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DEVELOPMENT OF STUDENT WORKSHEET BASED ON GUIDED INQUIRY USING ARTICULATE STORYLINE IN FUNGI SUBJECT MATTER FOR TENTH GRADE AT SMAN 2 PLUS PANYABUNGAN

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ABSTRACT

This study aims to determine the feasibility of worksheets based on guided inquiry using Articulate storyline on fungi material. This study uses the ADDIE development model which consists of five steps, namely analysis, design, development, implementation, and evaluation. The results showed that teachers and students needed worksheet so that the worksheet was designed based on guided inquiry. The validation of material experts, learning experts, and design experts are in the very good category with an average score of 96.87%, 96.87%, and 88.46%. The biology teacher's assessment obtained an average of 98.4% which was included in the very good category, and the student response to the worksheet obtained an average of 96.07% which was included in the good category. The product developed is effective in achieving learning indicators on fungi subject matter in terms of the N-gain test with a medium category of 0.65%. So, it can be concluded that worksheet is suitable for use in the learning process.

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INTRODUCTION

The development of an increasingly advanced era redemands the availability of qualified and competent human resources in various fields. The availability of quality human resources is closely related to education. Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious-spiritual strength, self-control, personality, intelligence, noble character, and skills needed by themselves, society, nation, and state (Kurniawan and Noviana, 2017) Education plays an important role in the process of developing the potential that exists in each individual through the learning process that takes place at school and outside of school. In addition, education at this time is required to be able to create a generation that is skilled in using technology (Antika, et al., 2020). The important role of education requires efforts to improve the quality of education, either through curriculum evaluation or completing learning support like learning strategies, completeness of learning tools and teaching materials. In this era the learning process need in the form of students-center learning, so that students are expected to be able to build their knowledge. One of the learning strategies that support the learning process is inquiry. On the other hand, the learning strategies are supporting by the learning tools and teaching materials, to make the meaningful learning process for student to achieve learning objectives.

One of the teaching materials that can be used to build students' knowledge in the learning process is the student worksheets. Student worksheets have long been used in teaching practice. Therefore, worksheets must also be dynamic following current learning needs (Patresia, et al., 2020). Student worksheets used in schools is usually made in printed form, so according to Lathifah, et al. (2021) to optimize student worksheets both in terms of appearance and quality of learning, worksheets require transformation based on the convergence of information and telecommunications technology. In this transformation, printed worksheets can be replaced with interactive worksheets. The use of student worksheets in digital form of course provides benefits for students to obtain information without being limited by space and time. According to Thomas and Israel (2014) the use of audio-visual aids like digital worksheet in sciences has been found to be an effective way of communicating ideas and concepts to students.

Researcher have conducted interviews with biology teachers at SMAN 2 Plus Panyabungan. Based on the results of the interviews, it can be seen that the school has used the 2013 curriculum. Biology teachers have used student worksheets in the learning process as teaching materials and have designed their student worksheets, but there are no materials in biology learning that already have student worksheets designed using articulate storyline. So, the researcher will produce the student worksheet in fungi for tenth grade. The worksheets available at the school use a scientific approach and are still in printed form, but it is stated that not all students can build their knowledge through the use of the student worksheets. Teachers have difficulty dividing the time for applying worksheets in the learning process, so sometimes worksheets are completed outside the learning process in class.

Researcher also received information that in the limited learning process that took place during the pandemic, teachers rarely used student worksheets. This is related to the worksheet available is in printed form, and teachers still find it difficult to adapt the student worksheets in limited online learning. So, the researchers concluded that student worksheets in digital form are needed to support the learning process.

Researcher will produce a digital student worksheet using the articulate storyline application based on the guided inquiry. The articulate storyline application is used to make this worksheets because in this application the designer can design their own worksheets, then can adding files in the form of images, videos, animation, simulation, and audio. This learning strategy prioritizes the problem-solving process, it will train students' critical thinking and problem-solving skills, so that they can build their knowledge.

