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Enhancing Elementary School Students' Reading Comprehension Skills Using the Assurance, Relevance, Interest, Assessment, Satisfaction (ARIAS) Model based on Project-Based Learning (PjBL)

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Abstract. Reading comprehension is a crucial language skill for elementary school students in the 21st century. However, the quality of reading instruction in Indonesian schools remains inadequate. An assessment of fourth-grade narrative text comprehension found that only 30% of students answered questions effectively, while 70% struggled. This study aimed to evaluate the effectiveness of the ARIAS (Assurance, Relevance, Interest, Assessment, Satisfaction) model, integrated with Project-Based Learning (PjBL), in improving reading comprehension among fourth-grade students in Cimahi, Indonesia. Using a one-group pretest-posttest design with 30 students as participants, the intervention was conducted over four sessions. The teacher implemented ARIAS through Project-Based Learning. Students created an explosion box project based on 5W+1H questions (Who, What, Where, When, Why, and How), targeting skills such as identifying main ideas, locating details, interpreting vocabulary, making inferences, and evaluating text structure. The pretest mean score was 62.70, rising to 77.10 on the posttest. A paired sample t-test showed a t-value of -14.133 with a significance level of <0.001, indicating significant improvement. These findings suggest that integrating ARIAS with PjBL fosters student engagement and enhances reading comprehension. The study offers insights for educators on using structured motivational strategies and hands-on projects to improve literacy skills in elementary students.

Keywords: Reading; Comprehension Skills; ARIAS; Project-Based Learning; Elementary School.

1. Introduction

Reading refers to the cognitive process of seeking and comprehending meaning within a given text. This process involves active interpretation, where readers decode and understand messages conveyed by the author (Grabe & Stoller, 2019). One specific type of reading, known as reading comprehension, involves the reader actively interpreting and grasping the message the author aims to convey through their words and writing. Complex internal and external factors influence a reader's reading process. Internal factors include the reader's cognitive, motivational, goals, and interests. On the other hand, external factors include the reader's environment, cultural habits, and methods used for reading. Ando & Naparota (2025) emphasize the critical role of metacognitive strategies such as planning, monitoring, and evaluating in enhancing students' reading comprehension.

Considering rapid technological advancements in the current era, education must equip students with competencies relevant to the 21st century. As informational demands increase, students must effectively master reading skills to access vital information. Cancelliere et al. (2023) highlight the importance of integrating 21st-century competencies, critical thinking, communication, collaboration, and creativity into foundational literacy lessons to improve student engagement and reading comprehension.

Effective reading instruction requires systematic procedures comprising pre-reading, during-reading, and post-reading activities (Moghaddam & Mahmoudi, 2016). Such structured activities ensure coherence and purposefulness in the reading process. According to current literature, activating students' prior knowledge, monitoring comprehension during reading,

and reflecting afterward are essential strategies for fostering deep reading comprehension. Similarly, Hattan et al., (2024) highlight that techniques such as visual prompts and open-ended questioning effectively activate prior knowledge and sustain engagement throughout the reading process. These practices encourage learners to integrate new content with what they already know, leading to richer understanding. Together, these findings support the implementation of structured reading models that guide students through the stages of pre-reading, reading, and post-reading to optimize comprehension outcomes.

1.1. Problem Statement

Ideally, reading instruction at the elementary school level should develop students' abilities to comprehend texts deeply and critically. This includes achieving core reading comprehension indicators such as identifying main ideas, locating specific details, interpreting vocabulary in context, making inferences, and evaluating text structure and communicative purpose. However, the current reality in Indonesian elementary schools falls short of this ideal.

UNESCO reports that reading interest among Indonesians is alarmingly low, with only 0.001% of the population considered avid readers, equivalent to just one in every 1,000 individuals. The 2019 ALIBACA Index further shows that out of 34 provinces, 26% have moderate literacy activity, 71% fall into the low category, and 3% are classified as very low, with none achieving high literacy. Although the PISA 2022 results reveal a five-rank improvement in Indonesia's reading literacy compared to 2018, Indonesia still ranked 70th out of 81 countries. It is important to note that while the PISA assessment focuses on evaluating students' abilities to use reading for life-related problem-solving, the present study uses different test instruments and indicators, tailored to curriculum-based comprehension of narrative texts. Therefore, PISA results are only referenced to illustrate broader national literacy challenges and not as a direct benchmark for this research.

