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Application of AIR Learning Model to Improve Learning Outcomes of DPIB Students

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ABSTRACT

Learning outcomes of basic techniques in the work of modeling design and building information of class X DPIB Vocational School 1 Lubuk Pakam are still relatively low. This is because the learning model used is centered on the teacher who is the only source of learning in the classroom so that students are not active in learning, and do not pay attention to the teacher when explaining the learning material. This study aims to apply the AIR learning model to improve student learning outcomes. This study is included in Classroom Action Research with two cycles. Each cycle consists of 4 stages, namely planning, implementation, observation, and reflection. The data for this study were obtained from the learning outcomes test of 34 class X DPIB students. The test instrument tests carried out were test validity, test difficulty index, question discrimination and test reliability. The results of this study indicate that there is a significant increase in learning outcomes from cycle I to cycle II. In cycle I, the average score of students was 76.19 with a completion rate of 61.76%. While in cycle II, the average score of students increased to 82.11% with a completion rate reaching 88.24%, so the increase in learning outcomes was 7.77% and the classical completion of the class was 88.23%. This shows that the AIR learning model is successful in improving the learning outcomes of basic techniques in the work of modeling design and building information of class X Vocational School 1 Lubuk Pakam.

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1. INTRODUCTION

Education serves as a conscious and systematic effort to preserve, cultivate, and transmit cultural values from one generation to the next. This role is realized through the creation of a learning environment and learning process that enable students to actively develop their religious and spiritual character, intellectual capacity, self-control, noble morals, and the practical skills required both by society and by themselves (Harahap & Wijaya, 2024). Such a mission implies that the success of students in learning does not occur automatically, but is strongly determined by how effective the learning process is in facilitating these developmental goals (Suleman & Idayanti, 2024).

In the context of vocational education, mastery of basic work techniques becomes one of the fundamental competencies students must acquire. Their ability to master these competencies is largely influenced by the quality of the learning process they experience. When the instructional process for basic work techniques is well designed clear in objectives, appropriate in method, and supported by relevant learning resourcesstudents are more likely to achieve optimal learning outcomes (Asim, 2021).

The effectiveness of the learning process can be evaluated through systematic assessment aligned with the intended learning objectives. Levels of student achievement, including their degree of mastery and the percentage of learners who reach the expected standards, become important indicators of instructional success (Suyawati, 2022). Ideally, these indicators reflect consistent improvement as students engage in meaningful and purposeful learning activities.

However, empirical conditions in the field often reveal a different reality. Observations show that the expected level of mastery is not always achieved, and learning practices frequently fall short of supporting students' optimal development. This discrepancy becomes particularly evident when examining the learning conditions at Vocational School 1 Lubuk Pakam, where several challenges in the implementation of basic work techniques learning are still found.

Vocational School 1 Lubuk Pakam is one of the schools that prepares graduates who can compete in the world of work by having knowledge, technology, skills, discipline, ready for a strong work ethic and skilled in their respective fields. One of the key areas of expertise offered at Vocational School 1 Lubuk Pakam is the Department of Building Modeling and Information Design (DPIB). This department focuses on developing students' competencies in building design, construction principles, and digital modeling, enabling them to acquire both theoretical understanding and practical skills relevant to the construction and design industry. As a major that requires strong foundational mastery of technical concepts, the quality of learning in DPIB plays a crucial role in shaping students' readiness to meet industry demands. Based on observations conducted during the Introduction to the School Environment program and interviews held on November 20, 2024, information was obtained from subject teachers indicating that the learning outcomes of the basic techniques of work in DPIB grade X students were relatively low.

This is supported by the learning outcome data for the basic techniques in Design Modeling and Building Information (DPIB) work for Grade X DPIB-B at Vocational School 1 Lubuk Pakam for the 2023/2024 academic year, as presented in **Table 1.**

Table 1. Learning Outcomes of Basic Techniques in Work of DPIB-B in Vocational School 1 Lubuk Pakam

School Year	Value	Category	Number of Students	Percentage (%)	Information
2023/2024	91-100	A	-	-	Very Competent
	81-90	B	2	6%	Competent
	75-80	C	4	12%	Competent Enough
	< 75	D	28	82%	Not Competent
	Amount		34	100%	

Based on **Table 1,** none of the students fall into the very competent category. Only 2 students (6%) are categorized as competent, 4 students (12%) as fairly competent, and the remaining 28 students (82%) are classified as incompetent. These findings clearly illustrate that the overall level of student achievement is relatively low. Such a distribution of competency levels suggests that the majority of students have not yet mastered the essential skills expected in basic engineering learning, particularly in the subject of modeling design and building information.

