Original Research Article

PROBLEM-BASED LEARNING BASED BIOLOGY LEARNING MODEL DEVELOPMENT USING THE ENVIRONMENT TO IMPROVE MOTIVATION AND LEARNING OUTCOMES OF BIOLOGY HIGH SCHOOL STUDENTS

ABSTRACT

This research aims to determine students' needs for a PBL-based biology learning model utilizing the environment for high school students This research uses the type of research and development research which refers to the ADDIE model which consists of five stages, namely Analysis, Design, Development, Implementation, and Evaluations. Data collection was carried out using interview techniques, observation, questionnaires, documentation and assessment sheets for product feasibility, practicality, and effectiveness. The data obtained was then analyzed using descriptive narrative and inferential statistics. The results of the research show that there is a need to develop a biology learning model based on problem-based learning (PBL). utilizing the environment to increase motivation and learning outcomes of high school students.

Keywords:*learning outcomes, problem based learning, utilizingenvironment*

INTRODUCTION

Education is a need that is needed by all humans throughout the world. Nonetheless, education in Indonesia has advantages compared to these countries or other developed countries based on Pancasila education and the 1945 Constitution which are rooted in the nation's culture which emphasizes character which is indispensable in facing the challenges of the 21st Century. 21st Century Learning is learning that integrates literacy skills, knowledge skills, skills, and attitudes, as well as mastery of technology.

A learning model that is suitable for the needs of the 21st century can be realized if there is a shift in thought patterns, mental patterns, and action patterns in various contexts of implementing the education and learning process. To become an educator who has the right strategy for the future (visionary) and is oriented towards the future, what must be understood is: changes in the conditions of students, views of students, profiles of students in the future, students' needs to adapt to changes , selection of suitable learning models and methods, creating learning conditions that support the selection and procurement of learning evaluation tools that are appropriate and contextual, and the quality of educators who are continuously improved.

The occurrence of a paradigm shift in teaching and learning methods that were previously teacher-centered, became student-centered, is expected to be able to motivate students to be actively and independently involved in participating in the learning process and students are expected to be able to access all available sources of knowledge. The Student-Centered Learning (SCL) learning method is a reflexive learning approach for both students and teachers. Student-centered learning is an umbrella term that characterizes several different pedagogical models, all of which are based on the principle of promoting students' independent and active engagement in the learning process. The idea of student-centered learning is well-established and in the educational literature, student-centered approaches are also referred to as people or learners (Bechter, Dimmock, and Jackson 2019), then student activity has been involved from the start in the form of learning designs that take into account knowledge, skills, and student learning experiences that have been obtained previously (Unin and Bearing 2016).

One of the problems facing our world of education is the problem of weak learning processes. In the learning process, children are less motivated to develop thinking abilities. The learning process in the classroom is directed at the child's ability to memorize information, the brain is forced to remember and hoard various information without being required to understand the information it remembers to relate it to everyday life.Learning should involve students as much as possible, so that they are able

to explore to form competencies by exploring scientific potential and truth. To explore the potential and scientific truth of student-centered learning, students have the opportunity and facilities to build their own knowledge so that they will learn more focused and continue to improve the quality of the students themselves. Therefore, to support this learning, it is necessary to use a learning model that is relevant to the conditions of students at school, a suitable learning model is the Problem Based Learning (PBL) model.

In line with the research results of Yulianitias, et al (2019) stated that learning in the experimental group using the environment-based Problem Based Learning model took place interactively, creating good communication between students and students, as well as students and teachers. By learning to use the environment-based Problem Based Learning model, students will immediately know how the sanitation, hygiene, and work safety lessons they are studying are. Using the Problem Based Learning model can develop student learning motivation, encourage students to be able to think at a higher level encourage students to optimize their metacognitive abilities and make learning meaningful to encourage students to have high self-confidence and be able to learn independently. Apart from using the Problem Based Learning model, learning is also assisted by the media, namely the environment, where they don't just imagine, but they can go directly to the environment to find out what sanitation, hygiene and work safety are. Utilization of the surrounding environment as a learning medium can replace the conventional educational process (room) which has been carried out passively. Teachers and students gain many benefits from using the environment in the learning process.

