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Student Worksheet Based on Contextual Teaching and Learning (CTL) in Biology Learning related Ecosystem Concept

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Abstract: This study aims to determine the concept, feasibility and effectiveness of student worksheet based on contextual teaching and learning (CTL) in biology learning related ecosystem concept. This research uses research and development with the ADDIE (Analysis-Design-Development-Implement-Evaluate) model. The subjects of this study were validators (one expert lecturers and two biology teachers) and seventh grade students of Nusa Penida Private Junior High School Medan. The object of this research is student worksheet based on CTL in biology teaching materials on ecosystem learning materials at Nusa Penida Private Junior High School Medan. The research instrument used in this study was a questionnaire to obtain student worksheet product validation assessment data. Technical analysis of the data in this study using expert feasibility test and effectiveness analysis. The results showed that the student worksheet based on CTL was feasible to use with a feasibility level of the learning outcomes test sheet of 93.1% and a student worksheet eligibility rate of 83%.The results of the analysis of student learning mastery show that the student worksheet based on CTL in ecosystem concept categorized as complete in the completeness of thinking ability indicators with a percentage gain of 84.3%. Thus, the student worksheet based on CTL in biology learning related ecosystem concept that has been developed is feasible for use in biology learning and is effective in developing students' thinking skills.

Keywords: Biology Learning, Contextual Teaching and Learning (CTL), Worksheet

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INTRODUCTION

National education aims to improve the ability of students to become moral, healthy, knowledgeable, capable, creative, independent, and dignified human. Meanwhile, different aspects of learning implementation are needed to achieve learning objectives. One of them is education.

Teaching materials consisting of printed and non-printed teaching materials can be used as presentation materials (Majid, 2017). Therefore, teaching materials that are part of the learning process must be made interesting in their content and can encourage students to learn. In fact, the teaching aids used by educators tend to focus on used books, namely textbooks that are used from year to year. Changing the way students develop their knowledge. In addition, the textbooks used by teachers and students contain general elements that have nothing to do with students' daily lives. Curriculum in this way will be useless because students do not know what is in the textbook. The learning process so far is not as learning as it should be because learning is mostly a mental activity that a person does to bring about positive changes in behavior that are in line with the environment (Sanjaya, 2013). Especially in learning biology, students need to fully demonstrate the basic concepts of biology, be it observations, research activities, diagrams, graphic media, table media, and general activities (Lemke, 1998).

> "Each educational unit can organize learning according to the interests and abilities of students, as well as learning with competency standards and basic competencies that are developed in accordance with local potential, cultural environment, economic conditions and regional needs, so that the learning process become more meaningful." (BSNP, 2006).

With reference to mentioned above, educators can develop tools that make it easier for students to understand the characteristics of students, regional potential, culture and environment. Education for environmental improvement and preservation can be carried out in schools, including educational institutions for quality education (Haka et al., 2020).

Learning methods should be used as teaching aids or aids to assist in the provision of materials, one of which is a printed form, namely the student worksheet (Daryanto, 2013). Therefore, research that can be done to assess and maintain an environmentally friendly system can be combined with the worksheet toolkit. Therefore, the development of teaching

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aids is very important, considering that teaching aids are things that can help achieve educational goals.

Based on the observations and questions given to the seventh grade students of Nusa Penida, it is assumed that students only use books when studying, illustrated books mean something, but do not use colors, so they don't do it in a. This is interesting, and then the contents of students' general textbooks seem irrelevant to their lives, various biological points are given in the textbooks. As a result, the large number of books makes it difficult for some students to go to school. This shows the lack of various learning aids for students, thus affecting student perceptions, learning, and student success and learning outcomes.

They have never been asked directly by a biology teacher about the culture and school environment, as well as the environment, and the development of teaching materials including the environmental system has never been done. Although, it is a way of learning that suits the environment of the participants, students will easily understand the topic. In addition, researchers who interviewed seventh grade students about biology had the impression that so far biology has seemed boring because most of the teaching is only in the form of observation, not for education, especially in Nusa Penida Private Junior High School. At school, environment as environmental and systems research as the other direction. Education. Teachers at Nusa Penida Junior High School believe that the development of environmentally friendly teaching aids is very important to support learning because it allows students not only to learn but also to learn about the environment.

