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The Effect of Discovery Learning Model Assisted by LKPD on Biology Learning Competencies of Students

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Abstract: This study aims to determine the influence of the discovery learning model assisted by lkpd on students' biology learning competencies. This research is a quasi-experimental research, with a Randomized Control-Group Posttest Only Design, the population of this experiment is students of class X SMAN 1 Batang Anai Padang Pariaman in the 2003/2004 academic year, while the sample of this research is students of class X1 as the control class, and X8 as the experimental class which is given the Discovery Learning model treatment assisted by Student Worksheets (LKPD). Sampling was carried out using the Purposive Sampling technique. The instruments used in this study were knowledge test questions, attitude and skill observation sheets. with Data analysis of normal and homogeneous distribution tests, namely Kolmogorov Smirnov and Levenne, while for the hypothesis test of the knowledge domain using the unpaired t-test, while for the attitude and skill domains using the Mann Whitney test. The results of the study and observations showed that the biology learning competence of students in the experimental class in terms of knowledge domain was in the sufficient category, attitude domain and skills domain were in the sufficient category compared to the control class with a sig. <0.05. It can be concluded that there is a positive influence of Discovery Learning Assisted by LKPD on the Biology Learning Competence of Class X SMAN 1 Batang Anai Padang Pariaman.

Keywords: DiscoveryLearning; LKPD; Learning Competence

Introduction

Biology is one of the subjects considered important in the education curriculum, because it studies aspects of life and the interaction of organisms with their environment. However, challenges in learning Biology often arise because the material is complex and abstract. Difficulties in learning Biology often arise because of the complex and abstract nature of the material being taught (Molnár et al., 2023; Amoah et al., 2023). Biology requires a deep understanding of various basic concepts, biological processes, interactions of organisms with their environment, and the various mechanisms involved in life. The complexity of this biological material is often a challenge for students in internalizing the material and relating it to the real world. In addition, the abstract aspect of Biology material can also make it difficult for students to imagine or conceptualize the concepts being taught. Therefore, Biology learning often requires a creative and structured approach to help students overcome the complexity and abstraction of the material (AytekiN & Topçu, 2024). Biology learning competencies play a very important role in forming a deep understanding of aspects of life and the interactions of organisms with their environment. As a subject that covers a variety of concepts and natural phenomena, students' ability to understand and master Biology material not only impacts their academic achievement, but also forms the foundation for a broader understanding of the world around them. By understanding the basic principles of Biology, students can develop a deeper understanding of health, the environment, and sustainability.

In addition, Biology learning competencies also help students develop analytical, critical, and problem-solving skills that are important in everyday life and in careers in various fields, including medicine, environmental science, biotechnology, and conservation (Guerrero & Sjöström, 2024; Fitri et al., 2024). In addition,

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a strong understanding of Biology also provides the necessary foundation for understanding and addressing global challenges such as climate change, health crises, and biodiversity. Thus, Biology learning competencies are not only relevant in an academic context, but are also important for forming individuals who are environmentally aware and able to contribute to sustainable development and solving complex problems in modern society (Boermans et al., 2024). Low Biology learning competency among students is a serious problem in the educational context (Handayani et al., 2021; Darling-Hammond et al., 2020). A poor or in-depth understanding of Biology concepts can hinder students' ability to understand natural phenomena, life processes, and the interactions of organisms with their environment. This not only affects students' academic achievement in Biology but can also have broader implications for their understanding of health, the environment, and the role of humans in ecosystems.

Low Biology learning competency can also limit students' opportunities to pursue careers in scientific or Biology-related fields, and can hinder their ability to participate in global issues related to the environment and sustainability. Factors contributing to low Biology learning competency can vary, ranging from a lack of adequate learning resources and facilities to teaching methods that are less suitable or less interesting for students. Therefore, it is important to identify the causes of low Biology learning competency and take appropriate steps to improve it, such as the development of a more relevant curriculum, better teacher training, and the use of innovative and student-oriented learning methods (Jeronen et al., 2016; Almulla, 2020). By addressing the low Biology learning competency, we can ensure that students have a strong foundation in understanding and appreciating life and the environment around them (Ardoin et al., 2020). Low Biology learning competency among students can be caused by various complex factors. One of them is a lack of interest or motivation in the subject. Biology is often considered an abstract and difficult subject to understand by some students, so they tend to lose interest or feel frustrated in learning. In addition, a lack of understanding of basic concepts or foundations of Biology can also be a cause of low learning competency. Some students may have difficulty understanding concepts such as genetics, ecology, or evolution due to their complexity or lack of adequate explanation from the teacher.