The main problem in the learning process in schools today is the low absorption capacity of students. This can be seen in the learning outcomes of students which are always very worrying. This achievement is of course the result of learning conditions that are still conventional. Based on the results of observations at high schools, the author obtained some information from interviews with biology teachers that there were learning difficulties experienced by students in understanding biology subject matter because in the learning process teachers were less than optimal in presenting the subject matter because of during the Covid-19 pandemic. What is meant here is less than optimal: teachers rarely use learning models that are adapted to the subject matter given to students, teachers teach biological concepts and theories through activities that are only teacher-centered, students are not involved in activities. active and does not provide opportunities to develop students' thinking processes. Learning with this method the teacher has not empowered all of his potential so that most students have not been able to achieve the individual competencies needed to prove participating in further learning, resulting in less motivation to learn, and resulting in low student learning outcomes. The author made this observation by interviewing biology teachers at Senior High Schools (SMA) in Majene.

Based on the description of the problem and the explanations explained above, it is deemed necessary to plan and develop a learning model that is meaningful and appropriate to the characteristics and needs of students so that it can increase students' knowledge and learning motivation. The learning model deemed necessary by researchers is the Problem Based Learning model utilizing the environment. The environment is able to provide opportunities for concrete thinking, activities freely, learning that allows students to carry out various activities, such as exploring, observing (Uno, 2014) .

process can motivate students to be able to connect their knowledge with the application of everyday life, so that it can help students understand learning material, in making decisions about content, environment, and opportunities for learning, for students in and outside the classroom, and can help define a dynamic learning context that is continuously updated. Therefore, researchers are interested in carrying out research and development with the title "Development of Problem Based Learning (PBL) Utilizing the Environment to Increase Motivation and Learning Outcomes of High School Students".

RESEARCH METHODS

The type of research conducted is Research and Development(R&D) which is a research method used to produce certain products and test the effectiveness of these products (Sugiyono, 2015). Research activities are integrated during the product development process, therefore in this research it is necessary to combine several types of research methods. *Research and development* products in the field of education can be in the form of models, media, equipment, books, modules, evaluation tools and learning tools: curriculum, school policies, and others (Mulyatiningsih, 2016). What was designed in this study is a *problem-based learning model of biology* that utilizes the environment, by following the ADDIE (*Analysis, Design, Development, Implementation or Delivery and Evaluation)* development model developed by Reiser *and* Mollenda (1996). This model can be used for various

forms of product development such as models, learning methods, media, teaching materials and learning models. The flow of learning model development can be seen in Figure 1.

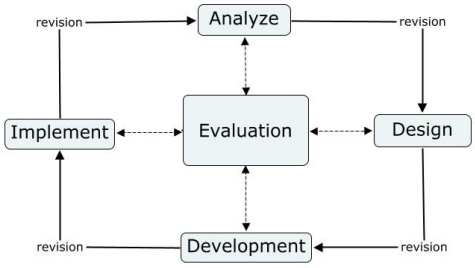

Figure 1. The ADDIE Concept (Branch, 2009)

In the Analyze stage, the main activities are analyzing the need for developing a learning model and analyzing the feasibility and requirements for developing a learning model (Sugiyono, 2019). In this model development research, the needs of the development model will be analyzed through a preliminary study. Based on the results of interviews and observations, this is a preliminary study conducted to obtain initial information in the model development process. The information obtained is used to plan and design a theoretical-hypothetical model. This preliminary study contains two main activities, namely literature review and needs analysis. The results of the preliminary study are used as the basis for designing the initial model or hypothetical model.

The second stage of the ADDIE model is the design stage. At this design stage, a prototype of a problem-based learning model was made to utilize the PBL environment Utilizing the Environment to improve biology learning outcomes and student motivation. This model prototype will become an operational model in research on developing problem-based learning models utilizing the PBL environment. The model prototype was designed based on a literature review which became the need for the development model, the PBL model prototype Utilizing the Environment was designed through learning carried out based on the results of literature review analysis, relevant research results and needs assessments. Meanwhile, the hypothetical model is designed to contain a formulation of the theoretical basis, objectives, scope, target population, learning steps, teacher's role, implementation procedures, and evaluation.

The third stage of development in the ADDIE development research model contains activities to realize product designs that have previously been created. In the previous stage, a conceptual framework for implementing the new product was prepared. The conceptual framework is then realized into a product that is ready to be implemented. At this stage it is also necessary to create an instrument to measure product performance (Mulyatiningsih, 2016). At this stage, the development of the PBL model Utilizing the Environment is carried out in accordance with the plan. After that, from the concept that has been created and designed, a product manufacturing process will be carried out that produces a product and will be implemented. At this stage is the process of making the PBL model Utilizing the Environment and developing other learning support devices that are in accordance with student competencies that are in accordance with the environment around students so that they can provide examples that are easy to see in real terms and can be implemented into students' daily lives. After the learning model is completed in product form, it is reviewed by the supervisor before being validated by experts.