A deeper examination of the learning process reveals that the instructional approach implemented by the teacher remains predominantly teacher-centered. In this model, the teacher serves as the primary and often the sole source of information, while students assume a passive role. They tend to listen without actively engaging in discussions, exploring ideas, or responding to the teacher's explanations. As a result, the classroom environment becomes non-interactive and less conducive to the development of higher-order thinking skills or hands-on competencies, which are essential in vocational education (Humeirah et al., 2023).

Moreover, the physical arrangement of the classroom appears to exacerbate these challenges. Students are seated in pairs, a setup that makes it difficult for the teacher to effectively monitor those sitting at the back. Limited visibility and restricted mobility reduce the teacher's ability to provide immediate feedback or maintain consistent supervision. This situation often results in an increase in off-task behaviors, such as chatting, disengagement, or inattentiveness behaviors that negatively affect learning outcomes (Van den Berg & Stoltz, 2018; Gao, 2022).

The collaboration among Grade X DPIB-B students was found to be weak, particularly between high- and low-performing students. Low-achieving students felt embarrassed to ask for help, while higher-achieving students were reluctant to assist their peers. Teacher interviews on November 21, 2024 revealed that learning materials were sent a day before via WhatsApp Group to help students prepare, yet this strategy did not improve outcomes.

Student interviews also showed that most did not read the materials because they were uninterested, and many could not hear the teacher's explanations clearly from the back of the classroom. Consequently, the teacher's direct instruction approach remained ineffective, making it difficult for students to understand basic engineering content and contributing to their low learning outcomes (Mason & Otero, 2021).

Considering these problems, an appropriate effort to improve learning outcomes in Grade X DPIB-B is the use of a learning model that actively engages students and promotes effective interaction between teachers and learners as well as among students themselves. A learning model serves as a framework that guides teachers in planning and organizing instruction to enhance student achievement (Wahyuni et al., 2024). One suitable approach is cooperative learning, which utilizes small groups where students collaborate and learn from one another. Various cooperative learning types exist such as STAD (Student Teams Achievement Division), NHT (Numbered Head Together), SFAE (Student Facilitator And Explaining), and AIR (Auditory, Intellectually, Repetition) learning models. Of the several cooperative learning models, the AIR learning model developed by Dave Meier is the right learning model because it encourages active student participation and allows students to express their ideas or opinions.

According to (Khadriah et al., 2025) the AIR learning model emphasizes three elements. The first one is auditory (hearing) which is used in learning to speak, listen, listen, present, express opinions, and respond. Intellectually (knowledge) which is the ability to think that is trained by reasoning, investigating, and understanding. Repetition which is repeating learning so that understanding is deeper and broader through working on questions and giving assignments or quizzes (Nuralam & Maulidayani 2020).

The characteristics of the AIR learning model are that it emphasizes the importance of listening to the material, then processing it by thinking and solving problems through group discussions, the results of which will be presented in front of the class and ending with repetition to strengthen students' memories (Palguna et al., 2020). To find out whether students have actually achieved learning outcomes, it is seen from student learning outcomes. Therefore, the purpose of this study is that the application of the AIR learning model can improve the learning outcomes of class X DPIB-B students at Vocational School 1 Lubuk Pakam.

2. METHOD

This research was conducted at Vocational School 1 Lubuk Pakam located on Jl. Galang, Tj. Garbus I, Kec. Lubuk Pakam. The research was conducted in the even semester of the 2024/2025 academic year in class X DPIB-B of Vocational School 1 Lubuk Pakam. The subjects of this study were students of class X DPIB-B in the even semester of the 2024/2025 academic year of Vocational School 1 Lubuk Pakam, totaling 34 students consisting of 17

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males and 17 females. This research is a Classroom Action Research (CAR) conducted by researchers and in collaboration with basic engineering teachers in DPIB work.