Environmental factors can also affect students' Biology learning competency. Lack of adequate learning resources or facilities, such as incomplete laboratories or outdated textbooks, can limit students' learning experiences in understanding Biology concepts practically. In addition, teaching methods that are less effective or less suited to students' needs can also be factors causing low learning competency. Teaching approaches that are too dominated by lectures or theoretical explanations without providing opportunities for students to actively participate in the learning process can hinder their understanding. Therefore, it is important for educators to consider these factors and adopt learning strategies that are more inclusive and responsive to students' needs to improve their Biology learning competencies (Islamiyati et al., 2021). The Discovery Learning Model is a learning model that emphasizes the active role of students in building their own understanding through exploration and discovery. By emphasizing the active role of students in exploration and discovery, this model provides opportunities for students to build their own understanding through direct experience.

In the context of Biology learning, the Discovery Learning Model offers great potential to increase student engagement with complex and abstract subject matter. By allowing students to conduct observations, experiments, and active discussions, this model can help students understand Biology concepts more deeply and relevant to everyday life. However, the influence of the Discovery Learning Model in improving Biology learning competencies still needs to be tested in the specific context of SMAN 1 Batang Anai Padang Pariaman. Each school has its own dynamics and characteristics that can affect the implementation and outcomes of a learning model. Therefore, research that looks at the influence of the Discovery Learning Model in a specific learning environment can provide valuable insights for the development of learning strategies (Aidoo et al., 2024). more effective learning in the school. Thus, this study can not only provide an understanding of the potential of the Discovery Learning Model in the context of Biology, but can also provide relevant recommendations to improve the quality of learning at SMAN 1 Batang Anai Padang Pariaman.

Student Worksheets (known with LKPD) are one of the tools often used in learning to guide students in the learning process (Chalsum et al., 2023). However, the use of LKPD in the context of the DiscoveryLearning model does not necessarily directly improve students' Biology learning competencies (Fadilah & Yohandri, 2019). Although Student Worksheets (LKPD) have become one of the common tools used in learning to guide students in the learning process, their use in the context of the DiscoveryLearning model does not always directly improve students' Biology learning competencies (Nurain et al., 2023). This is because the effectiveness of LKPD depends on its design and how LKPD is integrated into the learning process. In the DiscoveryLearning model, where students are encouraged to be active in exploration and discovery, it

is important for LKPD to be designed in such a way that encourages students to conduct independent investigations and develop a deep understanding of Biology concepts. If LKPD only functions as an instruction or drill that does not facilitate students' critical thinking and exploration, then its use in the context of DiscoveryLearning may not have a significant impact on students' Biology learning competencies (Kwangmuang et al., 2021; Sari et al., 2024) .

Therefore, it is important to carefully consider the design and implementation of LKPD in a specific learning context, including its suitability with the learning model used, such as the DiscoveryLearning model, to ensure that LKPD can effectively support the achievement of students' Biology learning objectives (Ramayani et al., 2024; Maulidiya* & Mercuriani, 2023). By considering these aspects, this study aims to see the effect of the DiscoveryLearning Model assisted by LKPD in improving the Biology learning competence of grade X students at SMAN 1 Batang Anai Padang Pariaman. Existing studies may have shown the success of the DiscoveryLearning Model in improving students' understanding of certain subject matter. However, each school context has unique characteristics that can affect the effectiveness of a learning model. Specifically, this study will explore the impact of the DiscoveryLearning Model assisted by LKPD on several aspects of Biology learning competence. By gaining a deeper understanding of the DiscoveryLearning Model in the specific context of SMAN 1 Batang Anai Padang Pariaman, it is hoped that the results of this study can provide valuable input for the development of curriculum and learning strategies in the school.

In addition, this study can also contribute to academic literature in the field of education, especially in terms of developing effective learning methods in improving students' learning competencies. Thus, a deep understanding of the influence of the Discovery Learning Model assisted by LKPD on Biology learning competencies can provide a strong foundation for the development of more effective learning strategies in the future. Based on the problems above, the author conducted a study on "The Influence of the Discovery Learning Model Assisted by LKPD on Biology Learning Competencies of Class X Students of SMAN 1 Batang Anai Padang Pariaman".

