Development of Student Worksheets with Contextual Teaching and Learning Approach for Learning Ecosystem

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Abstract: Biology learning at SMAS Taman Siswa Sukadamai has not used worksheets as teaching materials, teachers only use textbooks in the learning process so that the teacher-centered biology learning process becomes uninteresting and monotonous. This study aims to produce ctl-based worksheets on ecosystem material. The model used in this study is the ADDIE development model which consists of 5 stages, namely analysis, design, development, implementation and evaluation. This research data collection technique through interviews, observation, questionnaires and tests. The research results based on the assessment of material experts obtained a score of 88% and media experts by 92% with the category very suitable for use in learning. The teacher and student assessment responses during the try-out obtained a score of 90% for teachers and 83.37% for students in the very practical category for use in learning. The results of applying the CTL-based LKPD on ecosystem material to student learning outcomes obtained quite effective results with an n-gain value of 0.67 in the quite effective category. It can be interpreted that CTL-based worksheets on ecosystem material are very feasible and can be used in the learning process.

Keywords: student worksheet, Contextual Teaching and Learning, Biology learning.

Abstrak: Pembelajaran biologi di SMAS Taman Siswa Sukadamai belum menggunakan LKPD sebagai bahan ajar, guru hanya menggunakan buku paket dalam proses pembelajaran sehingga proses pembelajaran biologi yang terpusat pada guru menjadi tidak menarik dan monoton. Penelitian ini bertujuan untuk menghasilkan LKPD berbasis ctl pada materi ekosistem. Model yang digunakan dalam penelitian ini adalah model pengembangan ADDIE yang terdiri dari 5 tahapan yaitu analisis, desain, pengembangan, implementasi dan evaluasi. Teknik pengumpulan data penelitian ini melalui wawancara, observasi, angket dan tes. Adapun hasil penelitian berdasarkan penilaian ahli materi memperoleh skor sebesar 88% dan ahli media sebesar 92% dengan kategori sangat layak digunakan dalam pembelajaran. Respon penilaian guru dan siswa saat uji coba mendapatkan skor sebesar 90% untuk guru dan 83,37% untuk siswa dengan kategori sangat praktis untuk digunakan dalam pembelajaran. Hasil penerapan LKPD berbasis CTL materi ekosistem terhadap hasil belajar siswa memperoleh hasil cukup efektif dengan perolehan nilai n-gain sebesar 0,67 dengan kategori cukup efektif. Dapat diartikan bahwa LKPD berbasis CTL materi ekosistem sangat layak dan dapat digunakan dalam proses pembelajaran.

Kata kunci: lembar kerja siswa, contextual teaching and learning, pembelajaran biologi.

▪ **INTRODUCTION**

Education is a learning effort in developing a child's potential in accordance with civilization (Widya, Education, & Volume, 2019). In the process, education can be carried out in the family, school or community with the involvement of all parties so that the expected process of developing self-potential can be realized (Koerniantono, 2019). The implementation of education can be carried out by involving elements of the heart (feeling), physical elements (doing) and elements of the mind (thinking) so that a

character is formed that fulfills the involvement of these elements (Wekke, 2017). By involving all aspects followed by the process, education can take place well.

The aim of education is to improve the quality of human resources in accordance with developments assisted by the existence of educators as the key to the success of education through the learning process (Mulyawati & Purnomo, 2021). In implementing learning, an educator must be able to plan an effective and creative learning process through designing teaching materials that stimulate students to be active and think during the learning process (Pentury, 2017). The learning process will require the ability of a teacher to carry out the learning process. The learning process should pay attention to human elements, materials, facilities, equipment and the stages where all these elements must be related so that learning objectives can be achieved (Valen & Satria, 2021). Activities in learning can be carried out with activities chosen by educators by paying attention to materials, teaching materials and students' conditions (Fakhrurrazi, 2018). The learning tools that educators must prepare before learning can be in the form of competencies in planning and managing learning in a measurable and realistic way (Pardede, Br. Sitompul, Pinem, & Putrika, 2020).