The techniques used to collect data in this study were observation, documentation, and learning outcomes tests in the form of initial tests (pre-test) and final tests (post-test) which were used to measure student learning outcomes in the subject of DPIB Basics on the basic engineering elements in DPIB work with the application of the AIR learning model.

3. RESULT AND DISCUSSION

3.1 Results of Instrument Validation and Analysis

The instrument trial conducted on Grade XII students of the Building Modeling and Information Design (DPIB) Program at Vocational School 1 Lubuk Pakam in the 2024/2025 academic year aimed to obtain test items that met empirical quality standards before being used in the study. The results showed an improvement across cycles: in Cycle I, 21 of 30 items were valid and increased to 24 valid items in Cycle II; the difficulty distribution also shifted from 4 difficult, 9 medium, and 17 easy items in Cycle I to 11 medium and 19 easy items in Cycle II, indicating better alignment with students' ability levels. The discriminating power similarly improved, with 1 very good and 13 good items in Cycle I increasing to 7 very good and 16 good items in Cycle II. Reliability analysis demonstrated strong consistency, as shown by the Cycle I coefficient of $r_{11} = 0.856$, which exceeded the rtable value of 0.374. Supporting assumption tests further confirmed that the data were normally distributed, the variances were homogeneous, and the t-test results indicated a significant improvement in learning outcomes, as tcount was greater than ttable at $\alpha = 0.05$. Overall, these findings suggest that the instrument quality and its ability to measure students' basic engineering learning outcomes improved substantially across cycles.

3.2 Student Learning Outcomes

Student learning outcomes for Cycle I were obtained from the post-test administered after the completion of teaching and learning activities. The results are presented in **Table 2.**

Table 2. Student Learning Outcomes Success Indicators Cycle I

School Year	Value	Category	Number of Students	Percentag e (%)	Information
2024/2025	91-100	A	5	15%	Very Competent
	81-90	B	11	32%	Competent
	75-80	C	5	15%	Competent Enough
	< 75	D	13	38%	Not Competent
Amount			34	100%	
Classical Completion (%)	62%				

School Year	Value	Category	Number of Students	Percentag e (%)	Information
Percentage of Incompleteness (%)			38%		

Based on **Table 2**, 5 students (15%) achieved the very competent category, 11 students (32%) were competent, 5 students (15%) were fairly competent, and 13 students (38%) were not competent. The classical mastery level reached only 62%, indicating that the class did not meet the minimum classical completeness requirement. Thus, learning in Cycle I was not yet considered successful. Student learning outcomes for Cycle II were obtained from the post-test administered after the instructional improvements were implemented. The results of student learning outcomes in cycle II can be seen in **Table 3.**

Table 3. Student Learning Outcomes Success Indicators Cycle II

School Year	Value	Category	Number of Students	Percentage (%)	Information
2024/2025	91-100	A	9	26%	Very Competent
	81-90	B	12	36%	Competent
	75-80	C	9	26%	Competent Enough
	< 75	D	4	12%	Not Competent
Amount			34	100%	
Classical Completion (%)			88%		
Percentage of Incompleteness (%)			12%		

As shown in **Table 3**, 9 students (26%) achieved the very competent category, 12 students (36%) were competent, 9 students (26%) were fairly competent, and only 4 students (12%) were not competent. The classical mastery level increased to 88%, exceeding the minimum completeness requirement.

Therefore, student learning outcomes in Cycle II were classified as successful, and the action research was concluded at this stage. A comparison of the increase in learning outcomes in cycle I and cycle II can be seen in **Table 4.**

Table 4. Comparison of Learning Outcomes of Cycle I and Cycle II

Student Learning Outcomes	Cycle I	Cycle II
Average Value	76%	82%
% Classical Completion	62%	88%

Based on the data presented in **Table 4**, the improvement in learning outcomes of Grade X DPIB-B students from Cycle I to Cycle II is illustrated in **Figure 1** below.

