Development of CTL-Based Teaching Modules to Improve Learning Outcomes of Phase B Elementary Students

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Abstract

This research was motivated by the low learning outcomes of phase B elementary school students in the IPAS subject, particularly on the water cycle topic. This study aims to develop a teaching module based on Contextual Teaching and Learning (CTL) to improve students' learning outcomes. The method used is Design and Development (D&D) with the ADDIE model, which includes analysis, design, development, implementation, and evaluation stages. The results show that the CTL-based teaching module is highly feasible to use, with an average validation score of 91.66%. Furthermore, the N-Gain test results indicate an improvement in students' learning outcomes with a score of 0.66, categorized as moderate. This study recommends using CTL-based teaching modules as an alternative approach to enhance understanding and learning outcomes in IPAS subjects.

Keywords – Teaching Module; Contextual Teaching and Learning; Learning outcomes; Water Cycle

1. Introduction

Natural and Social Sciences (IPAS) is a subject that plays a vital role in the overall development of students' abilities as it encompasses knowledge, attitudes, and skills competencies (Amali et al., 2019). Teaching IPAS in elementary schools is essential for improving students' learning outcomes. By developing knowledge and observational skills, students can better understand their surroundings and learn to solve problems. When learning is designed to be engaging and effective, students' academic achievements can be maximized.

However, the learning outcomes of Phase B elementary students in the IPAS subject, especially on the topic of the water cycle, remain low. Observations revealed that most fourth-grade students have not achieved the Learning Objectives Criteria (KKTP), with 23 out of 28 students scoring below 66%.

This issue is influenced by the ineffectiveness of the teaching methods employed. The current learning models fail to actively involve students or connect the lessons to their everyday lives, making it difficult for them to grasp abstract concepts such as the water cycle (Lewar et al., 2023). IPAS lessons encourage students to develop curiosity and train them to think critically and objectively in solving problems. Learning processes that involve experiments can provide hands-on experiences for students, thereby improving their understanding of the material being taught (Ramadhan, 2021). Allowing students to actively participate in learning stimulates their curiosity and enhances their motivation to learn, which ultimately improves their outcomes.

To address this issue, one solution is to develop a teaching model that helps teachers connect lesson materials to students' real lives and encourage them to understand the relevance of their knowledge to daily applications within their families and communities (Yuni Sri Uminingsih, 2019). By linking lesson content to real-life experiences, this model not only strengthens the connection between the knowledge gained at school and students' daily experiences but also fosters deeper understanding.

Teaching modules are documents based on the Merdeka curriculum containing objectives, steps, teaching media, and assessments needed for a unit or topic, as outlined in the Learning Objectives Framework (ATP) (Prasetiyo & Zumrotun, 2024). These modules not only guide teachers in conducting lessons systematically and purposefully according to educational goals but also ensure that the teaching-learning process is interactive, inspiring, enjoyable, challenging, and motivating for students. Additionally, teaching modules should provide ample space for initiative, creativity, and independence, in line with students' talents, interests, physical development, and psychological growth (Salsabilla et al., 2023).

The CTL (Contextual Teaching and Learning) model focuses on student-centered activities, encouraging full participation in the learning process. The CTL model aims to help students find connections between lesson content and real-life situations, making learning more meaningful (Chityadewi, 2019). From this explanation, the CTL model can be concluded as a learning approach that motivates students to relate school lessons to their daily lives.

The CTL model has several straightforward objectives. It seeks to motivate students to understand the meaning of the material by linking it to their daily lives. Additionally, the model aims not only to help students memorize but also to understand the material being studied (Fauzi et al., 2022). Thus, the goals of the CTL model include productivity and meaningfulness in learning, engaging students in activities that connect academic content with the context of their daily lives.

According to Purwanto, learning outcomes can be defined by understanding the two elements that compose the term: "outcome" and "learning." In this context, "outcome" refers to an activity or process that causes functional changes in input. Similarly, in the teaching-learning process, students experience changes in behavior after learning, compared to their previous condition (Endayani et al., 2020). Learning outcomes are not merely academic achievements but also encompass students' overall growth. The learning process

should be an opportunity to develop conceptual knowledge, form positive attitudes, and enhance practical skills. Students are expected to apply their acquired knowledge in daily life, practice critical thinking skills, and develop positive character traits. Therefore, learning outcomes should reflect students' ability to master academic material and contribute positively to society.

The Merdeka Curriculum integrates natural and social sciences into IPAS with the aim of fostering students' interest and curiosity, encouraging active participation in learning, developing inquiry skills, understanding themselves and their environment, and deepening their knowledge of IPAS concepts (Agustina et al., 2022). One of the topics studied in IPAS is the water cycle. Water is essential for all living beings, and our daily lives depend on it, from drinking and cleaning to recreational activities. Water is a renewable resource on Earth, continuously cycling through the water cycle. The water cycle, or hydrological cycle, involves the endless movement of water from the atmosphere to the Earth's surface and back to the atmosphere through processes such as evaporation, transpiration, condensation, and precipitation. The heating of seawater by sunlight drives the continuity of this hydrological process (Siska Puspitasari, 2019).