Biology is a field of science that studies natural knowledge that discusses life from various points of view (Febrianti, Karyadi, & Kasrina, 2018). Biology is a science field that involves learning experiences in understanding various scientific concepts and processes (Candrawati, 2020). In the learning process, biology requires a series of activities that support the achievement of the expected learning such as exposure (Norhasanah, 2018), namely biology learning guides students to be able to explain through observation and experimentation activities on living object study objects and processes that occur in life.

Problems in the implementation of learning, especially learning biology, namely the lack of appropriate teaching materials in the school so that the learning process is carried out only centered on the teacher using learning resources in the form of books only so that students find it difficult to understand the material, this is in line with the presentation (Jayawardana, 2017) which explains that the impact of conventional learning will result in low student understanding. Learning with conventional methods like this makes students experience boredom which results in a lack of achievement of the expected learning objectives (Raihany, Widjaya, Meliya, & Andi, 2022). In overcoming this problem, it can be done by making teaching materials that pay attention to the characteristics and environment of students (Trinaldi, 2022). Teaching materials are interpreted as a form of material made by educators by paying attention to the appropriate curriculum so that students can be expected to use it in independent learning (Nuryasana & Desiningrum, 2020). There are various types of teaching materials, for example printed teaching materials such as modules, LKPD, books, etc. or non-printed teaching materials, such as radio, LPs, etc. Student worksheets, which were previously known as student worksheets, are printed teaching materials that are made systematically by following the basic competencies and core competencies used in schools (Hu, ALfian Hadi, Jauhari, & Huri, 2020).

Innovative learning processes can be carried out in various ways, for example by using teaching materials that attract students' interest, such as teaching materials based on Contextual Teaching and Learning, namely teaching materials that connect biology material with real life. The CTL approach is a learning design with linkages between

material and real life so students can make connections between the two (Agustina, Suastika, & Triwahyuningtyas, 2019). Learning that is assisted by the CTL approach will be able to make students create knowledge within themselves through the activities carried out (Widiastuti, 2021). CTL (contextual teaching and learning) is a contextual teaching and learning system based on the philosophy that everyone is capable of learning and is able to learn well if they know and can grasp the meaning of each lesson given. Students in this learning will go through a process of experiencing, then it will be applied in real problems with the roles and responsibilities of these students (Nurmawarni, 2019).

The CTL approach is a learning concept that assists educators in associating material with the real world so that it makes it easier for students to understand the material through 7 components namely; constructivism, asking, finding, learning communities, modeling, reflection and actual assessment (Sihono, 2004). The use of the CTL approach will make it easier for students to find concepts, as is the opinion of (Sunaryo & Fatimah, 2018) who explained that through the application of CTL in learning it will help students make connections with the knowledge they have with the application of everyday life in society. (Farida, 2017) explains that learning with the CTL approach used will make students active in the learning process through group work, discussion and mutual correction.

Based on the results of interviews and observations that have been carried out at SMAS Taman Siswa Sukadamai, problems were found in the learning process, namely the lack of interest and limited time for educators to develop teaching materials so that learning is only centered on the teacher who only uses the lecture method, (Farid & Sudarma, 2022) explains that a teacher-centered learning process will have an impact on low interest and learning outcomes. Learning that is done conventionally will make learning boring so that it will be difficult for students to understand the material being taught (Magdalena, Sundari, Nurkamilah, Ayu Amalia, & Muhammadiyah Tangerang, 2020). In the observations made, it can be seen that the understanding of biological material using the lecture method cannot be understood, this is in line with the elaboration (Triyanti & Nulhakim, 2018) that the learning process is only teacher-centered causing students to only be given the opportunity to ask questions at the end of learning, causing a lack of attention students during the learning process and impact the lack of understanding of students. That is why it is necessary to select appropriate biology teaching materials by paying attention to the characteristics of students so that learning can be carried out smoothly.