Ali's research (2014) on the development of student worksheets based on inquiry got the results in the form of completeness of student learning outcomes that got a percentage of 86.67% and a positive student response of 89.47%. Then the research of Yasin & Ducha (2017) showed that interactive multimedia developed using Articulate Storyline on the reproductive system subject matter is stated to be very deserved with a score of 3.94.

METHOD

This research is research and development, to make student worksheets on the topic of fungi by adapting the ADDIE development model. Subjects in this study involve several validators, consisting of material expert validators, learning expert validators, media expert validators,

biology teacher at SMAN 2 plus Panyabungan, and 34 students. The object of this research is student worksheets based on guided inquiry that produced by the researcher. Data collection technique were in the form of validation sheet by expert, assessment by teacher, student response questionnaire, and test.

The research procedure is carried out to produce student worksheets based on guided inquiry using articulate storyline with the ADDIE development model, namely 1) analysis, In the analysis stage the need analysis and curriculum analysis are carried out. 2) Design, in this stage the researcher is begun to design student worksheets and then arrange them with the results of the analysis that has been done. Student worksheets are designed and arranged in the articulate storyline 3 application. In here will make material collection, format selection and instrument formulation. 3) Development, at this stage the worksheet that has been design will validate bay material expert, education expert, and media expert, also will assess by the biology teacher. 4) Implementation, at this implementation stage, small group trials are conducted. A small group trial is carried out with a total of 6 students and the large group trial is carried out 34 students. 5) Evaluation, this is done to find out the indicator achievements after using student worksheets based on guided inquiry using articulate storylines.

Validation of student worksheets products obtained by material experts, education experts, media experts, and biology teachers in the form of descriptive data through validation sheets. The data is obtained in the form of a checklist which is summarized in the form of a Likert scale.

Table 1. Assessment criteria for eligibility of answer validation instrument item with Likert scale

Number	Answer	Score
1	Very Good	4
2	Good	3
3	Deficient	2
4	Not Good	1

Calculate the level of validity according to the following formula.

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

Information:
P = Score presentation
f= Number of answer scores obtained
N= Maximum number of scores

Table 2. Percentage of validation of student worksheet by material expert

Scale Range	Percentage (%)	Criteria
14≤ X ≤24,5	23,72≤ X ≤41,52	Not Good
25,5≤ X ≤36	43,22≤ X ≤61,01	Deficient
37≤ X ≤47,5	62,71≤ X ≤80,50	Good
48,5≤ X ≤59	82,20 ≤ X ≤100	Very Good

Table 3. Percentage of validation of student worksheets by education expert

Scale Range	Percentage (%)	Criteria
16≤ X ≤28	23,88≤ X ≤41,79	Not Good
29≤ X ≤41	43,28≤ X ≤61,19	Deficient
42≤ X ≤54	62,68≤ X ≤80,59	Good
55≤ X ≤67	82,08 ≤ X ≤100	Very Good

Table 4. Percentage of validation of student worksheet by media expert

Scale Range	Percentage (%)	Criteria
13≤ X ≤22,75	23,63≤ X ≤41,36	Not Good
23,75≤ X ≤33,50	43,18≤ X ≤60,90	Deficient
34,50≤ X ≤44,25	62,72≤ X ≤80,45	Good
45,25≤ X ≤55	82,27 ≤ X ≤100	Very Good

Table 5. Percentage of validation of student worksheet by biology teacher

Scale Range	Percentage (%)	Criteria
16≤ X ≤28	23,88≤ X ≤41,79	Not Good
29≤ X ≤41	43,28≤ X ≤61,19	Deficient
42≤ X ≤54	62,68≤ X ≤80,59	Good
55≤ X ≤67	82,08 ≤ X ≤100	Very Good

In analyzing the student response questionnaire to the student worksheets designed are as follows. The data is obtaine in the form of a checklist summarized in the form of a Guttman scale with alternative answers "Yes" and "No".