If this situation is left unaddressed, the consequences will include limited student ability to access and evaluate information, which in turn affects academic achievement and future career opportunities. Low reading skills contribute to poor comprehension, making it difficult for students to extract meaning, engage critically with texts, or solve problems using textual information.

The results of empirical studies conducted on grade IV students in one of the state elementary schools in Cimahi City show that students' reading skills are still low. Based on test evaluations of narrative texts, only 45% of students were declared complete and good at answering questions on understanding the content of reading, demonstrating the ability to correctly identify main ideas and key details. In comparison, 55% were unable to do so, reflecting limited comprehension in key aspects such as making inferences or drawing conclusions from the text.

Observation results also revealed that many teachers struggle to implement engaging strategies and media suitable for reading instruction. Lessons are often conducted without systematic planning, resulting in missed opportunities to activate students' cognitive abilities through structured pre-reading, reading, and post-reading stages. Additionally, students have difficulty formulating and answering questions based on key interrogatives (5W+1H: Who, What, Where, When, Why, and How), and they lack exposure to outcome-based projects that encourage the application of literacy skills in meaningful, real-world contexts.

To enhance students' reading comprehension skills, a meaningful learning approach is essential. This approach encourages active engagement, critical thinking, and knowledge transfer, all of which are vital to developing deep comprehension (Agra et al., 2019). These skills are reflected in key learning indicators such as identifying main ideas, locating specific information, interpreting vocabulary in context, making inferences, and evaluating the structure and communicative purpose of texts.

1.2. Related Research

Previous research emphasizes the significant role of the ARIAS model and the Project-Based Learning (PjBL) approach in enhancing students' reading comprehension skills and overall engagement in the learning process. However, there is a lack of studies that specifically

integrate both models. Several relevant studies have investigated the individual impacts of these models on student learning outcomes.

Hadi & Anggrasari (2021) reported that the ARIAS learning model based on digital literacy effectively improved the critical thinking abilities of elementary school students. The study showed a significant difference in the average scores between the experimental and control groups, suggesting the model's positive impact on students' cognitive skills. Similarly, Hardani et al. (2023) found that the ARIAS model, when assisted by documentary film media, significantly improved the expository text writing skills of Grade X students in Bandung, Indonesia. Their study demonstrated that the implementation of the ARIAS model led to higher average scores in post-tests compared to pre-tests, indicating its effectiveness in enhancing students' writing abilities. Additional evidence of the ARIAS model's effectiveness is provided by Nudianty et al., (2021), who reported a significant improvement in students' verbal communication skills after its implementation in social studies learning. Their findings demonstrate that the integration of vlog media with the ARIAS model effectively enhanced students' communication performance (Nudianty et al., 2021).

Research on the PjBL approach has similarly demonstrated its potential to improve reading comprehension. Regarding the PjBL approach An (2023) conducted a study on eighth-grade students in Vietnam and found that implementing PjBL in teaching English reading skills significantly improved students' engagement and learning outcomes. The study reported enhancements in students' vocabulary acquisition, analytical skills, and overall positive attitudes towards reading. Furthermore, Cañete, (2019) investigated the effectiveness of the PjBL strategy in improving the reading comprehension of Grade 7 students in the Philippines. The quasi-experimental study revealed that students taught using the PjBL strategy showed significant improvements in identifying main ideas, supporting details, and making inferences compared to those taught using traditional methods.

These findings collectively emphasize the potential of both the ARIAS and PjBL models in enhancing students' learning outcomes, with each model demonstrating unique strengths in different contexts. However, existing literature predominantly explores these models independently. The current study addresses this research gap by integrating both ARIAS and PjBL models, aiming to maximize their combined strengths to effectively enhance reading comprehension among primary school students, thus contributing novel insights into their synergistic educational potential.

1.3. Research Objectives

Departing from the description above, the ARIAS learning model integrated with Project-Based Learning (PjBL) is believed to have the potential to enhance reading comprehension skills in elementary school students. This study seeks to examine how effectively the ARIAS model, combined with PjBL, can improve students' reading comprehension abilities.

To evaluate the effectiveness of the learning intervention, this research employed reading comprehension test instruments specifically developed to align with the targeted learning indicators. The tests consisted of 10 essay-based questions derived from narrative texts appropriate for fourth-grade students. Each question was designed to assess key aspects of reading comprehension, including: identifying the main idea, locating specific details, interpreting meaning in context, making inferences, and evaluating the structure and purpose of the text.