As with the explanation of the problem above, it is necessary to develop student worksheets based on contextual teaching and learning on ecosystem material as a solution offered to biology teachers at SMAS Taman Siswa Sukadunia and have been approved. The teaching materials developed based on contextual teaching and learning are teaching materials that contain a contextual teaching and learning approach, namely an approach that connects learning material with the surrounding environment so that it can generate a sense of interest and implementation in applying these activities in everyday life (Ambarwati & Rochmawati , 2020).

This research is supported by relevant previous research, namely; 1) Research explaining that student worksheets with a contextual approach are valid and appropriate for use in classroom learning (Nareswari, Suarjana, & Sumantri, 2021). 2) Research

related to the development of CTL-based worksheets that has been carried out has found that the use of CTL-based worksheets has a potential effect on student learning outcomes (Antari, Muslimin, & Rukmala, 2022). 3) research related to the development of CTL-based learning tools that have been developed shows that learning tools prepared using the CTL approach can help students in problem-solving skills (Liiman, Mulyono, & Napitupulu, 2022). The purpose of this study is to produce CTL-based worksheets on ecosystem material that are feasible and practical and can be used in biology learning in particular.

▪ METHOD
Participant

This development research was conducted in class X MIPA 1 SMAS Taman Siswa Sukadamai in the 2022/2023 academic year. The subjects of this study amounted to 24 students. The sampling technique in this study was carried out through interviews, observation, questionnaires and tests.

Research Design and Procedures

This development research uses the ADDIE model which consists of 5 stages, namely Analysis, Design, Development, Implementation, and Evaluation. According to (Sugiyono, 2011) explained that R&D research and development is used to produce a product such as books, stationery or other learning tools. This research was conducted in the even semester of 2022/2023.

Instrument

This development research uses instruments in the form of validation sheets (material experts and media experts) which aim to obtain an assessment from a team of experts regarding the product being developed with the aim of knowing the feasibility of the product, questionnaire sheets with the aim of knowing opinions and responses to the product being developed and test sheets used to obtain data related to students' abilities.

Data Analysis

The types of data in this study are quantitative and qualitative, quantitative is a type of data that can be measured and calculated obtained from validator scores, questionnaires and student assessments while qualitative is the exposure of criticism, the validator's suggestions for the product being developed. using the ADDIE development model.

▪ RESULT AND DISSCUSSION

This study uses a development model with the ADDIE design which has 5 successive stages as shown below:

Analysis

In this analysis stage it is reviewed through needs analysis and curriculum analysis. Needs analysis was carried out through interviews with class X biology teachers at SMAS Taman Siswa Sukadamai. The results of the interviews found that in the biology learning process they had not used LKPD as teaching materials but only

used textbooks so that they needed the development of teaching materials as a solution to problems in learning biology in class X. Then an analysis of the curriculum was carried out in schools with the result that SMAS Taman Siswa Sukadamai using the 2013 curriculum in learning. Curriculum analysis is carried out with the aim of knowing what the subject matter of ecosystems will be studied so that it can be concluded that the product developed will contain basic competencies which include discussions about ecosystem components and interactions between components, products developed also contain related presentations of works that show interactions between components ecosystem so that it can be used properly as stated by (Ratnasari, Linggawati, & Amelia, 2019) which explains that analysis needs to be done so that student worksheets are developed based on the competencies that students must achieve during the learning process. The indicators in the product being developed are that students are expected to be able to identify the components of the ecosystem, be able to explain the types of interactions between biotic components and students are expected to be able to present papers on the interactions between ecosystem components.

