Development of Student Worksheet for the Instruction of Digestive System in Grade VIII of Junior High Schools

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Abstract. This development research aimed to create a product in the form of student worksheets that are valid and effective for use in the instruction of the digestive system in grade VIII of Junior High School. The method used was the four D model product development method namely define, design, develop, and disseminate. The instruments used were student worksheet validation sheets and the student response / questionnaire. The results of the validator's assessment indicated that the worksheet developed is quite valid with a mean score of 81.75%. Whereas based on the results of the questionnaire, it can be concluded that the worksheets are interesting for students; meanwhile, the worksheets could be completed by the students and the minimum standards were reached. Therefore, it can be concluded that the student worksheets developed are valid and effective, so they are suitable for use in the instruction of the digestive system in the grade VIII of junior high schools.

1. Introduction

Natural Science is one of the subjects that students must learn at the junior high school level. Natural Science is related to how to systematically find out about nature. Therefore, Natural Science is not only about mastering knowledge in the form of facts, concepts, or principles, but it is also a process of discovery. Natural Science is expected to be a means for students to learn about themselves and the natural surroundings, as well as the prospect of further development in applying it in their daily lives. Natural Science instruction should be carried out in a scientific-inquiry kind of way to foster the ability to think, work and be scientific and communicate it as an important aspect of life skills. Therefore, the learning conditions that are expected to be created are directed to encourage students to find out from various sources through observation and not just being told. One of them is by creating a conducive, interesting and fun learning atmosphere to ensure students active participation in learning.

The reality in the field indicates that natural science instruction seems monotonous or teacher centered so students become less active. In addition, the results of the field study showed that in the process of natural science instruction there was still a lack of supporting facilities such as teaching materials i.e. books and student worksheets as well as instructional media. Instructional activities that actively involve students will provide more effective outcome if the teacher can choose the right teaching material. Therefore, this research seeks to develop teaching materials in the form of student worksheets.

The results of case studies conducted at State Junior High School 1 of Sungai Raya, State Junior High School 3 of Sungai Raya, and State Junior High School 1 of Sungai Kakap showed that the
worksheets used generally only contained questions that students had to answer according to the material being studied. One of them is for the digestive system material. The existing worksheets have not fully described the activities of the students and do not include all concepts in the digestive system material. The interviews held with the students indicated that the worksheets on the digestive system material only require them to observe the images of the organs that make up the digestive system and mention their function. This worksheets developed in this research can later be used by teachers to increase student involvement in learning, because one of the factors in optimizing the achievement of learning outcomes is to involve or make students active in learning [1].

Student worksheets are sheets that contain tasks that students must perform [2], while [3] defines student worksheet as a printed teaching material that contains material, summaries and instructions for implementing tasks that students must do and refers to the competencies that will be achieved in learning activities. Several functions of a student worksheet, which can minimize the role of the teacher and make students more active, making it easier for them to understand the material provided, training students’ independence in learning and making instruction easier for students [4].

Based on the above background, student worksheets will be developed to accommodate all concepts in the material of digestive system and create activities that seek to involve students to participate in order to construct their knowledge. So, the objective of this research can be formulated as to produce a valid and effective worksheet on digestive system instruction for Grade VIII of Junior High School.

2. Research Method
The method used in this research was the 4D development method [5] which includes: 1) define, at this stage an analysis of the objectives and the perimeter of the material is carried out, 2) design, this stage aims to design learning tools in the form of student worksheets, 3) develop, this stage aims to produce a draft learning tools in the form of revised student worksheets based on input from the validators and data obtained from the results of the try-out, and 4) disseminate. This research was carried out only until the third stage, namely develop.

Product try-out was conducted to collect data that will be used as a basis for concluding or determining the effectiveness, efficiency or practicality and attractiveness of the finished worksheet products. The instruments used in this study were validation sheets for validators, questionnaires for students’ responses and answers to activities on the worksheet. The data obtained were analyzed qualitatively and the scores of the assessment questionnaire for the validation sheet were calculated to find the percentage with the following formula:

$$P = \frac{\Sigma X}{\Sigma Xi} \times 100\%$$  \[6\]

Explanation:
P : Percentage
\(\Sigma X\) : Total score of answer for each item
\(\Sigma Xi\) : Total maximum score for each item

The results of the above calculations were then concluded based on the criteria / category of assessment as displayed in Table 1.
Table 1. Validity Criteria [7]

| Criteria          | Validity Level                                      |
|-------------------|-----------------------------------------------------|
| 85.01% - 100.00%  | Very valid or can be used without revision         |
| 70.01% - 85.00%   | Quite valid, can be used but need minor revisions  |
| 50.01% - 70.00%   | Less valid, need major repairs, it is recommended not to be used |
| 01.00% - 50.00%   | Not valid, can’t be used                            |

For analysis of students’ response questionnaire data, if more than 50% give the same comment / response, it is used as a basis for revision or not. Meanwhile, the realization analysis of the worksheets was obtained from the observation sheet. Meanwhile, the results of the worksheet, a minimum of 50% of the students’ work meets the Minimum Mastery Criteria (KKM) set by the school, so it can be concluded that students have mastered the material contained in the worksheet.