Method

T This type of research is A quasi-experimental research. This study uses two sample classes, namely the experimental class and the control class. In the experimental class, treatment was given by implementing the Discovery Learning model, while in the control class, a conventional learning model was used using the lecture and question and answer method. At the end of the study, both classes were given the same learning outcome test (Posttest). The research location was at SMAN 1 Batang Anai Padang Pariaman with a population of 325 students, a sample of 67 students consisting of 31 students in class X8 experiment and 36 students in class X1. The data used were biology learning outcomes in the form of a posttest of 30 multiple-choice objective questions, and an attitude assessment rubric and a skills assessment rubric. The research design used in this study was the Control Group Posttest Only Design by comparing the test results (Posttest) of the experimental class and the control class.

Table 1. Research Design Control Group Posttest Only Design

Class	Treatment	Posttest
Experiment	X	T
Control	-	T

Description:
T: Posttest Results
X: Learning using the DiscoveryLearning model
-: Without DiscoveryLearning model treatment (using conventional models and question and answer methods).

Result And Discussion

Data Description

Based on the research that has been conducted in the experimental class (class X8) and the control class (class X1) at SMAN 1 Batang Anai Padang Pariaman, data was obtained that had a positive effect on biology learning competencies in the form of cognitive aspects (knowledge), affective aspects (attitudes) and psychomotor aspects (skills). Data on the cognitive aspect were obtained after completing the learning process of two basic competencies (remembering and recognizing terms), while data on the attitude aspect (critical thinking (accuracy and perseverance are the same as analyzing an object) and participation (communication and cooperation)) and the skill aspect (creating a concept (synthesis)).

Data Description Cognitive Competence (Knowledge)

The knowledge competency data in this study were obtained through a final test (posttest) with a written test technique in the form of multiple choices questions given to two sample classes at the end of the meeting (after being assisted by LKPD) from the Discovery Learning learning process.

Table 2. Competence of Students' Knowledge Aspects

Class	Competence	N	x	Xmax	Xmin
Control	C1	36	36	48	15
	C2		67	40	15
	C4		65	13	15
	Average value		52	75	15
Experiment	C1	31	67	48	39
	C2		65	40	39
	C4		39	13	39
	Average value		57	75	39

Attitude Competency Data Description

The attitude competency research data was obtained through observations conducted by observers using observation sheets to assess students' attitude aspects during the learning process.

Table 3. Attitude Aspect Values of Experimental and Control Classes

Class	Competence	N	x	Category
Experiment	C4	31	72	B
	C1		72	B
	C6		73	B
	Average value		72	B
Control	C4	36	60	C
	C6		72	B
	C1		36	D
	Average value		59	C

Description: SB=Very Good and B=Good

Based on Tables 3, the predicate of the attitude domain value of students filled in by observers in the experimental class obtained a higher average than the control class, namely in the experimental class the value was in the good category, while the control class had a sufficient value category. This shows that the attitude competence of students in the experimental class using the Discovery Learning model assisted by LKPD is higher than the control class with conventional without LKPD.

Description of Skill Competency Data

Research data on the skill aspect was obtained through observations made by observers using observation sheets for assessing the student's skill aspect during the learning process. There are two assessed skill data, non-practical and practical skill data. Non-practical research data in tables 13-14 from the results of quizzes 4.

Based on Table 4 (see attachments pp. 100-105) it is known that the total average value of the non-practical skill aspects of students filled in by observers in the experimental class obtained an average higher than the control class by 6.5 units and the category is sufficient. This shows that there is a positive influence of Discovery Learning assisted by LKPD on non-practical psychomotor competencies (skill aspect sheets) during the learning process. Research data on the Practical skills aspect were obtained through observations made by observers using student practical assessment sheets after the posttest and Discovery Learning assisted by LKPD. Research data on the practical skills aspect can be seen in Table 5.

Table 4. Non-practical Skill Aspect Value of Sample Class

Class	Competence	N	x	Category
Experiment	C4	31	72	B
	C6		73	B
	Average value		72,5	B
	C4	36	60	C
Control	C6		72	B
	Average value		66	C
	C4	31	72	B
	C6		73	B

Description:
SB=Very Good
B=Good

Table 5 Sample Class Practical Skills Aspect Value

Class	Competence	N	x	Category
Experiment	C5	31	73	B
	C3		61	C
	Average value	36	67	C
	C5		68	C
Control	C3		62	C
	Average value		65	C
	C4	31	73	B
	C6		61	C

Based on Table 5, it is known that the total average value of the practical skills aspects of students filled in by observers in the experimental class obtained the same average in the sufficient category. This shows that there is an influence of Discovery Learning assisted by LKPD on the experimental class's skills assessment sheets by 4.7, which is higher than the control class.