Design

After completing the analysis phase, then proceed to the design stage, while the specifications to be made are student-based worksheets with contextual teaching and learning approach. Product design is carried out after determining and stabilizing the material, then proceed with the initial planning in making products in the form of student worksheets that are designed according to basic competencies, syllabus and learning material for class X SMA/MA. Student worksheets with contextual teaching and learning consist of 7 syntaxes namely constructivism, finding, asking, learning communities, modeling, reflection and actual assessment. The design is carried out as attractive as possible by involving important components that must be in LKPD so that learning objectives can be achieved and learning becomes fun, such as the presentation (Khadijah, Ismail, & Resmawan, 2020) which explains that the teaching materials developed must consider the suitability of the format and attractiveness so that the results learning can be maximized.

According to Gani (in Fadhila et al., 2022) content design needs to be done well so that the entire initial design can be developed according to product design. This product was developed by taking into account the scope of discussion such as ecosystem components, interactions within ecosystems and the flow of energy within ecosystems. This CTL-based student worksheet was developed using A4 paper (21 cm x 29 cm) with Times News Roman writing type and writing size 12 with a cover display showing the material and supplemented with pictures which are personal documents. The software used is Microsoft word 2010, the hardware device used is a printer machine.
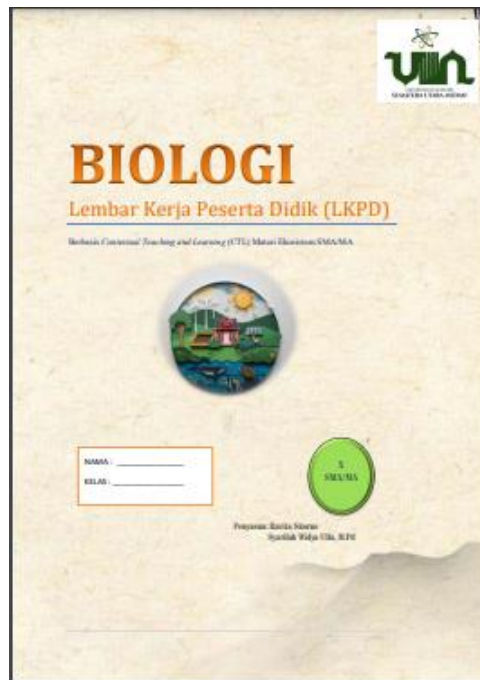
Figure 1. Cover of the student worksheet

Development

The development stage is a product realization sateg before use, this is in line with the opinion (Hidayat & Nizar, 2021) that the development stages are carried out in order to produce and validate learning resources. At this stage it produces a product in the form of a CTL-based LKPD on ecosystem material. Expert assessments and responses from educators and students are carried out to determine the feasibility of the product and the practicality of the product being developed as a basis for making improvements according to criticism and suggestions, this is in accordance with the explanation (Arigiyati, Kusmanto, & Widodo, 2019) which explains that a product must be validated to assess the material, appearance and effectiveness of the product. Below are the results of the validation based on expert judgment:

Material expert assessment

Material validation was carried out by a Biology lecturer who provided assessments, suggestions and comments on the material on student worksheets with contextual teaching and learning which is developed through 4 aspects namely content feasibility aspects, contextual nature aspects, student involvement aspects, and language aspects. The assessment is carried out by filling out the validation sheet provided. In the content feasibility aspect, there are 3 items and a sub-total score of 19. In the contextual nature aspect of the developed product, it contains 4 assessment items and a sub-total score of 17. In the aspect of student involvement in the product being developed, it contains 8 assessment items, obtaining a sub-total score of 35. In the language aspect there are 4 assessment items on the product being developed, obtaining a subtotal score of 17. The overall score on the material expert's assessment obtained is 88. If it is presented with the total score obtained divided by the maximum score then multiplied

by 100 to obtain 88% with a very feasible category with a few revisions, this is in line with research conducted (Waidah & Sawitri, 2020) that 84% eligibility was obtained from media experts and 90.69% from material experts, so based on the feasibility percentage table it was declared "Very Eligible" .

