Elementary students' worksheet based on discovery learning for environmental education and biodiversity learning

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ABSTRACT

The discussion of environmental issues and the biodiversity of flora and fauna are interesting topics to remarkable. This topic includes the learning process at the elementary school level. The learning tool that can be developed is student worksheets for elementary schools. The objective of this research is to develop discovery learning-based student worksheets for elementary school students on environmental and biodiversity topics. The ADDIE model was employed as the research methodology in this study. The development stages carried out are starting from analysis, design, development, implementation, and evaluation. The data analysis used was descriptive. The results of the research show that the student worksheet developed has a very valid category and is appropriate for use in learning with detail scores from Learning Expert I (3.90), Learning Expert II (3.70), and Learning Expert III (3.90). Students' worksheets were very valid and appropriate for learning. Student worksheets are one of the innovations that can be developed in school. The results of this research further validate that the student worksheets employed in fostering the development of student's critical thinking and creative thinking abilities. This research concludes that student worksheets based on discovery learning in environmental and biodiversity topics are appropriate for educational purposes.

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INTRODUCTION

Indonesia is a country with an enormous land and sea area. Many areas have high diversity (Kusmana & Hikmat, 2015; Mugwedi *et al.*, 2018; Panagiotopoulou *et al.*, 2021). Starting from land areas containing flora and fauna that we often encounter every day to rare flora and fauna. As for the waters, Indonesia has a very high diversity of flora and fauna. It is crucial for Indonesian society to effectively preserve this diversity to ensure its visibility for future generations. The area of education should enable students to acquire knowledge and understanding that will enable them to preserve the biodiversity of living organisms.

Topics related to the biodiversity of living organisms are frequently discussed by elementary school students together with environmental topics. Student education at the elementary school level carried out in the classroom or outside the classroom is the basis for environmental values and character. Learning activities are carried out using learning media and models, student worksheets, and teaching materials (Bissinger & Bogner, 2018; Trilestari & Almunawaroh, 2021; Zubaidah *et al.*, 2017). All learning tools must be developed according to the needs of students. In this context, students need an activity guide in the form of worksheets related to environmental topics and biodiversity.

Student worksheets for elementary school can be developed in the form of integration with various learning models (Fauziyah & Jailani, 2014; Yusuf & Widyaningsih, 2022). One learning model that can be used is discovery learning (Gruzd *et al.*, 2018; Maclean & Pavlova, 2017; Winarni *et al.*, 2020). In this case, the discovery learning model prioritizes students' exploration activities to solve a topic that has been discussed in the lesson. Student worksheets that are integrated with the discovery learning model can be utilized in scientific learning such as environmental studies and biodiversity. The selection of this topic was based on its highly contextual topic to study, considering that there are so many environmental issues. The student worksheets that are developed must, of course, correspond to the various syntaxes of the discovery learning model.

Several previous research results show that the development of learning tools such as the RMS (Reading, Mind Mapping, and Sharing) learning model has had a positive effect on student learning. (Muhlisin, 2018; Muhlisin *et al.*, 2016). Development of another learning model, namely the *Anmadev* model (Analyzing, Mapping, Developing) which was developed to improve students' science learning abilities (Ichsan & Nurafifah, 2023). Prior to this, we have conducted the development of worksheets that incorporate both environmental education and English language learning. The development of teaching materials related to the diversity of flora and fauna needs to be carried out because it is related to students' abilities, in this case, knowledge of science. It is very essential to develop student worksheets to shape students' character and attitudes.

Based on this description, there is an urgency to develop student worksheets based on the discovery learning model, which has the potential to improve the 21st-century abilities of elementary school students (Saputri *et al.*, 2019). The worksheet that needs to be developed is based on the discovery learning model on the topic of the environment and biodiversity. This topic is very appropriate to the needs of elementary school students to form characters who care about the environment and need to maintain environmental sustainability in the future. Based on what has been stated, an explanation can be drawn that it is necessary to carry out this research to develop integrated discovery learning elementary student worksheets on the topic of the environment and diversity of flora and fauna.

METHOD

The method used in this research is associated with the research and development (R&D) method which follows the stages of ADDIE (Branch, 2009). The process of developing this model begins with the analysis of problems in the field (Analyze), followed by the design phase (Design), the development of worksheets (Development), the Implementation of the model (Implement), and

finally, the evaluation of its effectiveness (Evaluate). Figure 1 shows the process of developing student worksheets needs to be carried out according to the ADDIE model.
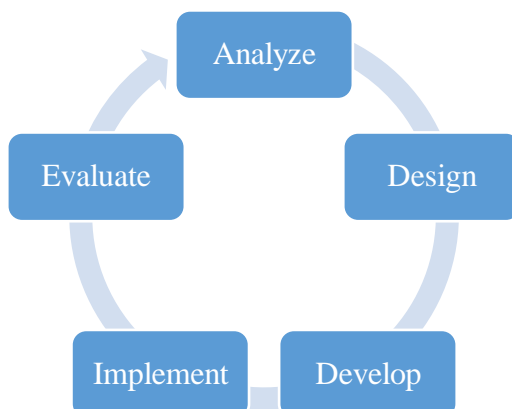
Figure 1. Development stages according to the ADDIE model