Table 6. Criteria for instrument answer by the Guttman scale

Number	Answer	Score
1	Yes	1
2	No	0

Calculate the level of validity according to the following formula.

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

Information:
P = Score presentation
f= Frequency being search for the percentage (number of students giving “Yes” answer)
N= Total Students

Table 7. Percentage of student worksheets assessment indicators from student response questionnaires

Score Range	Percentage (%)	Criteria
0≤ X ≤7,5	0≤ X ≤46,87	Not Good
8,5≤ X ≤16	53,12≤ X ≤100	Good

The student worksheets that have been designed then tested for the influence in the learning process through experimentation with a one-group pretest-posttest design. This test is conducted with the aim of obtaining information about learning indicator achievement. The results of student understanding are analyzed using gain score.

$$\text{Gain score} = \frac{Score\ of\ posttest - score\ of\ pretest}{Maximum\ Score - Score\ of\ Pre\ test}$$

Table 8. N-gain assessment criteria

Score Range	Criteria
g ≤ 0,30	Low
0,31≤ g ≤0,75	Medium
g≥0,76	High

RESULTS AND DISCUSSION

Need and Curriculum Analysis

The implementation of the 2013 curriculum, especially in biology subjects, has demanded student-centered learning, which previously was based on teacher-centered learning. To realize student-centered learning activities, the 2013 curriculum-based learning must contain and develop four basic skills in accordance with 21st-century skills, namely character strengthening education, 4C (Creative, Critical thinking, communicative, collaborative), high order thinking skills, and literacy (Muhimatul ,2017). The purpose of implementing the 2013 curriculum can be carried out well, if it is supported by strategies and learning models as well as appropriate learning tools. One of these learning tools is a worksheet. According to Annafi in Ramdhani, et al. (2021), the application of worksheets in the learning process will not give satisfactory results if it is not accompanied by the use of appropriate learning models. In accordance with the previous explanation, that learning in the 2013 curriculum focuses on developing science process skills through a scientific approach, one of the learning models relevant to the scientific approach is guided inquiry. According to Estitika, et al. (2022), the stages in the inquiry learning model are identical to aspects of science process skills, which include; observation, classification, asking questions, hypothesizing, planning experiments, using material tools, applying concepts, communicating, and conducting experiments, so that they can be used to improve science process skills.

At this stage, an analysis of the teaching materials used by SMA N 2 Plus Panyabungan is carried out. Based on interviews conducted with teachers, it is known that SMAN 2 Plus Panyabungan has implemented worksheets in the learning process on several biology materials. The approach used is a scientific approach. However, in online learning that was carried out during the pandemic, the teacher said that the use of worksheets was very limited, so worksheets were needed that could be used in online learning. The results of the analysis of student needs also showed that 96.6% of students needed worksheets in the learning process, 86.6% of students also stated that the use of worksheets in learning made them better understand the material presented, 93.3% of students stated that they requires a different learning experience in using worksheets, and 100% of students stated that they needed worksheets that not only contained questions and materials but also contained practicum and exploration activities. 93.3% stated that students need worksheets that can be accessed easily anytime and anywhere. Curriculum analysis is carried out to adjust the content and material of the worksheets with the curriculum used in the school concerned. Based on observations that have been made at SMAN 2 Plus Panyabungan, the curriculum used is the 2013 curriculum. The basic competencies that will be achieved in worksheets based on guided inquiry refer to the regulation of the Minister of Education and Culture of the Republic Indonesia number 69 of 2013. The basic competencies that must be achieved in fungi material are 3.7 grouping fungi based on characteristics, reproduction methods, and linking their roles in life, and 4.7 presents a report on the investigation result of the diversity of fungi and their role in life. Based on this, it can be seen that the learning activities in this material are focused on exploration activities and various types of fungi based on their morphological characteristics. So, it takes a learning model that is in accordance with this material, a learning model that contains exploratory activities so that students can construct their own knowledge about the diversity of morphological characters of each fungal species found from the results of learning activities, and observations, and the guided inquiry model is a suitable model in this material.