Achievement of Learning Competencies in the Knowledge Domain

The application of the Discovery Learning model has a positive impact on students' knowledge domain competencies. This is because the Discovery Learning model is a learning model that provides opportunities for students to build their own knowledge with the results of (Muhayati et al., 2023). In line with the opinion of (Nisa et al., 2023) that one of the characteristics of discovery learning is that the activities carried out by students encourage the integration of new knowledge into the initial knowledge that students already have. The same thing was stated by (Shaqila & Zetriuslita, 2023), that discovery learning is a learning process that

facilitates students to construct their own knowledge. The results of the study showed that the biology learning competence of students' knowledge domain can be increased by using the discovery learning model assisted by LKPD. This can be seen from the average value of the learning outcomes (posttest) of the experimental class of fifty-seven and the control of fifty-one. This is also in accordance with the results of research conducted by (Wadouh et al., 2014), it was found that the biology learning competence of students in the knowledge domain aspect who followed the discovery learning model assisted by LKPD was significantly better than the learning competence of students in the knowledge aspect who followed conventional learning. The improvement of learning outcomes in the experimental class cannot be separated from the application of the discovery learning model.

Discovery learning has several stages, namely stimulation, problem identification, data collection, data processing, proof and drawing conclusions. The first stage in the application of discovery learning is stimulation in the form of words that build, arouse the desire to learn (motivation) and the role of the teacher in this stage is to provide questions related to the material, the purpose of which is to stimulate students' curiosity (curiosity) about the material. Some students in the experimental class looked so enthusiastic about following the lesson, students actively answered questions given by the teacher. Starting from this high curiosity, it also has an impact on students' desire to investigate for themselves, students feel interested in following further learning. This is in line with Aila's research, (Pedaste et al., 2015), stated that the learning pattern that focuses on discovering concepts and exploring past knowledge after exploring images related to the material before going down to the school environment. After exploring the material and images through the five senses in the form of what is seen (visual pathway), heard (audio pathway) and memory (storage) (central nervous pathway) so that a constructive mind is formed. This is in line with research by (Kamaluddin & Widjajanti, 2019) stating that discovery learning is a learning process that facilitates students to construct their own knowledge.

Next, in the second stage, namely problem identification, the teacher provides time for students to find conceptual ideas for the material when understanding each image accompanied by a statement in the form of information in the LKPD and the problem formulated in the form of a hypothesis. This is in line with research (Santoso et al., 2024), stating that by implementing the discovery learning model, it can create learning conditions from passive students to active and change the mode of students from receiving information themselves (discovery) including the realm of understanding competence. The third stage is data collection. According to (El Zaatari & Maalouf, 2022) at this stage the hypothesis that has been established is proven to be true, and students in the experimental class are seen busy looking for, taking and writing the data obtained. Students are actively involved in learning and creating learning in two directions. This is in accordance with the statement of (Chusni et al., 2020), discovery learning is a way of learning that includes an instructional learning model and strategy that focuses on providing opportunities for students to be active and directly involved in the learning process.

The fourth stage, namely data processing. Students categorize, sort information that functions to form concepts and generalizations (general). At this stage, students gain new knowledge about solutions to problems by exploring and observing images and problems according to the material or concepts obtained. This is supported by the opinion of (Kurniawati et al., 2020), learning by implementing discovery learning requires an inductive process, namely information and knowledge resulting from exploration and observation carried out. (Retnaningrum & Pamungkas, 2024), argue that discovery learning provides opportunities for students to discover new rules and new ideas, not memorize what is said or conveyed by the teacher. Then the fifth stage, namely proof (C5-C6). For the proof stage, students carry out checks or evaluations that are truly thorough to prove whether or not the initial hypothesis that has been determined is correct [32] , the initial hypothesis is connected to the data obtained and students make conclusions from the results of observations of the objectives and activities in order to obtain a concept that applies generally to the same problem.

The learning stage of the discovery learning model makes students the center of learning so that it influences the learning outcomes of students' knowledge in the learning process and is supported by the right books. In line with the research of (Casinillo, 2023); when the application of the discovery learning model is assisted by LKPD, students are more active and time is effective [33]. Because students understand what activities will be carried out in the learning process. This certainly has an impact on the high aspects of knowledge, skills and student activity. Learning carried out in the experimental class has almost the same stages as those applied in the control class, namely collecting data, processing data and communicating data results, but in the first stage, namely the observation stage, there are differences in its implementation. In learning in the experimental class, the teacher distributes questions and students actively answer questions. In the control class, the teacher tries to do the same thing but few respond, while the others just listen silently with conditions like

this, so in the control class the teacher takes the initiative to change students to be required to actively answer questions.