Media validation

Media validation was carried out by expert who assessed the product being developed based on aspects of student worksheet size, cover design and content design as well as content illustrations through a validation sheet that was provided along with the product being developed. In the aspect of student worksheet size that was developed, there were 2 assessment items and a sub-total score of 9 was obtained. In the cover design aspect of the product being developed, there were 7 assessment items and a sub-total score of 32 was obtained. In the content design aspect of the product being developed, there were 6 items assessment, get a subtotal score of 28. In the illustration aspect of the content there are 5 assessment items and get a subtotal score of 23. The overall score on the media expert's assessment of the product being developed is 92. If it is percentaged by the total score obtained divided by the maximum score then multiplied by 100 92% results were obtained in the very feasible category with a few revisions, this is in accordance with research (Biology, For, Xii, Negeri, & Balai, 2022) which explained that the teaching materials developed received a score of 85% from the media expert validator in the very feasible category. Based on the assessment carried out by expert validators, the student worksheets with contextual teaching and learning is very suitable for use in the learning process with the results of material experts at 88% and media experts at 92%.

Educator Response

The assessment of the educator's response was carried out by the class X Biology Teacher on student worksheets with contextual teaching and learning through filling out a questionnaire to provide reviews, comments or suggestions to improve the quality of student worksheets being developed. The questionnaire given to educators contained 4 aspects, namely content feasibility aspects, language feasibility aspects, presentation feasibility aspects and graphic feasibility aspects. In the feasibility aspect of the content, there are 4 statement items that get a score of 22. In the language feasibility aspect, it contains 3 statements and gets a score of 14. In the presentation feasibility aspect, there are 10 statement items and gets a score of 46. In the graphical feasibility aspect, it contains 2 statement points and gets a score 8. Based on the assessment above, the practicality of student worksheet gets a score of 90% in the very practical category, such as research that has been conducted by (Minalti & Erita, 2021) with a result of 89.2% in the very practical category to be used to assist educators in learning.

Student Response

Student worksheets with contextual teaching and learning approach has been tested on 24 students in class X MIPA 1 by distributing a questionnaire containing 20 statements which were distributed after the use of student worksheet is carried out. As for the results of the practicality assessment of students after being calculated and matched through the practicality formula with the rating scale which is 83.37% with the

very practical category the results are in line with research (Nuriyanti, Prayitno, Tyaningsih, & Bachelor, 2022) with the research results namely the practicality of the product being developed get a practicality score of 83.75% with very practical criteria.

Implementation

This stage is the product trial stage in the field, as is the opinion of (Hidayat et al., 2021) which explains that the implementation stage is the design and method stages that have been developed in real situations, namely in the classroom. The application of student worksheets was carried out in class X MIPA 1, totaling 24 people. In learning, students are divided into several groups by being given one student worksheet with contextual teaching and learning ecosystem material as a learning resource in each group. Students carry out the learning stages according to the CTL syntax listed on the student worksheets that are distributed.