The effectiveness of the instrument was ensured through expert validation, confirming its relevance, clarity, and alignment with curriculum standards. A scoring rubric was applied using a scale from 1 (lowest) to 3 (highest), which measured students' ability to comprehend and analyze texts using the 5W+1H framework. These test instruments were used both in pretest and posttest stages to provide reliable and measurable data on students' reading comprehension improvements.

2. Theoretical Framework

2.1. Arias Models

The Attention, Relevance, Confidence, and Satisfaction (ARCS) model was created by Keller and Kopp and is a foundational framework in instructional design aimed at enhancing learner motivation. Grounded in motivational learning theory, the ARIAS model is designed to foster greater student engagement and achievement by ensuring that learning experiences are perceived as meaningful, interesting, and attainable. In the context of social studies, Nudianty et al. (2021) found that students showed increased motivation and participation when the ARIAS framework was applied.

Building upon the ARCS model, the ARIAS model (Assurance, Relevance, Interest, Assessment, Satisfaction) integrates additional components to further enhance student engagement and learning outcomes. The 'Assurance' component focuses on building learners' self-confidence, while 'Interest' pertains to stimulating learners' curiosity and engagement with the material. 'Assessment' involves providing timely and constructive feedback, and 'Satisfaction' ensures that learners feel a sense of accomplishment upon completing learning tasks. This model has been effectively applied in various educational settings to improve students' motivation and comprehension skills (Hardani et al., 2023).

In the context of contemporary education, fostering student motivation and achieving meaningful learning outcomes requires the integration of pedagogical strategies that address both cognitive and affective dimensions. One such strategy is the ARIAS model—an adaptation of Keller's ARCS motivational framework, which emphasizes five core components: Assurance, Relevance, Interest, Assessment, and Satisfaction. These elements collectively foster a learning environment that supports student engagement, persistence, and academic achievement (Gibson & Ifenthaler, 2024).

The Assurance component aims to build students' confidence by reinforcing their belief in their capabilities, thereby enhancing self-efficacy and resilience. Relevance ensures that instructional content is meaningfully connected to learners' prior knowledge, personal interests, and future aspirations, which increases intrinsic motivation. Interest is maintained through curiosity-driven tasks and stimulating learning contexts that engage students cognitively and emotionally (Song & Kao, 2023). The Assessment component provides timely and constructive feedback, encouraging reflection and self-regulation, while Satisfaction reinforces positive learning experiences through recognition, achievement, and opportunities for real-world application.

When intentionally implemented, these components help create a supportive and collaborative learning environment that nurtures both academic and emotional growth. Thus, the ARIAS model is not only a motivational tool but also a comprehensive instructional approach aligned with the demands of 21st-century learning. The ARIAS model is a cooperative learning approach that pairs well with the learning-based model. Both models are effective in enhancing students' interest and motivation, thereby helping them achieve their learning objectives, including improvements in reading comprehension skills. By integrating these models, educators can cultivate an interactive and stimulating learning environment that promotes a deeper understanding and encourages active student participation.

2.2. Project-Based Learning (PjBL) Approach

The Project-Based Learning (PjBL) model is a learner-centered educational approach that emphasizes active exploration and knowledge construction through real-world projects. Rather than relying solely on traditional instruction, PjBL enables students to acquire knowledge and skills by engaging in meaningful, hands-on experiences over an extended period. This approach has been shown to enhance both cognitive and affective learning outcomes significantly. As highlighted by Lavado-Anguera et al. (2024), PjBL fosters holistic development by integrating problem-solving, collaboration, and communication skills into the learning

process through experiential pedagogy. Similarly, (Despoina & Aikaterini, 2015) emphasize that PjBL is structured around authentic, complex questions and tasks, encouraging deeper engagement and understanding. Furthermore, Kline et al. (2021) note that experiential, hands-on learning environments within the PjBL framework help students develop both technical competencies and soft skills essential for 21st-century challenges. Additionally, the model empowers students to deepen their conceptual understanding while applying knowledge to address real-world issues in contextually relevant ways. When incorporated into the Merdeka Curriculum, PjBL creates an enriching and comprehensive learning experience. It not only enhances students' grasp of the subject matter but also cultivates essential 21st-century competencies, such as problem-solving, collaboration, and effective communication. Martinez (2022) highlights the benefits of integrating Project-Based Learning (PjBL) in teacher preparation programs, noting that it can significantly boost teachers' self-efficacy, an important attribute for addressing the diverse learning needs of modern students..