In line with the research of (Aflalo, 2021), making students actively answer questions from learning resources, this aims to foster students' curiosity about the material and learning is not boring. In line with research conducted by (Gillies, 2023) the application of the discovery learning model makes students look active in learning, actively expressing opinions, asking questions and communicating their ideas about learning materials. Learning that uses discovery learning, at the proof stage, students recheck whether the initial hypothesis that has been determined is correct or not with the information data obtained, while in the control class there is no stage, this difference in learning stages provides the results obtained by students in that class. Without proof, students in discovery learning train students to be more careful, especially in the final conclusions (Rahayuningsih et al., 2024; Swiecki et al., 2022). The existence of LKPD in the learning process is also a very supportive factor in improving students' biology learning competencies, students in the control class use non-discovery learning without the help of LKPD so that most students are passive, this happens because most students are confused and do not know the activities being carried out, in this condition the teacher tries to facilitate learning well. This is in line with the opinion of (Gan et al., 2021; Andersson & Granberg, 2022), LKPD used in learning makes students more independent and able to target their own achievements in the material given by the teacher.

Achievement of Learning Competence in the Attitude Domain

The results of observations of students' attitude domain competencies carried out by observers, obtained data on students' attitude domain competencies in the experimental class as a whole obtained a good category. The problems given at the beginning of each learning can provide a stimulus that stimulates students' curiosity In'am et (Kusuma et al., 2021) to become knowledge that has a positive effect on increasing analytical skills and curiosity can provide solutions to relevant problems. Problem-solving tasks train students to be careful and diligent, tasks are carried out by students and collected at a time agreed upon with disciplined trained teachers. This is supported by the theory of (Aldalur & Perez, 2023), discovery learning requires students to build their own knowledge by engaging in activities that require real solutions. This trains their discipline in working together to solve existing problems.

The learning process uses discovery learning, students are divided into several groups to be responsible for the tasks given by the teacher. At the stage of collecting and processing data, students are trained to build good cooperation with their class members so that the results obtained are better and the time used is more effective. That students can achieve learning goals only by learning together with other students in their group. Students in the experimental class whose learning process is assisted by LKPD look very enthusiastic in learning. Likewise with the self-confidence possessed by students, through the problem-solving process that requires students to be confident in expressing opinions, not awkward in acting. When presenting the results of work or presentations, students are trained in cooperation and discussion. Students in the control class also have a lower discipline attitude than the experimental class. Many students in the control class are late in submitting assignments and do not respect the teacher who provides the material. In addition, they behave individually and lack cooperation or independence.

Achievement of Learning Competence in the Skills Domain

In the experimental and control classes, in the practical skills, students made a Biodiversity Concept Mapping, and the results of the assessment of the students' skills domain were obtained, the data obtained were that the skills competencies of the experimental class students were significantly better than the control class. The discovery learning model has special characteristics, namely producing products or works and exhibiting these products. The skills domain competencies of students in the experimental class as a whole obtained a good category for practical skills. While in the non-practical aspect of the biodiversity material, the category was sufficient in the experimental class and lacking in the control class on average. The learning process in the two sample classes, namely the experimental class and the control class, can show significant differences. The experimental class uses the discovery learning model assisted by LKPD, which has an average of less than significant experimental class and the average of both classes that in a discovery learning environment, students are actively involved in learning to construct knowledge and apply it in skills.

Conclusion

Based on the results of the research and discussion that have been carried out, the following conclusions were obtained: The discovery learning model assisted by student worksheets (LKPD) has an influence on the biology knowledge competency of class X students of SMAN 1 Batang Anai Padang Pariaman; The discovery learning model assisted by student worksheets (LKPD) has an influence on the attitude competency of class X

students of SMAN 1 Batang Anai Padang Pariaman; The discovery learning model assisted by student worksheets (LKPD) has an influence on the skills competency of class X students of SMAN 1 Batang Anai Padang Pariaman.

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Author Contributions
Conceptualization,; methodology,; validation,; formal analysis,.; investigation,; resources,.; data curation,.: writing—original draft preparation,.; writing—review and editing,.: visualization, K. M. All authors have read and agreed to the published version of the manuscript

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Conflicts of Interest
The authors declare no conflict of interest.

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