Design of Worksheet

Design is the second step that is carried out after the curriculum analysis and needs analysis stages. At this stage, worksheets and instruments are designed based on the results of needs analysis and curriculum analysis. At this stage the researcher designed the fungi worksheet using the Guided Inquiry approach using an articulate storyline, the guided inquiry approach was chosen on the fungi material because in Metaputri and Garminah (2016) explained several advantages of guided inquiry learning, namely helping students to build mastery of skills and cognitive abilities, helping students to improve themselves according to their abilities, being able to motivate students in learning because they are directly involved, and lastly is student-center learning. This is in line with the objectives of the 2013 curriculum, which is to encourage students to be better able to observe, ask questions, reason, and communicate (present) what they get or know after receiving learning materials at school.

At this stage, the worksheets development process begins. The design stage aims to design the fungi worksheets that were developed by determining the components needed in the preparation of this fungi worksheet. The components of the presentation of the worksheets consist of:

a. The opening section consists of an intro in the form of a video symbolizing the State University of Medan, then an opening menu containing worksheets titles, play icons, creator info, and icon instructions. Furthermore, there is the login menu, in this section students will be asked to fill in the name and password of the application.
b. The Contents section consists of several menus, namely basic competencies, indicators, worksheets instructions, and activity sheets consisting of 2 activities.
c. Closing section which contains the bibliography.

The activities on the worksheets emphasize the learning process using guided inquiry which consists of several components. In this worksheet the guided inquiry is design as follows:

a. Orientation, in the orientation section, the text is given as a trigger for students to arouse curiosity and can formulate questions from the text given. In the first activity in the worksheet, reading texts and pictures are given regarding cases of mushroom poisoning that have occurred in Indonesia, then in the second activity, texts are given about mushroom cultivation houses. The first activity aims for students to be able to identify the morphology of poisonous mushrooms and edible mushrooms so that they can classify these mushrooms into the toxic category or not through their morphology. Then, activity two aims to make students know the cultivation and role of mushrooms in life.
b. Formulating the problem, in this section students are asked to formulate a problem in the form of questions according to the questions that arise after they read the text and observe the pictures given in the orientation section. In the first activity, researchers expect that students will raise questions such as how the characteristics of poisonous mushrooms and edible mushrooms differ morphologically, then what mushrooms contain so it can cause poisoning. In this activity, the two researchers expect that students will raise questions such as how to cultivate mushrooms, what are the roles of other fungi besides being food, and what nutritional mushrooms have so that they are very beneficial for health.
c. Formulating hypotheses, in this section the researcher designs so that students will make temporary answers to the problem formulations they have made. In this worksheet the researcher expects students to make hypotheses using the information they get from other relevant readings.
d. Collecting data, in this section, the researchers designed an experiment conducted to collect data that would help them answer the questions that arose earlier. In activity one, practicum activities were carried out on the identification of poisonous mushrooms and edible mushrooms. In the second activity, students carried out data collection activities in the form of the role of mushrooms in various fields by making posters about the role of mushrooms in various fields. This will also support the achievement of indicator 4.7, namely making a report or project regarding the role of the line in life.
e. Test the hypothesis or make a discussion, in this section some questions related to the information they need to know related to the experiments carried out in the data collection section are given. In this section, students are asked to be able to integrate their initial knowledge with the new knowledge they find.
f. Formulating Conclusions, in this section, students are asked to make conclusions based on the activities they have done, the conclusions made must be in line with the formulation of the problem made previously.

Development of Worksheet

At the product development stage, a worksheet has been completed as planned. Furthermore, the product is validated by an expert validator and assessed by a biology teacher. The average percentage score from expert validation and teacher assessment can be seen in the graph .