Project-Based Learning (PjBL) is an educational approach that fosters the development of a wide range of essential skills and attributes in students. Through immersive, hands-on projects, PjBL promotes creativity, innovation, and autonomy in the learning process. This approach contributes to growth in several critical areas: (a) knowledge acquisition, (b) collaborative teamwork, (c) problem-solving abilities, (d) motivation for learning, and (e) self-regulated learning skills (Yazici, 2020; Jeremy St. John et al., 2023). PjBL is particularly well-suited to the independent learning tendencies of Generation Z, as it emphasizes self-directed learning. In typical PjBL projects, students are given a specific task with well-defined goals, followed by team selection, and culminating in a final presentation or report (Jeremy St. John et al., 2023). Building on this foundation, (Miller & Krajcik, 2019) argue that PjBL engages learners in extended inquiries centered on meaningful, complex problems that reflect real-world challenges. Students are encouraged to investigate, make decisions, and generate tangible products that demonstrate deep understanding.

The implementation of PjBL involves several key steps (Sudjimat et al., 2021):

1. **Start with the Essential Question**: Learning begins with a meaningful question that encourages students to investigate real-world issues. This question should spark curiosity and set the foundation for student inquiry.
2. **Design a Plan for the Project**: Teachers and students collaboratively create a detailed plan outlining project objectives, learning activities, and expected outcomes, fostering a sense of ownership among learners.
3. **Create a Schedule**: A timeline is established to organize the project's milestones, enabling students to manage time effectively and develop responsibility.
4. **Monitor Students and Progress**: Teachers supervise student activities, providing support and feedback to ensure alignment with learning goals and encourage student autonomy.
5. **Assess the Outcome**: Evaluation is conducted through student presentations or reports, assessing both the product and the process to determine whether learning objectives are achieved.
6. **Evaluate the Experience**: Reflection is encouraged at the project's end, where students and teachers assess the learning experience, identify successes and areas for improvement, and develop new insights for future learning.

Research indicates that PjBL can significantly enhance students' engagement and comprehension, particularly in reading and literacy development (Cañete, 2019; An, 2023)

2.3. Integration of ARIAS and PjBL for Enhancing Reading Comprehension

Integrating the ARIAS model with Project-Based Learning (PjBL) creates an interactive and effective learning environment that enhances student engagement and understanding. The ARIAS model, which stands for Assurance, Relevance, Interest, Evaluation, and Satisfaction, complements the PjBL framework by providing structured steps to foster a rich learning experience. Here is how the integration can be structured:

1. Assurance:
    a. To boost students' enthusiasm and confidence, the teacher begins the lesson by inviting students to sing and listen to engaging videos. This warm-up activity helps create a positive atmosphere.
    b. The teacher poses lighter, introductory questions related to the material to be learned, ensuring that students feel comfortable and ready to participate.
2. Relevance:
    a. The teacher connects the essential question to the learning objectives, emphasizing the importance of the material to be discussed, specifically focusing on key comprehension concepts typically framed through 5W+1H (Who, What, Where, When, Why, and How), which encourage students to extract detailed information from texts and develop deeper understanding.
    b. This connection helps students understand the significance of the lesson and how it applies to real-world contexts.
3. Interest:
    a. To capture and maintain students' attention, the teacher shows videos related to the material and encourages students to ask questions about the content.
    b. Students are engaged through interactive slides that present information about 5W+1H (Who, What, Where, When, Why, and How), and the teacher outlines the upcoming activity: creating a folklore explosion box project. This piques students' curiosity and excitement about the project.
    c. Group Formation: Students are divided into groups of 4 or 5 to promote collaboration.
    d. Reading Folktales: Each group reads a different folktale, allowing for diverse perspectives and ideas.
    e. Project Overview: The teacher provides a comprehensive explanation of the Explosion Box Folktale project, detailing expectations and outcomes.
    f. Project Instructions: Each group receives a Learning Activity Sheet that outlines the steps for creating a Folklore Explosion Box, aligned with the PjBL steps:
        1) Asking Questions: Groups discuss what elements should be included in the explosion box.
        2) Designing a Project Plan: Students collaboratively create a plan for their project.
        3) Compiling a Schedule: Groups develop a timeline for project completion.
        4) Creating the Explosion Box: Students construct the box, incorporating questions based on the 5W+1H framework (Who, What, Where, When, Why, and How).
        5) Decorating the Box: Learners enhance their projects with creative decorations.
        6) Teacher Monitoring: The teacher monitors group dynamics, guides student activities, and assesses participation and attitudes during the project.
4. Evaluation:
        1) Presentations: The evaluation activity continues with the final step of Project-Based Learning (PjBL), where each group presents their explosion box to the class, showcasing their work and demonstrating their understanding.
        2) Discussion and Feedback: The teacher facilitates a discussion about challenges faced during the project, reinforcing learning and correcting any misconceptions.
    b. Formative Assessment: Students complete formative assessments to reflect on their learning and progress.