The fourth stage of implementation, after the product is declared valid, the product can be implemented. The operational model is composed of validation and development stages, namely a problem-based learning model utilizing the environment, then field trials are carried out to determine the effectiveness of the model. This effectiveness test was carried out using the True Experimental Design Technique which uses a control group and an experimental group, with a design Pretest – Posttest Control Group Design where the research subjects were chosen randomly (Sugiono, 2017). The research design is schematically depicted in Figure 2 below:

Pretest – Posttest Control Group Design

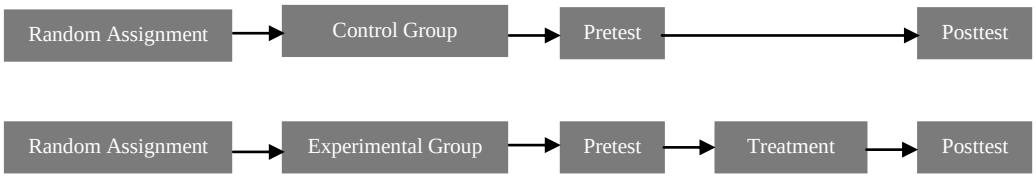

Figure 2. True - Experimental Design Schemein Model Effectiveness Testing

The target subjects for testing the effectiveness of the model were students of SMA Negeri 1 Sendana, Majene Regency. The intervention material for testing the effectiveness of the model is "The World of Plants/Plantae" which can increase students' motivation and learning outcomes in biology based on the PBL learning model Utilizing the Environment. The results of this model effectiveness test become material or information in revising and perfecting the operational model to become a tested model or final model.

The evaluation stage in the ADDIE model development research was carried out to provide feedback to product users, so that revisions were made in accordance with the evaluation results or needs that had not been fulfilled by the product. The final goal of evaluation is to measure the achievement of development goals. The evaluation stage describes the results of implementing the model and achieving the research objectives. Evaluation is intended to determine the level of mastery of students towards the competencies that have been taught, in addition to knowing the application of the PBL Utilizing the Environment model can increase students' motivation and learning outcomes in biology.

The data collection techniques used in this research and development, there are several instruments used to collect data. Some of these instruments are: (1) observation sheets, (2) questionnaires, (3) biology learning results tests and (4) interviews. The data analysis technique used at the needs analysis stage is descriptive qualitative analysis and uses percentage techniques. Analysis of needs to find out student/teacher responses regarding the need to develop problem-based learning models utilizing the environment to increase students' motivation and learning outcomes in biology. Technique Percentages are used for several data that have been given in the questionnaire. The formula used is:

$$P = \frac{f}{N} x\ 100\%$$

Information:

P = Percentage number

f = frequency that is being searched for the percentage

N = Number of frequencies/number of individuals (Arikunto, 2019) .

RESEARCH RESULTS

Problem Based Learning Models Using the Environment. This activity is the initial stage in this research analyzing by carrying out a series of activities including: curriculum analysis and Learning Implementation Plans (RPP), analysis of textbooks used so far in schools and Siawa Worksheets (LKS) used, analysis of student needs through giving questionnaires and conducting interviews with teachers. The following is described in detail.

Analysis of Curriculum and RPP

Based on the survey in the preliminary study, it is known that there is a gap between ideal conditions and conditions in the field in the implementation of learning in the 2013 Curriculum in Senior High Schools. Curriculum analysis activities have been carried out to review the curriculum at State High Schools in Majene Regency. This analysis activity was carried out on January 16-18 2023 through documentation study activities at three public high schools in Majene district, namely, Majene 1 Public High School, Majene 3 Public High School, and Sendana 1 Public High School. Material analysis is carried out by analyzing the curriculum to adjust the model to be used in learning, as well as selecting Core Competencies (KI), Basic Competencies (KD), indicators and materials developed. Materials in biology lessons that are considered difficult for students to understand are identified and arranged systematically.

Based on the results of the documentation study, researchers obtained information that in class X at this school they still use the K13 curriculum so that the learning tools developed refer to the 2013 curriculum. will be achieved. Whereas for the RPP that is made it is necessary to change the composition where the RPP that is prepared is in accordance with K 13, while the implementation of the model in the field is not yet in accordance with the abilities of the teacher because the RPP that is made only comes from RPP teacher friends, thus the implementation of biology learning is not optimal because the characteristics of students are not in accordance with the learning carried out. Based on these conditions, researchers feel the need to make lesson plans that are in accordance with the learning model and student characteristics.