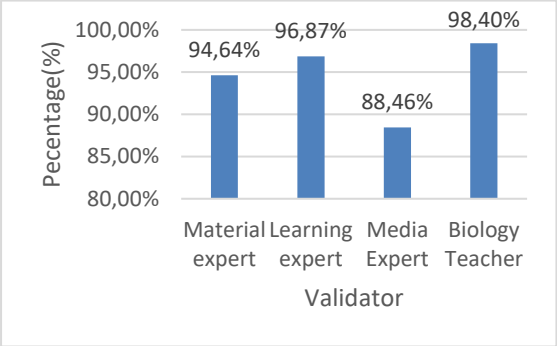

Figure 1. Graph for score average from expert validator and biology teacher

The validation results from material experts obtained an average of 94,64% which is categorized into the very good category. There are two aspects that are assessed by material experts, namely the feasibility of content and linguistics. In the aspect of content feasibility, an average assessment of 95,45% which is included in the very good category, which means that the designed worksheets are in accordance with the basic competencies and learning indicators in the fungi material, and the fungi material on the worksheets is clearly arranged, equipped with examples, pictures, concepts, and facts that are appropriate to those proposed by Devi (2010) the material contained must be presented systematically and logically. In the linguistic aspect, an average rating of 91.66% is obtained which is included in the very good category. In terms of language, the material expert stated that the developed worksheet had met the constructive requirements, based on what was stated by Pawestri and Zulfiati (2020) including the language structure used was in accordance with scientific and EYD rules, the use of language that was in accordance with the maturity level of students, and using a clear sentence structure. So, it will make it easier for students to catch what worksheets imply and have clear learning objectives.

The validation results from learning experts obtained an average of 96.87% which was categorized into the very good category. There are three aspects that are assessed by learning experts with several indicators. These three aspects are content feasibility, guided inquiry learning components, and language. In the aspect of the feasibility of the content obtained an average rating of 100% which is included in the very good category. According to Pawestri and Zulfiati (2020), one of the requirements for a worksheet to be included in the good category is the fulfillment of didactic requirements. Based on the assessment of learning experts, this fungus worksheet has met the didactic requirements which include the worksheet is in accordance with the basic competencies and indicators, the worksheet is in accordance with the intellectual development of students, the worksheet emphasizes the process or discovery of concepts, and the worksheet creates learning interactions or student involvement, so that improve communication skills between students. In the aspect of the guided inquiry learning component, an average assessment of 92.85% is obtained, which is included in the very good category. In this case, the steps and concepts of guided inquiry learning have been contained in the fungus worksheet which was developed including the orientation stage, formulating problems, presenting hypotheses, collecting data, testing hypotheses, and making conclusions (Sanjaya, 2006). The last aspect that was validated by learning experts was the linguistic aspect, which obtained an average rating of 100%, which was included in the very good category. In terms of linguistics, learning experts stated that the developed worksheets had met the constructive requirements, based on what was stated by Pawestri and Zulfiati (2020). The language structure used was in accordance with scientific and EYD rules, the use of language in accordance with the maturity level of students, and using a clear sentence structure.

The validation results from media experts obtained an average of 88.46%, which was categorized into the very good category. There are three aspects that are assessed by media experts with several indicators. The three aspects are presentation component, writing display, and layout. In the component presentation aspect, an average rating of 100% is obtained which is included in the very good category. In the aspect of writing display, an average rating of 81.25% is obtained which is included in the very good category. The last aspect is the layout aspect, with an average rating of 82.25% which is included in the very good category.

Based on the assessment of the biology teacher, it was found that the worksheets developed were in the very good category with an average score of 98.4%. The aspects assessed by the biology teacher consist of four aspects, namely

the presentation assessment component with an average score is 100%, content feasibility with an average score is 100%, the component of learning based on guided inquiry with an average score is 96.4%, and language aspect with an average score is 100%. The score given is included in the very good category, which means that according to the teacher's assessment the worksheets developed are suitable and can be used in the learning process.