5. Satisfaction (Reinforcement):
    a. Summarization: The teacher and students collaboratively summarize the learning activities, reinforcing key concepts and skills acquired during the project.
    b. Reflection: Both students and teachers take time to think about the entire learning experience, sharing what worked well and identifying areas for improvement in future projects. This process of reflection reinforces learning and fosters a mindset focused on growth and improvement.

Integrating the ARIAS model with project-based learning allows teachers to cultivate an engaging and supportive classroom environment that fosters collaboration, active participation, and critical thinking among students. This approach enhances learning outcomes while also helping students develop essential skills for solving real-world problems through teamwork and creative thinking.

Integrating meaningful learning and project-based approaches can significantly enhance students' reading comprehension by fostering deep engagement, critical thinking, and sustained motivation. Meaningful learning encourages learners to connect new knowledge with existing cognitive structures, thereby supporting the development of higher-order comprehension skills such as identifying main ideas, interpreting context, and making inferences (Mubarok et al., 2022). Project-Based Learning (PjBL), when implemented effectively, provides authentic contexts that motivate students to explore, collaborate, and construct meaning through hands-on reading tasks. An (2023) a study demonstrates that PjBL improves students' reading comprehension by increasing their involvement in real-world problem-solving and encouraging active use of textual information. Moreover, the integration of meaningful, mindful, and enjoyable learning experiences, as discussed by (Li et al., 2020), promotes a more supportive and enriching classroom environment that nurtures both academic performance and emotional engagement. Collectively, these approaches offer a powerful instructional framework that not only improves reading outcomes but also fosters lifelong literacy habits.

3. Method

3.1. Research Design

This research employs a quantitative approach with a pre-experimental design, specifically utilizing a one-group pretest–posttest model. The one-group pretest–posttest design is commonly used in educational research to evaluate the impact of an intervention within the same group. According to Knapp (2016), this design offers a practical and efficient approach when randomization or the inclusion of a control group is not feasible, enabling researchers to observe measurable changes resulting from the intervention. Such a design is particularly suitable for classroom research settings, where ethical or logistical constraints may limit experimental options.

The learning outcomes assessed in this study are based on core competencies for reading comprehension. These include students' abilities to: (1) identify the main idea of a text, (2) locate specific information, (3) interpret meaning from context, (4) draw inferences, and (5) evaluate the structure and communicative purpose of texts. These indicators align with national curriculum standards and are consistent with international reading comprehension benchmarks (Rice et al., 2023; Guerreiro et al., 2022).

The one-group pretest–posttest design is a frequently used quasi-experimental method, involving three main steps: administering a pretest to assess the dependent variable, implementing the experimental treatment as the independent variable, and then conducting a posttest to reassess the dependent variable. The effect of the experimental treatment is determined by comparing the pretest and posttest results, which helps researchers evaluate whether the intervention or the produced product is effective in real-world settings (Knapp,

2016; Alessandri et al., 2017). This design allows for measuring changes attributable to the intervention within the same group of participants (Kimport & Hartzell, 2015). Although widely used for its simplicity, researchers should be aware of its limitations, such as potential threats to internal validity (Knapp, 2016). A visual representation of this research design is shown in Figure 1 below:

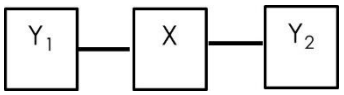

Figure 1. One Group Pretest-Posttest Design

Y_1 = Pretest score before treatment

X = Treatment of the ARIAS model based on PjBL

Y_2 = posttest score after treatment

(Knapp, 2016)

3.2. Participant

This research was conducted during the even semester of the 2023/2024 academic year at SDN Padasuka Mandiri 3 in Cimahi City. The research focused on fourth-grade students, with a sample size of 30 participants. A test instrument was used for data collection, specifically designed to assess reading comprehension. The assessment of reading comprehension activities contains aspects to be assessed based on the stages of reading comprehension activities, with the ARIAS learning model based on Project-Based Learning. The aspects assessed include answering questions and creating questions using the 5W+1H framework (Who, What, Where, When, Why, and How). A scoring rubric was applied to evaluate these aspects, with scores ranging from 1 (the lowest) to 3 (the highest).