To achieve the educational goals of subject teachers, apart from being able to provide good teaching with learning strategies and methods, tools are also needed to be used in the teaching process such as tactic that are important in subjects style, but a learning resource for students (Murray, 2009). However, the researchers found a problem that although the teaching materials used in schools were only in the form of textbooks, textbooks could help students in the learning process, but students were prone to boredom when using textbooks.

Based on the problems above, it is necessary to develop educational materials to present workhseet based on CTL. The development of teaching materials carried out is the development of an worksheet-based environment in the Medan City area. With the environment-based worksheet, it is hoped that it will facilitate the understanding of class VII students about biology related to the concept of ecosystems.

Many previous studies on worksheets have been carried out. These studies include the effectiveness of high school biology students worksheets based on critical thinking skills on the protist concept (Hariati et al., 2020), development of comic integrated student worksheet to improve critical thinking ability in microscope material (Handayani et al., 2019), developing of students worksheets through STEM approach to train critical thinking skills (Hartini et al., 2020), the development of science worksheet based on inquiry science issues to improve critical thinking and scientific attitude (Hastuti et al., 2018), and developing interactive electronic student worksheets through discovery learning and critical thinking skills during pandemic era (Subekti & Prahmana, 2021). Based on these studies, the development and application of student worksheets based on CTL and ecosystem concept have not yet been found. Therefore, researchers will examine appropriate and effective student worksheets based on CTL related ecosystem concept.

Based on the background above, the researcher will conduct research on student worksheet based on CTL in biology learning related ecosystem concept. This study aims to determine the concept, feasibility and effectiveness of student worksheet based on CTL in biology learning related ecosystem concept. This research describes a student worksheet based on CTL related to the ecosystem concept that was developed, the process and results of the student worksheet's feasibility test that was developed, as well as the process of testing the effectiveness of the student worksheet along with the results.

METHOD

This research uses research and development (R&D) methods using ADDIE (Design-Analysis-Design-Development-Implementation-Evaluation) developed by (Dick et al., 1996). The reason the researcher uses the R&D method in this research is to develop teaching materials that can be used in the research room to improve the efficiency of the teaching and learning process at Nusa Penida Private Junior High School.

This research was conducted at Nusa Penida Private Junior High School Medan, Jl. Setia Budi No. 366 Tanjung Sari, Medan Selayang District, Medan City, North Sumatra Province, Indonesia. This research was conducted to develop student worksheet based on CTL for learning biology related ecosystem concept.

The types of data in this study are qualitative and quantitative data. Both data are used as evaluation material for the development of the education system using the student

worksheet biology. Researchers used a questionnaire to obtain validated assessment data for the development of enviromental-based teaching materials on biology learning materials at Nusa Penida Private Junior High School Medan. This research tool is used to facilitate researchers in developing student worksheet based on CTL in biology learning related ecosystem concept. The data analysis technique used is expert feasibility test and effectiveness test.

FINDING AND DISCUSSION

Finding

Description of the Analysis

Phase the analysis phase tries to analyze and identify learning needs by analyzing the objectives and limitations of the object. The results of the intervention stage activities are explained as follows based on the results of the senior high school supervision student worksheet, it was found that several weak worksheets used by teachers were still in school, the school did not use the method of obtaining publications and they did so indirectly using this method. The fact that the subjects what the teacher teaches is not in accordance with the contents of the student workhseet, causing boredom and poor learning outcomes. To overcome this problem, it is necessary to develop student worksheet that meets the current requirements.

The topic of this research is the environmental subject of the 2013 curriculum. This analysis aims to define, define and formulate the ideas that students will learn about environmental objects. This concept was then adapted to the CTL method.

Description of Design Phase

Student workhseet learning activities are developed through a group-based learning approach with an emphasis on the learning process. The results of each activity at this design stage are as follows.:

a. Preparing Workhseet

The main strengths obtained in the preparation of student workhseet namely: (1) analysis of interactions between organisms and their environment and population movements resulting from these interactions; and (2) presenting observations on biodiversity and its environment.

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When collecting the student workhseet, the assessment is carried out after the course and given resources in the workhseet, the course is an environmental program, the student workhseet model was developed by a researcher called the student workhseet. Instructions and steps for learning basic mathematics and student workhseet ecosystem materials for high school students are also included in the list of student workhseet.

b. Selection of Media

Learning ecosystem needed to implement ecosystem materials including learning practices and student working papers student worksheet. Some of the props needed include: a blackboard, signs, deletions, notebooks and pens.

c. Selection of Format

The selection of the student workhseet model is based on the principles, characteristics, and steps to study related topics. The education implementation plan includes key skills, achievement criteria, learning objectives, materials, learning methods and methods, learning materials/media/markets, and learning activities. Learning activities consist of basic activities, basic activities and related activities.