2. Method

This study uses the Design and Development (D&D) method as proposed by Richey and Klein, with the ADDIE model consisting of five stages: analysis, design, development, implementation, and evaluation. The data sources include fourth-grade Phase B elementary school students, teachers, and experts. Data were collected through interviews, validation questionnaires, and learning outcome tests. Data analysis was carried out qualitatively to describe the validation results and quantitatively to measure the effectiveness of the module through the N-Gain test.

The purpose of this study is to develop a CTL-based teaching module to improve the learning outcomes of Phase B elementary school students. The development model applied is the ADDIE model

3. Result and Discussion

Findings

a. Initial Design of the CTL-Based Teaching Module to Improve Elementary Students' Learning Outcomes

The development of the CTL-based teaching module was carried out through the analysis and design stages. The analysis phase involved examining the learning objectives, materials, and needs. The design phase focused on creating a prototype and an initial design for the teaching module. The details of each stage are as follows:

Analysis Stage

The researchers conducted an analysis to ensure that the teaching module aligned with the targets and needs of Phase B elementary school students. This stage included reviewing documents on learning objectives and materials to confirm that the module content met the competencies expected in the water cycle topic of the IPAS subject. Additionally, a needs analysis was carried out through interviews with fourth-grade homeroom teachers to understand students' learning requirements.

The researchers analyzed the learning objectives of the water cycle material for fourth-grade Phase B students, which became the focus of the CTL-based teaching module development. The material was tailored to the learning objectives outlined in the Merdeka Curriculum, as specified in the Head of BSKAP KEMDIKBUDRISTEK Decree No. 008/H/KR/2022. The details of the learning objectives are as follows:

Table 1. Learning Objective

Element	Capaian
Understanding of IPAS (Science and Social Studies)	Students describe the occurrence of the water cycle and its relation to efforts to maintain water availability.

The researchers analyzed the prerequisite, core, and supplementary materials in the learning of the water cycle. The prerequisite material included understanding the basic concept of changes in the state of water, helping

students connect these processes to the water cycle. The core material covered the stages of the water cycle, including evaporation, transpiration, condensation, and precipitation, as well as the movement and transformation of water. The supplementary material emphasized the benefits of water and ways to preserve its availability in daily life. The researchers conducted interviews with fourth-grade elementary school teachers to design the CTL-based teaching module.

A needs analysis was conducted through interviews with fourth-grade teachers, revealing that students faced difficulties in understanding the water cycle due to its abstract processes and numerous stages, such as evaporation, transpiration, condensation, and precipitation. These challenges arose due to the lack of structured guidance in commonly used models, where students were expected to find information and draw conclusions independently but without sufficient teacher support. External factors, such as home environments, also affected learning outcomes. Students living in conducive environments tended to perform better than those in less favorable surroundings. Additionally, the relationship with teachers significantly influenced students' development and behavior. Teachers who built close relationships with their students often made them feel more comfortable asking questions and participating in learning activities.

Fourth-grade students exhibited visual and social learning styles, as evident from their enthusiasm when learning with visual media, such as videos or simple experiments, as well as group learning. However, these learning styles were not well-facilitated in the models designed by teachers. As a solution, Contextual Teaching and Learning (CTL) was developed to address these shortcomings. CTL was designed with more structured guidance, active teacher involvement, support for collaborative learning, and the integration of real-life experiences relevant to students' daily lives, catering to their learning styles.

b. Validation Results of the CTL-Based Teaching Module to Improve the Learning Outcomes of Phase B Elementary Students

After developing the CTL-based teaching module, the next step was validation to ensure its feasibility. The validation process involved three experts: a subject matter expert, a design expert, and a teaching practitioner (teacher). The subject matter expert conducted a single round of validation, assessing the aspects of content feasibility, presentation feasibility, language feasibility, and contextual assessment. The module was deemed to meet the standards, achieving a validation score of 93.33%, categorized as "highly feasible."

The design expert conducted two rounds of validation, evaluating the module's dimensions, cover design, and content layout. In the first validation, the score was 84.44%, as the researchers received several revision suggestions. After implementing these revisions, the second validation yielded a score of 88.38%, categorized as "highly feasible."

The teaching practitioner carried out two rounds of validation, assessing content feasibility, presentation feasibility, language feasibility, contextual assessment, and graphical feasibility. In the first validation, a score of 93.77% was obtained, as further revisions were suggested by the teacher. After revisions were made, the score improved to 100%, categorized as "highly feasible." The teaching practitioner evaluated the module's ease of use in the teaching process.