Implementation of Worksheet

Based on the results of product trials in small groups, it was found that the product was in the good category with an average percentage of 94, 44% with the aspects assessed were worksheets display ad presentation, worksheet content, and language. From these three aspects, 3 out of six respondents responded with a score of 100%, meaning that the display and presentation, content, and language worksheets were appropriate according to the respondents.

Based on the results of the large group trials, the worksheet was declared good with a worksheet display and presentation is 99,16%, worksheets content is 92,15%, and language aspect is 97%. The average percentage of worksheets assessment is 96.07% is included in the good criteria. Aspects that are responded by students consist of three aspects, namely the appearance and presentation of worksheets, with an average score of 99.16%, included in the good category. Based on this, students responded that the worksheets based on guided inquiry made with articulate storylines were interesting, and easy to use, also the instructions for working were easy to understand. Then from the aspect of the contents of the worksheet obtained an average score of 92.18%, which is included in the good category. Based on this, students responded that worksheets based on guided inquiry made with articulate storylines motivate students to interact and cooperate, then direct them to find concepts in the function material, and make them play an active role in learning. The last aspect is the language aspect, with an average score of 97.06%, which is included in the good category. Based on this, students responded that the worksheets based on guided inquiry made with an articulate storyline in terms of language were easy to understand by students and the language used was communicative.

Evaluation

The use of worksheets for class tenth, students of SMAN 2 Plus Panyabungan provides an increase in the achievement of fungi material indicators, this can be seen from the average value of students' abilities before and after using the worksheet. Analysis of student achievement indicators is tested with the N-gain test. The results of the gain score analysis show the achievement of fungi material indicators through increasing students' understanding by paying attention to initial abilities.

Table. 9 The result of N-gain test

Gain	Criteria	Amount
g ≤ 0,30	Low	1
0,31≤ g ≤0,70	Medium	17
g≥0,71	High	16

Based on table 4.10 it can be seen that 16 of the students got a Gain score in the range of greater than 0.70, or experienced an increase in the "High" category. At intervals of 0.30 g and 0.70, there were 17 students included in the "medium" enhancement category. Then for the range of g 0.30 (low), there is 1 of the students experienced an increase in the ability of the low category. The average of the n-gain score is 0.65 which is include to medium category, its mean that the development worksheets in the fungi material based on guided inquiry using articulate storyline have been increase in the achievement of fungi material indicators.

Fungi worksheets were developed based on guided inquiry, according to Metaputri and Garminah (2016) the guided inquiry learning model really helps students to achieve a better understanding, through an exploration process to lead to the truth of new concepts and ideas because this learning model is very challenging and can make the interaction between students' initial understanding of new evidence they get. In learning that applies the Guided Inquiry learning model, there are learning steps that encourage students to find problems, and students are better trained to develop an understanding of scientific concepts through the process of obtaining and receiving information through observation or experimentation. Using logical thinking to answer and solve problems according to the questions and problem formulations.

CONCLUSION

Based on the analysis results of the needs analysis and curriculum analysis, it is concluded that students and teacher need worksheets, that can help students build their own knowledge and are student-center based. The design stage, worksheets are designed based on the results of

the analysis so that worksheets are made based on guided inquiry using articulate storyline in fungi subject matter. The validation from material experts, learning expert, media expert to student worksheets based on guided inquiry using articulate storyline on fungi subject matter for the tenth grade at SMAN 2 Plus Panyabungan obtained an average of 94.64%, 96.87%, 88.46% which is categorized into the very good category. The assessment from biology teacher to student worksheets based on guided inquiry obtained an average of 98.4% which is categorized into the very good category.The students response to student worksheets obtained an average of 96.07% which is categorized into the good category. The results showed that the product developed in the form of worksheets that had been produced is effective in achieving learning indicators on fungi subject matter in terms of the N-gain test with the medium category, namely 0.65%.

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