1) The Study Test Sheet

Exam paper consists of lesson 1. The purpose of this study is to provide students with an understanding of the interaction between the environment and the environment, and to explain the interaction between the environment and the environment.

2) Student Worksheet

The student worksheet developed in this research are student worksheet and the general education system. Student worksheets include activities that encourage students to put their ideas into writing. Outside of activities in student workhseet, students are required to develop ideas with their friends in groups and demand everyone's responsibility.

Description of Development Stage

For each stage of student worksheet development, there are many stages of research, including the level of student worksheet certification and approval of student exams, which are defined as follows:

Approval is carried out to assess the feasibility of the student worksheet and student learning outcomes by completing the draft that has been prepared. The authors of this study are as in **Table 1**.

Table 1. Name of validator

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No	Name of Validator	Remarks
1	M. Iqbal H. Tambunan	Lecturer of Tadris Biology, State Islamic University of North Sumatra
2	Nola Afni Oktavia, S.Pd	Teacher of Biology at SMP Nusa Penida
3	Mayank Sari Fitricia , S.Pd	Biology Subject Teacher at SMP Nusa Penida

At this stage, reviewers are required to review the submitted paper, as well as provide criticism and feedback on the project prepared by the researcher. Criticisms and ideas that will be used as suggestions for reviewing, validating and promoting student worksheet achievements and CTL-based student learning outcomes, will be used as practical steps in learning to see the value of research tools developed by researchers. The researchers did.

Table 2. Revision of the learning outcomes test sheet based on the validation results suggestions from the validator

Validator	Criticism and Suggestions	Repairing
Validator 1	Pay attention to the language that is arranged so that it is easy to understand and pay attention to the answers that deceive	Language and the answer choices have been corrected
Validator 2 Corrected	Answer choices to mislead from the correct	Answer the answer choices have been changed to deceive the correct answer
Validator 3	The source of the questions used should not only be from student textbooks	The source of the questions has been corrected

The results of the study received criticism and suggestions that were taken into consideration when reviewing the research learning outcomes test sheet. Criticisms and suggestions from the validators can be seen in the **Table 2**.

Table 3. Student worksheet revision based on the results of the validation

Validator	From	Suggestions
Validator 1	Pay attention to the content, design, writing of refined spelling, foreign names and arrangement of teacher instructions	Content, design, writing of refined spelling, foreign names and arrangement of teacher instructions have been corrected.
	Pay attention to the source of images and bibliography used	Image sources have been corrected and bibliography has been compiled a
Validator 2	Page on the worksheet to make it easier for students to complete the student worksheet	The page on the student worksheet has been added

Validator 3	Add the author's name so that the student worksheet display is more attractive	The author's name in the student workshee display has been added
	Adjust the concept map to the contents of the student worksheet	The concept map has been adjusted to student worksheet

In the table student worksheet validation obtained the results of the validation test at the time of examination 1 with an average of 4.03 compared to a maximum of 5, so the percentage was 80.6% in the best category. The average of 2 is 4.12 over 5, so the percentage is 82.4% at the best level. Verifier 3 averages 3.90 out of 5, so a good percentage is 78.0%. Criticism and feedback is available to each veterinarian as a result of the student worksheet review. Criticism and advocacy are as in **Table 3**.

Based on the draft results, the quality of the learning test sheet and student worksheet are obtained, including:

1) Learning Outcomes Test Sheet Assessment Results

Results of leraning outcomes test sheet assessment from the validator can be presented for the leraning outcomes test sheet as in **Figure 1**.

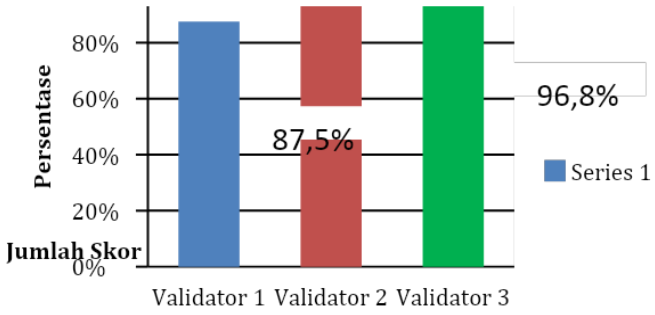


Figure 1. Learning outcomes test sheet assessment results by experts

Based on the results obtained by experts, the average percentage of fulfillment of the requirements is 93.1%. However, the preparation of this draft is still subject to criticism from parties who agree with it, so it is very important to review the project in order to be able to match the criticisms and inputs from project stakeholders.

