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The Development of Teaching Materials Based on Research of Shisha Cigarettes Exposure Reproductive System Materials as A Learning Source of High School

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Abstract

The Research and Development aims to determine the feasibility and effectiveness of using research-based teaching materials supplements as a source of learning for high school students. The learning resources developed are in the form of research-based teaching materials. The method used in this study uses research steps from Sugiyono (2015) that have been modified. The indicators used in this study are indicators of feasibility and effectiveness. Indicators of eligibility in this study involve material and media validity, student and teacher responses. The results of the research have shown that research-based teaching materials are feasible and effective to be used as a source of learning for students. The results of the validity of the material and media are in very valid criteria with each score 85% and 96.875%, while the responses of students and teachers are in the criteria of a good readability level with the value of 88.4 % and 80%. The developed teaching materials are also effective, this can be seen from the classical completeness criteria obtained a score of 83% and an increase in the results of the N-gain test that there are $\geq 70\%$ of students who get N-gain scores with moderate to high criteria.

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INTRODUCTION

Biology is a subject that in the learning process requires several components that support learning. One important component that must be present in the learning process is learning resources. The lack of learning resources used by students will certainly be related to the learning outcomes that will be obtained. According to Cimer (2012) one of the reasons underlying students' difficulties in learning biology is that there are still few available learning resources so students have not been able to learn independently. In addition, one of the factors of misconception in biology is also due to lack of learning resources. This is in line with the statement of Khairaty *et al.* (2018) states that one of the factors causing misconceptions is that there is no a permanent resource of learning and the teacher being the most dominant source of information for students.

Learning resources is one of the important roles in the learning process. The more learning resources used will certainly support the achievement of learning objectives. This is in line with Hamdani's statement in Winarti *et al.* (2018) which states that the more learning resources owned by students, their knowledge and insight will become wider and lead to critical souls in students. The existence of learning resources other than those owned by students in the school will certainly help teachers and students in achieving learning objectives. According to Supriadi (2015), the availability of learning resources for students is still very limited. These limitations can be seen in terms of the quality and quantity of learning resources, namely from aspects of variations in learning resources, easy access, and also the form of learning resources.

Interview observations were made to 10 students of grade XII Natural Sciences as a sample for analysis of needs which was taken randomly. All students taken as a sample stated that learning carried out at school was good enough, the teacher gave a good explanation so that it was easy to understand, but the learning resources used were still limited to LKS or worksheet, internet and PPT. In the worksheet the images displayed are unclear and do not contain the latest contextual information and have not used a good color combination that can attract students since it's only available in black and white. Based on interviews with 10 students, 9 of them stated that research-based teaching materials were needed as a complement to student learning resources.

The use of research-based teaching materials is one of the activities that can be used to expand and extend the material applicatively. Research-based teaching materials can be as an alternative contextual learning resource for students to make it easier to understand the material (Primianai, 2014). Based on this, researchers are interested in conducting research on the existence of new learning resources as a complement that can attract students in learning biology and is used as an alternative to reduce smoking culture, namely research-based teaching materials. Teaching material that will be created based on research on shisha cigarette exposure to testicular histopathology in rats. Researchers chose shisha cigarettes because they are one of the most popular cigarettes in Indonesia and also want to change people's thinking that these cigarettes are safe, because in fact these cigarettes are as dangerous as ordinary cigarettes. According to Langley (2016) shisha cigarettes contain chemicals like those found in ordinary cigarettes, one of which is carbon monoxide (CO) which occurs due to repeated heating of charcoal so that it can cause CO poisoning.

Based on these descriptions, researchers are interested in conducting research with the title The Development of Teaching Materials Supplements Based on Research of Shisha Cigarette Exposure, Reproductive System Materials as Student Learning Resources.

RESEARCH METHOD

The development of research-based teaching materials used in this study uses steps from the modified Research and Development (R&D) research from Sugiyono (2015). This research step was chosen based on the consideration that this step is clearer, structured, systematic and easy to understand. The steps in this study actually consist of ten steps, but in this study only up to the nine steps. The following is a sequence of R&D research steps according to Sugiyono (2015); (1) analysis of potentials and

problems, that is to find out the problems and potentials that exist at the high school level, the researcher took one example of high school in Semarang, namely SMA Negeri 15 Semarang, (2) data collection, that is collecting the required data such as a lesson plan, research on shisha cigarettes and also journal literature to compile teaching materials, (3) product design, that is the making of research-based teaching materials that will be developed based on potential and problem analysis, (4) design validation, which consists of validation from material experts and media, (5) design revision, the process carried out after the teaching materials have been validated, (6) small-scale trials, that is trials to determine the feasibility of teaching materials based on the validation of material and media experts and questionnaire responses of teachers and students, (7) product revision, the revision process that is carried out after teaching materials are tested on a small scale based on the advice of teachers and students (8) large scale implementation that is trials to determine the effectiveness of teaching materials by knowing student learning outcomes based on classical completeness criteria and improvement of the N-gain test.