3. Result and Discussion

The product of this development research was the Student Worksheet of the instructional material for the digestive system which consists of the concept of food substances, digestive organs, digestive mechanisms, and diseases and their prevention. The validation results by the validators showed that the results of the assessment calculation for aspects of the validity of the content, presentation, and language of the developed worksheet can be seen in Figure 1.

![Figure 1. Student worksheet validation result by Validators](image)

The data in Figure 1 show that the Student Worksheet developed has an average score of 81.75%, where the results of the validation by lecturers and field practitioners, obtained a score of 81.25% and 82.25% respectively. It can be concluded that the student worksheet of the digestive system instructional material developed is quite valid. In general, the validators comments are good since the worksheets are presented systematically (from general to specific) so as to make it easier for students to understand the contents of the worksheet. In addition, the problems raised in the worksheets are in accordance with students’ cognition and have clear objectives, and are equipped with pictures and illustrations. The presentation of worksheets that are simple to complex according to the child’s development will support child’s involvement and willingness to be actively involved [8]. Meanwhile the image visualization aims to help students maximize their vision in understanding the concept of the material and the images or illustrations that accompany a text will be remembered for a long time compared to the presentation in the form of text or images [8,9].
The scientific ability of students expected by the 2013 curriculum is also present in the student worksheet. The student worksheet has developed students’ scientific abilities such as observing, asking questions by formulating problems, conducting experiments, linking experimental results with existing theories and communicating the results of the activities they carried out. It can be concluded that the student worksheet has emphasized on the process to find concepts as a guide for students to find out about something.

However, the validators suggested that the material or tasks contained in the student worksheet should be broken down into a collection of knowledge in accordance with the expected essential concepts, the learning experience obtained by students through this worksheet needs to be added. In addition, they also suggested that there are several words that need to be replaced so that students can easily understand the meanings and use the imperative sentences in the tasks that students must do. This is in line with the opinion that the composition of sentences and words used in a writing should be simple, easy to understand, concise, and clear [10].

Based on the results of the questionnaire analysis of the students’ responses to the worksheets, it can be concluded that the worksheets developed are interesting and receive positive responses but there are things that students complain about the sentences or language used in the work steps and questions given after completing the activity. Therefore a revision is made to the part that the students complain about as shown in Table 2 below.

Table 2. Revised student worksheet results after the trial.

| Before Revision                                      | After Revision                                      |
|------------------------------------------------------|-----------------------------------------------------|
| Prepare tempe, for solid ingredients, puree in advance with mortar and pestle then add a little water | Prepare tempe and puree in advance with mortar and pestle then give a little water |
| Look at the data in the table and then stretch the rope on the floor (make winding shapes like the intestine). | 1. Look at the data in the table  
2. Stretch the rope on the floor with a winding shape according to the organ and size in the table. |
| Why does it take different times for food to enter the digestive organs? | Why do the foods we eat require different times when passing through each digestive organ? |
| Each cloth is soaked in a container / bowl of water for 30 seconds. | Soak the two pieces of cloth into a container / bowl of water for 30 seconds |

Table 2 shows that the revisions made are linguistic aspects where the use of the right words can help students to learn [9]. The same thing was expressed, in an article in which he said the words or sentences should be easily understood, clear, concise, and simple [10]. So, it can be concluded that the success of the message delivered in the worksheet is determined by the language factor.

The realization of student worksheet in learning includes the students’ activities in working on or using student worksheet when learning takes place. The results can be seen in Figure 2.
Figure 2 shows the realization of the use of worksheets in learning. Of the 38 students, 10 students were in the high category because they succeeded in doing all activities contained in the worksheet, questions and evaluation. Meanwhile, 28 students did not complete the activities and did not finish in answering questions and in evaluations. Lack of time caused them to be unable to have discussion to answer the questions. In addition, students did not participate in student worksheet activities due to lack of motivation from both the teacher and the students. The students will not get more experience if they do not do the activities that have been designed [11]. Meanwhile, the results of the worksheet by students have met the minimum mastery criteria.

4. Conclusion
Based on the research findings, the student worksheets on the digestive system material were declared valid and suitable for use as teaching materials with an average score of 81.75%. In addition, the worksheets developed are interesting for students, and the students can work on the activities contained in the worksheets. For this reason, it can be concluded that the worksheets that are developed are valid and effective for use in digestive system instruction in the Grade VIII of junior high schools.

5. Acknowledgement
We would like to thank all those who helped in carrying out this research, particularly: the Ministry of Research and Technology, which has funded this research. We also would like to express our special thanks to the Faculty of Teacher Training and Education, and the Tanjungpura University Research Institution, the lecturers at the Faculty of Teacher Training and Education of the Tanjungpura University, and teachers who became the validators as well as the students of Biology Education Study Program at the Faculty of Teacher Training and Education of the Tanjungpura University.

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