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2) The Student Workhseet Assessment Results

Results of the student worksheet assessment from the validator can be presented for the worksheet draft as in **Figure 2**.

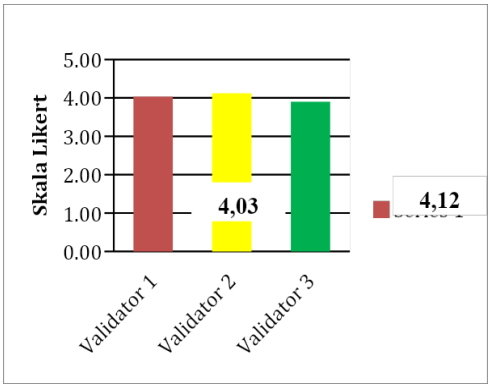


Figure 2. Student worksheet assessment results by experts

According to the expert results, from the project results in the charts and graphs above, the student worksheet project has reached 86% and the actual criteria. However, this student worksheet project is still receiving criticism from its supporters, so we need to revise the blueprint taking into account the criticisms and comments from the authors.

3) The Student Responses

Performance of the results of this study was reviewed based on the results of feedback given by students after conducting a study program using the worksheet based on CTL related ecosystem concept. Student orksheet can be reported accurately if students have scored 75%. Student scores can be analyzed to determine student learning outcomes as in **Table 4**.

Analysis results of high school students shows that the student worksheet on CTL related ecosystem concept is very good at maintaining thinking skills, with a purchasing power of 84.3%. Complete standards are emphasized because instructional practice is critical to a student's academic development. CTL learning and techniques have a positive impact on students' thinking skills (Mulyono, 2018). This is because students think about answering the questions asked by the teacher while studying, according to Amtu et al. (2020), the teacher plays a major role in student learning outcomes during the learning process. Teacher involvement is needed to guide student learning programs that provide words or phrases that can guide students in solving problems related to the subjects being studied. The words or phrases given can be in the form of questions, which are also included in one of the pillars related to research. According to Sorto et al. (2009), asking questions helps teachers gain

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knowledge about lesson management, motivation, motivation, student success, and decision making.

Table 4. Results of student response assessment

No	Material	Indicator Question	Score (%)	Category
1	Understanding	Explaining the meaning of ecosystem	100%	Very Complete
		Explaining the understanding of ecosystem balance and disturbing factors for ecosystem balance	95%	Very Complete
2	Ecosystem Components	Determines	100%	Very Complete
		Autotrophs and heterotrophs	77.5%	Very Complete
		Herbivores, carnivores, omnivores	97.5%	Very Complete
3	Types of Ecosystems	Living organisms; Individual, Population, Community, Biosphere	78.3%	Highly Complete
		Ecosystem; Sea, Lake, River, Land	75%	Complete
4	Ecosystem	Interaction Interaction between; Organisms, Populations, Components	77.5%	Very Complete
		Food Chain	95%	Very Complete
		Food Web	75%	Complete
		Food Pyramid	70.5%	Sufficiently Complete
		Symbiotic Relationship	70%	Fairly Complete
Average			84.3%	Complete

Discussion

Based on the research described above, it was conducted at SMP Nusa Penida Medan Level VII Jl. Setia Budi No. 366 Tanjung Sari, Medan Selayang District, Medan City, North Sumatra Province, Indonesia. In the past, in school education, teachers used teaching aids provided only by the school. So far, education seems boring because most schools are only standard, especially the Nusa Penida Private High School does not have a school. Use the environment as a learning tool. This research was conducted in the development of CTL teaching materials in biology study papers.

Based on learning biology, student worksheet seeks to increase the willingness to learn and facilitate student learning. Therefore, there are many stages of development that need to be carried out so that student worksheet production can achieve educational goals, in phase

research, through several stages of ADDIE development, namely; results for the next stage after analysis, analysis, design, development, implementation, and evaluation.