*c. Improvement in Learning Outcomes of Phase B Elementary Students***

The implementation of the CTL-based teaching module was carried out at an elementary school in Bandung. This activity involved 26 fourth-grade students in Phase B of elementary education. The implementation took place over two separate days, on September 18 and September 23, 2024. During this activity, the teaching module was tested to observe improvements in the students' learning outcomes. Below is the graph showing the results of the pre-test and post-test.

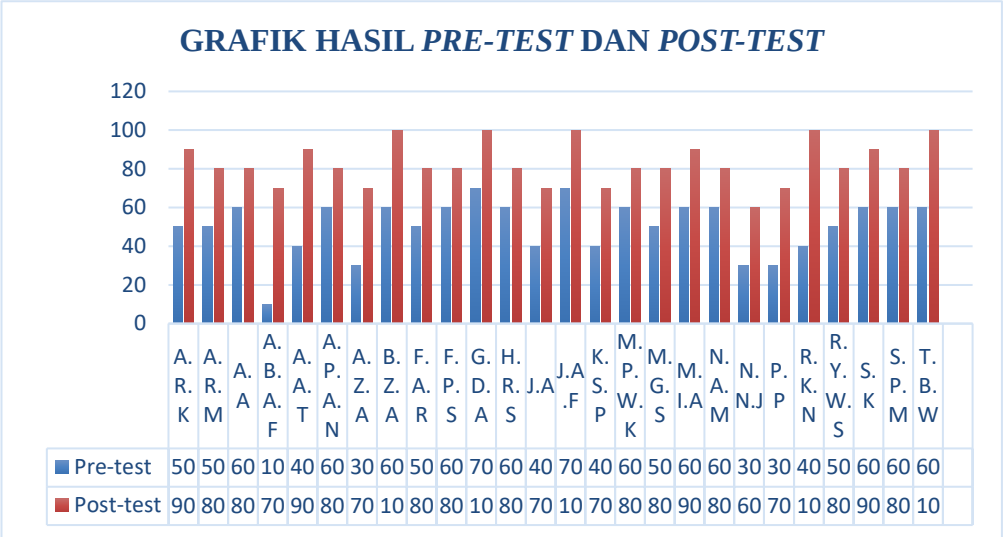

Figure 1. Graph of pretest and posttest result

Based on the pre-test results, it was found that students' scores varied. The lowest score obtained was 10, while the highest score was 70, with an average score of 46.15. Further analysis showed that most students were in the score range of 30 to 50, indicating that the students' initial knowledge of the material taught was still relatively low. The learning process using a CTL-based module was carried out over two sessions. This module was designed to improve student learning outcomes.

After two sessions, a post-test was conducted to observe the improvement in learning outcomes. Based on the pre-test and post-test results, it was found that all students showed an improvement in their learning outcomes. In the pre-test activity, the lowest score was 10, and the highest score was 70, with an average score of 46.15. Meanwhile, in the post-test activity, the lowest score was 60, and the highest score was 100, with an average score of 82.69. Below is the N-gain test formula and an explanation of the N-gain test results for 10 out of 26 students tested as follows:

N-gain=(Skor Postest-Skor Pretest)/(Skor Ideal-Skor Pretest)

Discussion

a. Initial Design of the CTL-Based Teaching Module to Improve Elementary School Students' Learning Outcomes

Needs analysis is an essential step in product design. The results of this analysis serve as the primary foundation for the product development process to align with actual needs in the field, thus achieving the intended goals effectively and efficiently (Afifulloh & Cahyanto, 2021). During the needs analysis phase, the researcher found that students faced difficulties understanding the water cycle material during interviews with the fourth-grade homeroom teacher. This indicates that the prior learning was not fully contextual, which aligns with Piaget's cognitive theory. According to this theory, elementary school-aged children exhibit concrete operational thinking, allowing them to logically process tangible or real-world phenomena (Bujuri, 2018). Thus, students find it easier to understand material presented visually and through direct experience.

Based on the interviews conducted, the researcher also considered the importance of enhancing students' enthusiasm for learning through experiments and visual activities tailored to the visual and social learning styles of fourth-grade students. This aligns with Gardner's multiple intelligence theory, specifically spatial intelligence, which involves skills in creating images, imagination, and understanding the visual and spatial world around us (Syarifah, 2019). This learning style can be optimized through appropriate teaching methods, such as using videos and experiments, incorporated into the CTL-based teaching module.

Implementing the steps of the discovery learning model used by teachers requires students to learn independently. Given the challenges in understanding the abstract nature of the water cycle material, students need guidance from the teacher during lessons rather than independent learning. This is consistent with research (Bagja & Yuliana, 2019) showing that discovery learning assumes students are ready for independent learning, which can

burden those unprepared, causing frustration and anxiety (Winarti et al., 2021). Considering students' visual and social learning styles and their difficulty grasping the water cycle's abstract stages, they require a learning model that aligns with their learning styles, as embedded in the CTL model.