The initial phase starts from the analysis stage, namely reviewing various previous research results. Continue to create a design for the student worksheet that will be developed, in this case, the worksheet is made according to the discovery learning model at the second phase. The third phase is developing the worksheet. The discovery learning model that follows this consists of several distinct phases; stimulation, problem statement, data collection, data processing, verification, and generalization. The implementation and evaluation which are the fourth and fifth phases, were not conducted in this research. This limitation comes from the fact that the scope of this research is limited to the development phase. The validation was carried out by three experts who had qualifications as lecturers. The assessment indicators include the presentation of worksheets and the use of language. These indicators are then detailed into several items including activity orders presented systematically, student worksheets containing essential activities, instructions presented according to the context, student worksheets can be used in several material contexts, activities presented can improve higher-order thinking abilities Skills, language according to enhanced spelling rules, language used according to the context, language used communicative, sentences used are clear and easy to understand, complete sentence structure according to grammatical rules. The student worksheets that are developed are then validated by experts. The results of the validation are following the assessment categories as follows.

Table 1. Range of scores and validation categories

Interval Score	Category
3,25 < x ≤ 4,00	Very Valid
2,50 ≤ x ≤ 3,25	Valid
1,75 < x < 2,50	Less Valid
1,00 < x < 1,75	Invalid

Sources: (Ratumanan & Laurens, 2006)

RESULTS AND DISCUSSION

The research findings indicate that the student worksheets developed are categorized as very valid. The worksheets created for elementary school students play a crucial role in thematic learning,

especially on environmental topics and biodiversity. Student worksheets that have been developed need to be implemented further in learning. The results of validating student worksheets can be seen in Table 2 below.

Table 2. Results of student worksheet validation

Validator	Score	Category
Learning expert 1	3.90	Very Valid
Learning expert 2	3.70	Very Valid
Learning expert 3	3.90	Very Valid

The results of product validation show that the elementary student worksheets that have been developed in this case are said to be valid and appropriate for use in learning. Figure 2 shows the results of the development of student worksheet products that have been developed.

Figure 2. Results of developing student worksheets based on discovery learning

The findings of this study indicate that the developed worksheets are appropriate for educational purposes. In addition, the worksheets addressed the following 21st-century skills: critical thinking, creative thinking, communication, and collaboration. The results of this research show that the worksheets that have been made can be used for student learning in elementary schools. Students who have critical thinking and creative thinking skills will be able to compete in the era of global competition. The student worksheets developed are appropriate for learning as they align with the characteristics of students who require skill development. Worksheets enhance to strengthen students' abilities to overcome environmental problems around them.

Elementary school students can develop Critical thinking skills by improving their abilities through the utilization of various learning models, such as discovery learning. This model requires students to think about various possible alternatives to solve the problem. This aligns with the characteristic of the discovery learning model, which involves engaging in exploratory activities during learning. The export activities in this study can cultivate students to think critically (Gampell *et al.*, 2017; Liu, 2007; Maclean & Pavlova, 2017). This is because not everything explored can be included in the flora or fauna list. Elementary students should possess the ability to select and group flora and fauna based on the type and location where they are found. Critical thinking skills in this case can be trained using student worksheets that have been developed by the teacher because critical thinking skills need to be trained with activities that are integrated with the discovery learning model. The discovery learning model facilitates students' ability to think critically to be able to explore problems, one of which is at the data collection, data processing, and verification stages.

Another ability that can be improved using this student worksheet is the ability to think creatively. This ability focuses on students' ability to be able to use their ideas and creativity to produce something. The output from activities using student worksheets can be craft products made by students. The results of the student's work are a form of implementation of the student's creative thinking abilities. Students need to be trained in creative thinking skills so they can develop innovations that will be needed in the globally competitive world (Fauziah, 2018; Rahayu *et al.*, 2011; Suharno *et al.*, 2022; Tanujaya *et al.*, 2017; Widiana & Jampel, 2016). Elementary students are prepared to be competitive and have competencies that are in line with global needs.

The development of learning tools is an effort that can be carried out by various parties starting from teachers, lecturers, researchers, and practitioners in the field of education. Using appropriate student worksheets will help teachers convey various relevant and contextual material in learning. The delivery of contextual material in learning is very important for teachers to pay attention (Bustami *et al.*, 2018; Paristiowati *et al.*, 2019; Susanti *et al.*, 2020). This is related to relevance and current topics that are currently hotly discussed in recent times. Environmental education which discusses the diversity of flora and fauna contained in biodiversity is very appropriate to be used as an object of study in learning.

CONCLUSION

Based on the research results, it can be concluded that student worksheets are an essential learning tool. Student worksheets can be designed and have been successfully developed according to the discovery learning model. The experts' validation result indicates that the worksheets that have been developed are appropriate for use in learning and are categorized as very valid. Student worksheets play a potential role in supporting education and learning in elementary schools, particularly in the context of environmental and biodiversity topics. Future research should focus on the crucial need to develop better facilities and infrastructure to support learning, including, in this case, learning media. The limitations of this research are related to the fact that further implementation has not been carried out for the student worksheets that have been developed.

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