758.

Wasahua, S. (2021). *Konsep pengembangan berpikir kritis dan berpikir kreatif peserta didik di sekolah dasar*. *16*(2), 72–82.

Wijaya, I. K. W. B., Candiasa, I. M., Jampel, I. N., & Suma, K. (2025). *Pembelajaran Ilmu Pengetahuan Alam (IPA) Di Sekolah Dasar Berbasis Hakekat Sains Untuk Peningkatan Literasi Sains Siswa. Jurnal Pendidikan MIPA*. *15*, 783–787.