Based on the material analysis stage, students need to understand the concept of water phase changes as a foundation for studying the water cycle. This is crucial because it helps them connect phase changes with the stages of the water cycle. Research supports that mastery involves understanding and comprehending materials or concepts in both theory and practice, enabling application in different or new situations (Nihayah, 2021). Therefore, students can master the water cycle material only after mastering phase change material. The core material focuses on the water cycle itself, such as evaporation, transpiration, condensation, and precipitation processes. Meanwhile, supplementary material encourages students to understand the benefits of water and ways to preserve its availability in daily life.

b. Validation Results of the CTL-Based Teaching Module to Improve Learning Outcomes of Phase B Elementary School Students

The prototype design stage in developing the CTL-based teaching module aims to create an initial framework focusing on basic structure, using B5 paper size and Times New Roman font. The module is designed with engaging visual elements, such as water cycle illustrations featuring rivers, clouds, the sun, and children, to facilitate understanding of abstract concepts. The module cover includes the title, university logo, phase, and grade, with a green theme representing the water cycle.

The module’s interior uses diverse visual elements such as clouds, grass, and the sun to illustrate water cycle stages. The module ends with a theme depicting a rainstorm stopping and a rainbow. Worksheet 1 features a beach theme with sand, the sea, and marine life elements, using yellow-cream colors. Worksheet 2 has a home yard theme showing children watering plants and faucet elements, using yellow-brown tones. The teaching materials theme

is a garden with fences, trees, puddles, and umbrellas, using blue colors. These visual elements not only make the worksheets more appealing but also help students understand the presented material. This aligns with Sadiman, Arief S. (2003), who stated that visual media effectively conveys learning material (Safitri & Kabiba, 2020).

Validation of the CTL-based teaching module involved three expert validators: subject matter experts, design experts, and learning practitioners. In developing the module's content, several key aspects were considered, including the use of straightforward, communicative language suited to students' intellectual development to ensure ease of understanding. This aligns with the notion that language plays a significant role in students' thinking, socializing, and emotional development and supports their learning across subjects (Tepu Sitepu & Rita, 2017)

Design validation of the CTL-based teaching module covered graphical feasibility, including size, cover design, and content design. Effective design supports readability, comprehension, and the module's attractiveness to students. This aligns with the view that engaging and interactive design can increase students' learning motivation, ultimately improving their learning outcomes (Dendodi et al., 2024). Based on validation by design experts, attention must be paid to indicators such as harmonizing and maintaining consistency in cover appearance and ensuring contrast in title colors.

Validation by learning practitioners evaluated the CTL-based teaching module's feasibility, considering five main aspects: content, presentation, language, contextual relevance, and graphical design.

c. Improvement in Learning Outcomes of Phase B Elementary School Students

Research results show an improvement in students' learning outcomes after using the teaching module designed according to their needs and learning styles. The module was developed with steps and supporting media relevant to helping students understand the water cycle concept. Additionally, analyzing learning outcomes (CP) was crucial in designing this module. By

understanding CP, learning objectives could be clearly identified, ensuring the module could improve students' learning outcomes.

During module validation, aspects like colors, image selection, and sentence structure were refined to ensure the material's appeal and clarity. Color selection, for example, not only serves an aesthetic purpose but also helps students focus while reading and understanding material, ultimately enhancing their learning outcomes. This aligns with the idea that incorporating color as a spatial element supports learning and boosts students' motivation (Julianto et al., 2019)

Based on the average N-gain test score of 0.66, categorized as moderate, the CTL model's inclusion in the module significantly contributed to its effectiveness. The CTL model includes constructivism, inquiry, questioning, learning communities, modeling, reflection, and authentic assessment. Moreover, its characteristics—such as fostering connections, performing meaningful tasks, self-regulation, collaboration, critical and creative thinking, nurturing individuality, achieving high standards, and using authentic assessments—proved beneficial. Research confirms that learning processes using the CTL model improve learning outcomes and positively impact students (Sumiati, 2023). Thus, developing the CTL-based teaching module effectively enhanced Phase B elementary school students' learning outcomes.

4. Conclusion

The CTL-based teaching module was designed based on an analysis of learning outcomes, material, and needs, encompassing various components such as the cover, general information, learning activities, reflection, assessments, pre-tests and post-tests, enrichment questions, remedial questions, worksheets (LKPD), and teaching materials. Validation by three experts demonstrated that the module is highly suitable for use, with evaluations meeting the criteria for content feasibility, presentation, language, contextual assessment, module size, cover design, and content design.

The module was tested on Phase B elementary school students through pre-test and post-test activities. The results were processed using the N-Gain formula, showing an improvement in learning outcomes within the moderate category.

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