Prior to learning using student worksheets with contextual teaching and learning In ecosystem material, each student is given a pre-test question sheet, namely multiple choice questions totaling 20 questions to work on independently. Furthermore, learning is carried out using LKPD based on CTL ecosystem material in class X MIPA 1 with the end of the lesson being given a post-test, namely in the form of multiple choice questions totaling 20 questions that are worked on independently by students. The results obtained are; the number of students who took part in the pretest and posttest were 24 students. The value obtained from the pre-test is 905 with an average value of 37.7083. Meanwhile, the post-test scores totaled 1910 with an average of 79.5833, which means that the average score has exceeded the KKM. This shows that cognitive domain learning outcomes increase after using student worksheets. Based on the pre-test and post-test values in the table listed above, an n-gain value of 0.67 is obtained and meets the range of $0.30 < g < 0.70$ in the moderate category with sufficiently effective criteria. It can be concluded that student worksheets with contextual teaching and learning this can improve student learning outcomes, this is in line with research conducted by (Ulya & Rusmini, 2022) with the results of the analysis of calculating the N-Gain scores of cognitive tests and scientific literacy tests showing an increase of 0.67 and 0.60 respectively in the moderate category so that it meets the criteria of being effective and feasible to be used as a learning resource. The following below is a comparison chart of learning outcomes before and after using student worksheets.
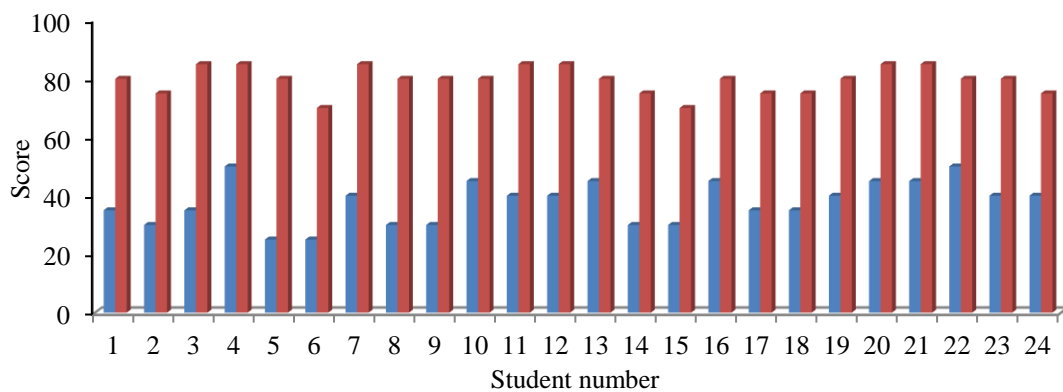

Figure 2. Students' learning outcomes in Ecosystem topics

Evaluation

At the evaluation stage, the researcher will measure the achievement of the development goals that have been carried out. The product produced in this development research is in the form of student worksheets with contextual teaching and learning. This student worksheet has several descriptions, namely:

a. Its physical form is in printed form which uses A4 paper size; space 1.5; font size 12; and Times New Roman font.

b. Products are arranged based on components of contextual teaching and learning approach which consists of constructivism (Constructivism), asking (Questioning), finding (Inquiry), learning community (Learning Community), modeling (Modeling), reflection (reflection), and the actual assessment (Authentic Assessment).

c. The product has a display consisting of a cover, preface, table of contents, list of pictures, instructions for use, competencies to be achieved, concept maps, materials, pictures, student worksheets and bibliography.

The product contains ecosystem material in accordance with the basic competencies previously described. After carrying out the field trials, the researchers made the final revision of the worksheets that had been developed through input in the form of suggestions from the validator and the results of the questionnaire, namely related to the addition of material in LKPD, this was in line with the presentation (Anita, Thahir, Komarudin, Suherman, & Rahmawati, 2021) who explained that the final stage of development is an evaluation that aims to correct weaknesses in the product being developed.

▪ **CONCLUSION**

Based on the results it can be concluded that the feasibility of using student worksheets based on the results of the validation of material experts, an average percentage of 88% is obtained with the very feasible category and the validation results of media experts are 92% with the very feasible category. The practicality of using worksheet from the results of the teacher's response, an average percentage of 90% was obtained in the very practical category and the results of the responses of students with a total of 24 students obtained an average percentage of 83.37% in the very practical category. The effectiveness of using worksheets tested through the provision of pretest and posttest questions on improving cognitive learning outcomes of students scored 37.70 with an average post-test result of 79.58. The increase in cognitive learning outcomes is included in the moderate category with an average n-gain test value of 0.67 which is quite effective. As for the suggestions given to educators, they should be able to make teaching materials that are in accordance with the characteristics of students in the learning process, suggestions for Biology learning, it is better if the application of biology learning is carried out to be designed as attractive as possible by involving students' activeness which can be done by using teaching materials that are creative and innovative so that learning does not cause boredom.

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