3.3. Data Collection

In this research, data collection was carried out using pretests and posttests to evaluate students' reading comprehension skills. These assessments measured their abilities both prior to and after learning through the ARIAS model integrated with Project-Based Learning.

The pretest and posttest each consisted of 10 essay-based questions constructed around narrative texts. The test items were designed to assess specific indicators of reading comprehension, including: (1) identifying the main idea of a text, (2) locating specific details, (3) interpreting vocabulary based on context, (4) drawing inferences from the text, and (5) evaluating the text structure and communicative purpose. The narrative texts used in the tests were selected from materials appropriate for the fourth-grade level, aligned with the national curriculum.

In addition to answering questions, students were also asked to formulate questions using the 5W+1H framework (Who, What, Where, When, Why, and How) as part of their comprehension task. These responses were evaluated using a scoring rubric with a scale ranging from 1 (lowest) to 3 (highest), reflecting their understanding and ability to apply comprehension strategies. The test instruments and rubric were reviewed by experts to ensure their clarity, relevance, and alignment with the learning objectives.

3.4. Data Analysis

The data analysis methods were carefully aligned with the research objectives and hypotheses, incorporating both descriptive and inferential statistical analyses using the t-test. Descriptive analysis was conducted to provide an overall picture of the students' reading comprehension abilities.

The data analysis was conducted using Statistical Product and Service Solutions (SPSS) version 29. Prior to hypothesis testing, prerequisite analyses were carried out on the students' final test scores, which included the normality test and the homogeneity test. The normality test was performed to assess whether the data from both sample groups followed a normal distribution.

On the other hand, the homogeneity test was used to determine whether the two sample groups had comparable variances.

Following these tests, the analysis continued with a mean difference test to evaluate whether there was a significant difference in students' reading comprehension skills before and after the implementation of the ARIAS model based on Project-Based Learning. The paired sample t-test was applied to compare the pretest and posttest mean differences, with a significance level set at $\alpha = 0.05$ (5%).

The research hypothesis is:

H_0: $\mu_1 \neq \mu_2$, there is no significant increase of the ARIAS model based on Project-Based Learning on students' reading comprehension skills.

H_1: $\mu_1 = \mu_2$, there is a significant improvement from learning the ARIAS model based on Project-Based Learning on students' reading comprehension skills.

The test criteria are as follows:

1. If sig. < $\alpha = 0.05$, then H_1 is accepted and H_0 is rejected.
2. If sig. > $\alpha = 0.05$, then H_1 is rejected and H_0 is accepted.

3.5. Validity and Reliability

Before performing hypothesis testing, it is necessary to conduct prerequisite analyses, including tests for normality and homogeneity. The Shapiro-Wilk test was employed to assess the normality of the pretest and posttest data. The outcomes of this normality test are summarized in Table 1.

Table 1. Pretest and Posttest Data Normality Test Results

Results	Sig.	α = 5%	Status
Pretest	0,114	0,05	Normal
Posttest	0,055	0,05	Normal

Based on the results presented in Table 1, the normality test indicates that the significance value for the pretest was 0.114 (sig. = 0.114 > α = 0.05), while the posttest had a significance value of 0.055 (sig. = 0.055 > α = 0.05). These findings suggest that both the pretest and posttest data follow a normal distribution.

Table 2. Homogeneity Test Results of Pretest and Posttest Data

Results	Sig.	df1	df2	Status
Pretest- Posttest	0.627	1	58	Homogeneous

Based on Table 2, it can be seen that the homogeneity test resulted in a sig.= 0.627 value greater than α = 0.05 or 5%. The implication is that the variances of the pretest and posttest scores are the same (homogeneous).

4. Findings

This study provides a descriptive analysis of the data and presents the results of the Mean Difference Test, which compares students' reading comprehension skills before and after receiving instruction using the ARIAS model integrated with Project-Based Learning. The integration of the ARIAS model with the Project-Based Learning (PjBL) approach was implemented through a structured classroom procedure as follows:

1. **Assurance**: At the beginning of the lesson, the teacher built students' confidence by explaining the learning objectives clearly and assuring them of their ability to succeed. Motivational strategies such as encouragement and affirmation were used to foster a positive mindset.