In the analysis stage, the purpose of this analysis is to identify issues that threaten teaching and learning activities, especially environmental materials; identify, interpret and develop learned ideas; definition of core competency and basic competencies; and set learning objectives based on core competency, basic competencies.

Next is the design stage, the worksheet design stage will be promoted in student worksheet collection and worksheet development and evaluation. Now, choosing the environment is a way to find out the environment needed to carry out learning activities by choosing core competency, basic competencies.

The next stage is the development stage. This method is used to determine the implementation of student worksheet based on learning methods and learning sheets used in the teaching and learning process. The student worksheets and knowledge tests were tested to allow approval by two expert teachers and three expert teachers. During the development, the results achieved were as follows:

a. Validation of the learning outcomes test sheet

   At the time of decision making, the results of the examination were made available to the confirming officers, in which the first auditor received 87.5% and the corresponding share, and 87.5% and the corresponding share. appropriate, 2. For the results of the veterinary examination, the used study sheet the examination.

b. Student worksheet validation

   In the student worksheet control program, Verifier 1 gets a good score of 80.6%, verifier 2 gets a score of 82.4%, and Verifier 3 gets a percentage. Indeed, the inspection result is received from the confirmation. 78.0% stock with good share. Based on the results of the examination conducted by the auditor, the student worksheet can be used after review.

c. Student worksheet effectiveness

   The results of the analysis of student learning skills show that the student worksheet based on CTL related ecosystem concept is in full-range thinking skills with a score of 84.3% and is reported to have been completed in the best part according to the criteria for completion at 3.4. student answers (Dufresne et al., 2002). Complete standards are emphasized because basic education is important in developing students' knowledge.

As a result of this high-level explanation, worksheet's high-level environmental resources can facilitate student learning activities and provide interesting student outcomes. As a result, practical learning is needed not only for effective teaching methods, but also for educational materials that contain content or tools that can motivate students to develop their mental activities. There is a cultural change, politeness in which teaching materials will provide instructions related to learning activities. Therefore, teaching aids play an important role in learning.

The contents of the worksheet include local culture or intelligence from northern Sumatra. A higher culture should be formed when compiling the 2013 curriculum, which is used in students' lives. pride and community integration (Widyastono, 2014). The use of student worksheet teaching aids will greatly assist caregivers in providing living material to students where worksheet materials can be moved according to student needs and students can study independently (Nurahman et al., 2019).

The combination of biology and natural resources can be integrated into the environment. Environmentally friendly materials are easy for students to understand (Ekantini & Wilujeng, 2018). However, things related to nature and its parts will feel boring if taught in class. Therefore, there are teaching aids that can help students better understand something, make the learning process more efficient, and explore the energy around them, imparting environmental knowledge and learning activities in the workplace.

Considering the performance of environmentally friendly materials and CTL, the development of student worksheet is used to be more effective and effective in education. Performance can be seen in the practice of teaching materials in the classroom and assesing their usefulness when used and after use (Abd Rahman et al., 2010).

Therefore, the development of student worksheet based on CTL related ecosystem concept and VII facilities at Nusa Peninda Private Junior High School Medan deserves consideration more expertly and can be used in learning. In addition, in terms of implementation, student worksheet is best used in the education sector. The use of student worksheet based on CTL after its development greatly facilitates the learning process and increases students' learning motivation.

The increase in learning outcomes is caused because the student worksheet media makes it easier for students to understand learning material, helps students get ideas, and acts

as a teacher, which in turn affects student learning. The importance of student worksheet as a tool for building student knowledge is clear.

From the point of view above, every teacher must be able to choose and use the best teaching method so that students can receive and understand the information provided by the teacher, so that the teaching and learning process runs smoothly**.**

CONCLUSION

Research on student worksheet based on CTL in biology learning related ecosystem concept has been carried out. Based on the results of the expert validation analysis, it shows that the feasible student worksheet based on CTL related ecosystem concept developed is feasible to use with a feasibility score of the learning outcomes test sheet of 93.1% and a student worksheet feasibility of 80.3%. While the results of the analysis of student learning activities show that the student worksheet based on CTL related ecosystem concept is categorized as complete in terms of the completeness of the indicators of thinking ability, with an acquisition percentage of 84.3%. Thus, the student worksheet based on CTL in biology learning related ecosystem concept that has been developed is feasible for use in biology learning and is effective in developing students' thinking skills. Student worksheet based on CTL in biology learning related ecosystem concept can be an alternative in learning biology.

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