Analysis of textbooks and worksheets

Textbooks and worksheets are teaching materials commonly used by teachers in the learning process. Analysis of textbooks and worksheets was carried out on January 19-21 2023 at three public high schools in Majene district, namely, Majene 1 Public High School, Majene 3 Public High School, and Sendana 1 Public High School. Researchers conducted interviews with 3 teachers and 10 students by asking questions related to the teaching materials and worksheets used so far in the learning process.

The researchers conducted discussions with teachers through interviews at Majene State High School by asking three questions. The results of the researchers' interviews with teachers and students can be summarized in table 1 below:

Table1. Summary of Interview Results between Researchers, Teachers, and Students

Teacher	Student
The school provides textbooks that are used in learning from outside publishers so that teachers are used to using existing textbooks so that the desire to create textbooks is lacking.	There are limited textbooks so that the number of students is not balanced with the number of books provided by the school resulting in uneven use of textbooks.
Existing textbooks are sometimes difficult for students to understand because the explanations for learning material are very minimal, so that problems encountered by students in learning are difficult to solve.	The distribution of worksheets is rarely done in learning, even though worksheets can help students understand and solve problems related to the environment, especially the concept of the plant world (Plantae).
The development of teaching materials needs to be carried out by the teacher so that they can adapt to the environment around students which has something to do with the material being taught in this case the material concept of the world of plants (plantae).	Students should be given worksheets at every meeting that are related to the surrounding environment so that we are helped in understanding the material

Looking at the results of the summary of interviews with teachers and students, the use of textbooks that utilize the environment, students and teachers are interested in using them in learning carried out individually and in groups involving students and teachers as facilitators and motivators.

Analysis of Learning Implementation

The activity of analyzing the implementation of learning was focused on one school which was the school that was used as the research location, namely SMA Negeri 1 Sendana. By conducting interviews with teachers, it is intended that problems that occur in the implementation of learning can be resolved properly. The focus of the interview questions asked is related to the learning model used, the problems encountered in the teaching and learning process and student learning motivation. As for the results of observations and interviews, namely: (1) based on the results of observations during learning the researcher saw directly the learning activities in the classroom where the teacher taught using conventional methods and models even though the prepared lesson plans referred to the 2013 Curriculum. can support the learning process to run well and can arouse student learning motivation, where in this learning activity the teacher is more dominant active, students only become loyal listeners when the teacher explains. This is because it is difficult for students to build knowledge by the students themselves in the sense that the role of the teacher as a facilitator is not optimal, therefore conventional teacher-centered learning is still implemented. (3) by conducting interviews with biology teachers in senior high schools in Majene, all the teachers invited to discuss knew that biology learning should start with problems that are in accordance with the situations experienced by students, in accordance with real life and close to students, as well as environmental problem-solving approaches are very important in learning that focuses on student learning. However, the implementation of the problem-solving process is still not implemented comprehensively in learning. (3) most teachers rarely use modules and LKS in learning, this is based on the results of free interviews with students, therefore learning is only centered on the teacher. With the use of module books and worksheets, it can provide opportunities for students to carry out activities so that students are able to build understanding and construct their knowledge independently. In this way, students will be trained to work on questions that are related to the surrounding environment.

The results of further observations, where learning activities are centered in class only, students are rarely left out of class even though learning material is related to the environment, resulting in decreased student motivation because the process of delivering subject matter by teachers tends to

still apply the lecture method where learning begins with prayer and greetings, then the teacher immediately enters the learning material and writes the material on the blackboard sometimes also using a projector then explains the material and gives examples of simple questions. While students only sit listening to the teacher's explanation, there are even some students telling stories with their classmates or even playing smartphones, maybe this is caused by the use of learning methods and models that are not appropriate with the material presented by the teacher. Teachers should use learning methods and models in accordance with the material presented in learning activities, so that students participating in learning activities can be active in learning. By having learning outside the classroom or the surrounding environment, it can increase student motivation in learning and student learning outcomes. Based on the results of these limited observations and interviews, researchers feel the need to make improvements to the implementation of learning, so that educational goals can be realized as mandated in Law Number 20 of 2003 concerning the National Education System.