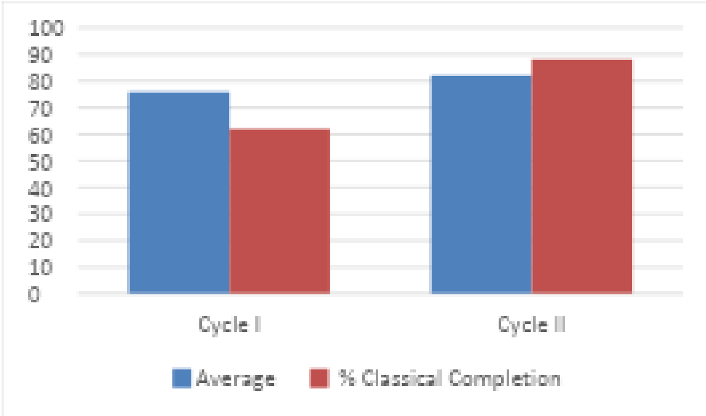

Figure 1. Graph of Improvement in Student Learning Outcomes in Cycle I and Cycle II

As illustrated in **Figure 1**, the learning outcomes of Grade X DPIB-B students show a clear and positive progression from Cycle I to Cycle II. The graph presents two key indicators: the average learning score and the percentage of students achieving classical completion. Both indicators demonstrate measurable improvement following the implementation of the AIR learning model. In Cycle I, the average score and classical completion rate remain at a moderate level, indicating that a portion of students had not yet fully met the expected competency standards. However, after the refinement of instructional strategies in Cycle II, both indicators increase noticeably. The average score rises, reflecting enhanced individual mastery of the material, while the classical completion rate also improves, signifying that a greater proportion of students successfully reached the minimum criteria for learning achievement.

This upward trend underscores the model's effectiveness in strengthening student comprehension, engagement, and consistency in achieving learning targets (Wong & Liem, 2022). The improvement between the two cycles suggests that the learning interventions applied in Cycle II such as more structured guidance, reinforced practice, or clearer scaffolding contributed significantly to optimizing the learning process. Overall, the graph provides empirical support for the conclusion that the AIR learning model positively influences student performance and facilitates higher levels of learning attainment.

The implementation of the AIR learning model has been shown to substantially enhance student learning outcomes. This reinforces the importance of selecting instructional models that align with learners' characteristics, as such alignment increases learning motivation and ultimately strengthens achievement (Meng, 2023). The Auditory component enables students to receive information through listening, discussion, and oral explanation, providing a solid initial comprehension of the material (Kusumardi, 2023). The Intellectual component then promotes higher-order thinking by engaging students in reasoning, inquiry, and collaborative problem-solving, allowing them not merely to receive information but to construct meaning actively (Niemienen et al., 2022).

Finally, the Repetition component reinforces long-term memory through repeated practice, exercises, and follow-up tasks, which has been widely recognized as an effective strategy for strengthening conceptual retention. The synergy of these three elements creates an active, structured, and continuous learning environment that enhances students' motivation, engagement, and conceptual understanding (Hellin, 2023). This comprehensive process is reflected in the significant improvement in students' scores from Cycle I to Cycle II.

The AIR model is particularly compatible with the basic engineering elements taught in the DPIB program, contributing to the improved performance of Class X DPIB-B students at Vocational School 1 Lubuk Pakam. Technological developments further support the effectiveness of learning models by enabling teachers to better understand their functions and integrate interactive tools such as quizzes, game-based activities, and equitable grouping methods. When teachers and students collaborate to create engaging and meaningful learning experiences, motivation increases and learning outcomes improve. This study demonstrates that the AIR model effectively leverages these conditions to produce significant gains in student achievement.

4. CONCLUSION

The findings of this study demonstrate that the AIR learning model (Auditory, Intellectual, Repetition) effectively enhances student learning outcomes, particularly for the basic engineering elements taught in the DPIB program. The consistent improvement from Cycle I to Cycle II indicates that instructional models aligned with learners' characteristics can significantly strengthen motivation and achievement. Moreover, the integration of technology supports teachers in optimizing the implementation of various learning strategies, fostering more engaging and meaningful classroom activities. Overall, the AIR model proves to be a relevant and impactful approach for improving the learning performance of Class X DPIB-B students at Vocational School 1 Lubuk Pakam. This research helps schools, especially teachers, increase information and knowledge about the learning process, which can foster interest and enthusiasm for learning, thereby improving learning outcomes. This research can be used by teachers of the DPIB Basics subject, particularly those focused on the Basic Techniques in DPIB.

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