2. **Relevance**: The teacher connected the lesson content to real-life contexts and students' experiences. The project, which involved creating a folklore-themed explosion box, was designed to reflect cultural stories familiar to the students, making the learning experience more meaningful.
3. **Interest**: To capture students' attention, interactive slides and storytelling techniques were used. Students explored folklore content using digital media and participated in discussions, which stimulated their curiosity.
4. **Assessment**: Students were guided to construct an explosion box project containing responses and questions framed through the 5W+1H (Who, What, Where, When, Why, and How) framework. This allowed them to apply their reading comprehension skills creatively. Formative assessments were conducted through observations, peer feedback, and teacher evaluations using a rubric.
5. **Satisfaction**: At the end of the project, students presented their explosion boxes and received constructive feedback and recognition for their efforts. This reinforced their sense of accomplishment and motivation to engage in future learning activities.

These procedures ensured that the integration of the ARIAS model with PjBL created an engaging, student-centered learning environment that significantly contributed to the improvement of reading comprehension skills.

4.1. Descriptive Analysis

A descriptive analysis was performed to summarize the collected data. The data for this study consisted of reading comprehension test scores, which were gathered from pretest activities before the treatment and posttest activities after the treatment using the ARIAS model based on Project-Based Learning.

To examine the data from the pretest and posttest, the researchers employed several statistical methods, including the computation of the mean, median, standard deviation, variance, and the identification of both the minimum and maximum scores. The table below presents a summary of students' reading comprehension performance prior to and following the learning intervention, as reflected in the pretest and posttest results.

Table 3. Pretest and Posttest Scores of Reading Comprehension

Statistics	Statistical Value	
	Pretest	Posttest
Sample Size	30	30
Maximum Score	83	94
Minimum Score	33	55
Mean Score	62,70	77,10
Standard Deviation	13,919	12,458
Variance	193,919	155,197

Based on the output in table 3 above, important information is obtained, namely the mean acquisition of students' reading comprehension skills after (posttest) getting learning with the ARIAS model based on PjBL is 77,10 higher than the mean acquisition of students' reading comprehension skills before (pretest) getting learning ARIAS model based on PjBL which is 62,70.

Based on the evidence presented above, it can be said that there is a difference between the outcomes of students' reading comprehension skill acquisition before and after using the

ARIAS model based on PjBL. The following Figure 2 compares the mean scores from the pre-test and posttest.

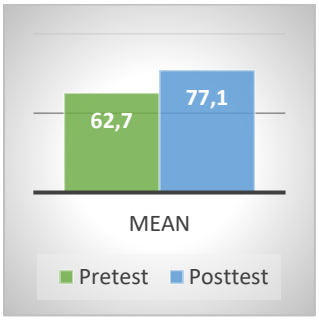

Figure 2. Column Chart of Pretest and Posttest Scores of Reading Comprehension Skills

4.2. Mean Difference Test Results

Following the completion of the precondition analytical test, which requires data that is homogeneous and normally distributed, the researcher uses the paired sample t-test to perform the mean difference test.

Table 4. Results of Paired Sample T Test of Reading Comprehension Skills

Results	N	Mean	T	Sig.	Status
Pretest-Posttest	30	-14,400	-14,133	<,001	Homogeneous

The findings of the paired sample t-test indicate a significant value of less than 0.001, which is below the 0.05 (5%) a level. This shows that performance has significantly improved from the pre-test to the posttest, with better marks on the latter. Thus, it can be said that teaching with the ARIAS model, which is founded on project-based learning, has a favorable effect on and greatly improves students' reading comprehension skills.

5. Discussion

The analysis of pretest and posttest data indicates a notable improvement in students' reading comprehension skills following the implementation of the ARIAS model within a project-based learning framework. This improvement is reflected in the increase in mean scores, with the pretest average at 62.70 and the posttest average rising to 77.10. These findings suggest that the intervention effectively improves students' reading comprehension abilities. Specifically, students demonstrated improvement in key indicators of reading comprehension, including the ability to identify main ideas, understand specific information, interpret meaning in context, make inferences, and evaluate text structure and purpose. These indicators align with standard learning outcomes for reading comprehension as outlined by international frameworks. These indicators align with national curriculum standards and are consistent with international reading comprehension benchmarks (Rice et al., 2023; Guerreiro et al., 2022).