Analysis of Student Questionnaires

The results of the model needs analysis questionnaire can be described by displaying several items that have a high frequency and percentage of students' responses as a basis for developing *problem based learning models* utilizing the environment can be seen in the following table:

Table 2. Frequency and Percentage Distribution of *Problem Based Model Needs Learning* takes advantage of the environment of students

Question	*F*	%	Criteria
Do you enjoy studying biology?	114	85.07	Very happy
Do you easily understand the material presented by the teacher?	94	70.15	Quite easy
Are the teaching materials used by the teacher interesting?	75	55.97	Quite interesting
Does the teacher start learning by linking previous material?	85	63.43	Often
Does the teacher provide motivation before teaching the material by utilizing the environment around you?	90	67.16	Seldom
Is the learning model used by the teacher interesting?	84	62.68	Quite interesting
Are the learning resources provided by the teacher easy for you to understand?	98	73.13	Quite easy
Do teachers often provide worksheets in learning?	86	64.17	Seldom
Does the teacher often give you problem solving questions?	96	71.64	Seldom
Does the teacher give you space to convey your thoughts or ideas in learning?	79	58.95	Often
Do you know the plants around you?	94	70.15	Enough to know
Do you think that presenting various problem situations connected to learning material can make it easier to understand the material?	111	82.83	Strongly agree
Do you need learning resources, both textbooks and worksheets, that provide problems related to the environment around you?	112	83.58	Urgently require
Do you need a learning model that gives you space to improve problem solving?	115	85.82	Urgently require
Do you need a learning model that presents environmental problems related to the learning material?	120	89.55	Urgently require

Based on the results of the analysis of the distribution of needs questionnaires, the Problem Based Learning Model utilizes the environmentfrom students, we can see that 85.07% of students in the category are very happy to take part in biology lessons, this shows that students have the desire and motivation to take part in biology lessons. While the percentage of students in need of a learning model that is relevant to the learning material is 89.55 in the very need category. There are still other questionnaire questions which we can see in table 2, we can conclude that students need a model or learning situation that is fun and can adapt learning material to the learning model in this case PBL learning utilizing the environment.

DISCUSSION

The Problem Based Learning Model Utilizing the Environment was developed using the ADDIE model procedure which consists of 5 stages, namely analysis, design, development or production, implementation, and evaluations. The development of the The problem based learning model utilizes the environment model is expected to produce products that meet the criteria of being valid, practical and effective. One of the stages of development is analyzing the needs for developing biology learning models and tools. Based on the results of observations of the implementation of learning before the research, interviews with teachers and students, as well as the distribution of questionnaires about the level of needs of senior high school students (SMA) in Majene Regency, it can be concluded that there is a need for learning using problem-based learning models that utilize the environment. This is based on the analysis of the implementation of learning that so far, the biology learning process has been carried out using conventional models, where learning has been carried out using lecture and question and answer methods between teachers and students. So that it does not show its relation to the environment or real life, and is considered to attract less attention to solving or solving biology learning problems, therefore students are less motivated and student learning outcomes do not increase.

Some needs that are very necessary in biology learning based on information obtained from students and teachers are the need for a learning model and learning tools that can attract students' interest and motivation related to the environment. Based on the results of student questionnaires about the need for a biology learning model with a model of utilizing the environment, as many as 120 or 89.55% of students said they really needed it. In addition, the results of interviews with several teachers provide suggestions about the need for a problem-solving learning model related to the environment.

Apart from that, several learning model tools that support the model based on information obtained from observations, interviews and questionnaires are teaching modules, learning implementation plans (RPP), and student worksheets (LKS). This learning model and learning tools are expected to be able to increase student motivation and learning outcomes as well as solve problems related to environmental problems. Therefore, environmental empowerment is an approach that seeks to increase student involvement through utilizing the environment as a learning resource (Mulyasa, 2017). The environment can be formatted or used as a learning resource. In this case, the teacher can relate the material being taught to students' real world situations so that it can encourage students to make connections between the knowledge they have and its application in everyday life (Richardson and Mishra, 2018).

Furthermore, Piaget argued that the learning process will occur if there are individual activities interacting with the social environment and the physical environment. With the interaction with the environment in the learning process, students will get or find information that can be communicated to students in the form of acceptance learning which presents that information in the final form or in the form of discovery learning which requires students to find out for themselves some or all the material to be taught. in accordance with the learning theory proposed by Ausubel.

Based on the results of observations and interviews about the need to use learning models that can increase student motivation and learning outcomes, the researchers assume that the PBL model utilizing the environment is very appropriate for use in biology learning both inside and outside the classroom.

CONCLUSION

This research is model development research which is expected to produce a biology-based learning model Problem based learning (PBL) utilizesthe environment to increase the motivation and learning outcomes of high school (SMA) students in Majene Regency. The model is expected to be a valid, practical, and effective model. Therefore, the needs of high school teachers and students in Majene Regency were obtained based on the results of giving questionnaires to students, analysis of lesson plans, analysis of teaching modules and results of analysis of learning implementation through interviews with teachers. The results of the analysis show that teachers and students need to develop a PBL model utilizing the environment.

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