To assess the validity of the statistical results, homogeneity and normality tests were conducted, confirming that the data were drawn from a homogeneous and normally distributed population. As a result, a paired sample t-test was deemed appropriate for further analysis. The t-test yielded a t-value of -14.133, well below the standard $\alpha = 0.05$ threshold, with a significance level of less than 0.001. These outcomes indicate that the application of the ARIAS model in project-based learning significantly improved students' reading comprehension skills, leading to the rejection of the null hypothesis (H_0) and the acceptance of the alternative hypothesis (H_1).

The findings from the t-test offer compelling support for the effectiveness of integrating the ARIAS model with Project-Based Learning in enhancing students' mastery of reading comprehension skills. This model's approach emphasizes active student engagement, critical thinking, and collaboration, which likely contributed to the positive learning outcomes. Additionally, the structured and systematic design of the ARIAS model, combined with the hands-on, exploratory nature of Project-Based Learning, may have created an engaging and supportive learning environment that facilitated meaningful improvements in students' comprehension abilities.

These findings support previous research demonstrating the effectiveness of creative learning strategies in meeting the requirements of diverse students and improving academic achievement (Yazici, 2020; An, 2023; Hadi & Anggrasari, 2021). This study emphasizes the potential of the ARIAS model as an effective instructional approach for enhancing students' reading comprehension. Nevertheless, additional research is needed to examine the long-term effects of this model in various contexts and to fine-tune its application for even more significant outcomes.

6. Conclusion

The study conducted at SD Negeri Padasuka Mandiri 3 in Cimahi City aimed to investigate the impact of integrating the ARIAS model with Project-Based Learning (PjBL) on improving students' reading comprehension abilities. The findings revealed that the ARIAS model, when integrated with PjBL, significantly improved students' reading comprehension abilities. Statistical analysis indicated notable improvements in students' performance, with a clear difference between pretest and posttest scores. The mean score on the posttest was 10 points higher than the mean score on the pretest, which was 62.70. With a significance level of less than 0.001, the paired sample t-test produced a t-value of -14.133, significantly below the conventional $\alpha = 0.05$. This demonstrates that the ARIAS model significantly improves students' comprehension of narrative texts when used in conjunction with PjBL. The learning outcomes achieved in this study include several key indicators of reading comprehension: (1) identifying the main idea of narrative texts; (2) locating and understanding specific details; (3) interpreting the meaning of words or phrases based on context; (4) drawing logical inferences from the text; and (5) evaluating the structure and purpose of the text. These outcomes reflect competencies outlined in both national curriculum standards and international benchmarks such as PISA. These results highlight the effectiveness of the ARIAS model, based on PjBL, in improving these specific learning indicators and overall reading comprehension performance in the classroom.

Limitation

There are some limitations to the current research that need to be addressed in subsequent investigations. First, it lacks the integration of appropriate interactive technology, which could significantly enhance student engagement and better align with the needs of the digital era. Another limitation lies in the absence of long-term evaluations, as the study does not thoroughly explore the sustainability and long-term impact of implementing the ARIAS model based on Project-Based Learning in diverse educational settings.

Recommendations

Based on the above findings, several recommendations can be made. The ARIAS model, based on Project-Based Learning, is recommended for teaching reading comprehension in elementary schools because it is proven to be effective. Teachers can combine various learning methods to meet students' diverse learning needs. Future research can integrate appropriate interactive technology to make it more interesting and in accordance with the needs of the current digital era, and needs to develop more detailed measurement tools and stronger control variables to ensure accurate results. Implementation of the learning model

should be done with the best quality to maximize its effectiveness. Similar research with the ARIAS model based on project-based learning in various educational contexts and long-term evaluation of the effects of this learning model needs to be conducted to understand its sustainability and long-term impact on student learning.

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Conflict of Interest

The Author(s) declare(s) that there is no conflict of interest.

Declaration of Generative AI-assisted Technologies

This manuscript was prepared with the assistance of Generative AI ChatGPT, Grammarly, and Translator. The AI was used to assist translation, paraphrasing, and language refinement. All intellectual contributions, critical analyses, and final revisions were conducted by the authors. The authors take full responsibility for the accuracy, originality, and integrity of the content presented in this work.

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