The study was conducted at SMA Negeri 3 Tegal with 10 students as samples for small-scale trials and SMA Negeri 15 Semarang for grade XI MIA 4 for large-scale trials which were taken by *purposive sampling* techniques namely by considering suggestions from teachers based on grades. Where in the class that will be used for research, there are 50% of students who still get Biology test scores under Minimum Completeness Criteria (KKM). Learning design uses One Group Pretest and Posttest Design.

RESULTS AND DISCUSSION

The study was conducted in the even semester of the 2019/2020 school year. The purpose of this study is to determine the feasibility and effectiveness of the Reproductive System teaching materials. What is meant by feasibility is the results of media and material validation as well as the results of readability of teaching materials based on responses from Biology teachers and 9th grade students who have received reproductive system material, while the effectiveness referred to in this study is the student's cognitive learning outcomes in the form of classical completeness and enhancement of N-gain test based on the *pretest* and *posttest* values after learning by using Reproductive System teaching materials.

1. Feasibility of Reproductive System Teaching Materials

The feasibility of the reproductive system teaching material is obtained based on the test of validity and readability. Teaching material is said to be feasible if the test results by the media and material validators show valid criteria with a score of $\geq 65\%$, and the results of the readability test through the questionnaire responses of students and teachers show good criteria with a score of $\geq 65\%$.

1.1 Validity of Reproductive System Teaching Material

Components of evaluating the validity of the teaching material of the reproductive system covering aspects of content eligibility and presentation eligibility. The results of the details can be seen in the following Table 1.

Table 1 Results of the validity of Reproductive System teaching materials.

No	Rated Aspect	Score
A	Component of content eligibility	30
B	Component of presentation eligibility	21
	Total score	51
	Maximum total score	60
	Percentage score (%)	85
	Criteria	Very valid

Based on the results of the assessment of material experts obtained a score of 85% with very valid criteria. This is because the material presented is adjusted to the curriculum used based on Core Competencies (KI) and Basic Competencies (KD) contained in the syllabus of biology subjects. Teaching material developed is adjusted to the student needs and in accordance with class XI material supplemented

by research as a modification of the previous teaching materials. According to Setiyadi *et al.* (2017) the development of teaching materials needs to be done by educators so that learning is more effective, efficient and does not deviate from the competencies to be achieved, so that teaching materials are important to be developed as an effort to improve the quality of learning.

In addition to the assessment from material experts, the validity of teaching materials is also determined by the validity of the media experts. Components of evaluating the validity of the reproductive system teaching materials covering aspects of graphics and language. The details of the results of the media validity can be seen in Table 2 below:

Table 2 Results of the validity media of Reproductive System teaching materials.

No	Rated aspect	Score
	The Component of graphic feasibility	27
	Component of language eligibility	35
	Total skor	62
	Maximum total score	64
	Percentage skore (%)	96,875
	Criteria	Very valid

Based on the results of the assessment of media experts obtained a score of 96,875% with very valid criteria. The teaching material developed are feasible to use because it can make students happy and motivated to learn because of the selection of colors, sizes and images used in the drafting of teaching materials. In accordance with the statement of Korniwati *et al.* (2016) which states that the teaching material developed has been valid, because it has an attractive color selection, harmonious and does not interfere with concentration, and using the type and font size that are easy to read and easy to use.

1.2 Students and Teacher Responses to Teaching Materials in the Human Reproductive System

Student and teacher responses were obtained using the questionnaire responses on small-scale trials. A small-scale trial was conducted at SMA Negeri 3 Tegal with 10 students as samples to fill in the questionnaire of student responses to teaching materials based on reproductive system research material. The results of students and teacher responses to teaching materials can be seen in Table 3 and 4 as follows:

Table 3 The results of the analysis of students' responses to research-based teaching materials

No	Question	Score
1.	Teaching materials have an attractive cover appearance	86
2.	The photos and images presented are clear and related to the material	98
3.	The color component used attracts the reader	90
4.	Teaching materials are written in easy-to-read font sizes and types	84
5.	Teaching materials have an attractive design for readers	82
6.	Teaching materials contain material that is relevant to basic competencies	92
7.	The material presented in the teaching materials is clear	94
8.	Teaching materials can help students to understand the material of the reproductive system, especially sub disorders	90
9.	Teaching materials are able to encourage students to be wiser in responding to problems about smoking	98
10.	Teaching materials can encourage students to seek information about abnormalities in the reproductive system	88
	Total score	902
	Average	90,2%

Table 4 The results of the analysis of teacher responses to research-based teaching materials

No	Biology teacher code	Percentage of response (%)	Criteria
1	GB-01	80	Good

The results of teacher responses obtained 80% score with the category of "good" and the results of student responses obtained an average score that is 88.4% with the category of "very good". It based on assessments conducted by media experts and material experts as well as student and teacher responses, so that research-based teaching materials on reproductive system materials are suitable for use in learning biology in reproductive system materials.

2. Effectiveness of Reproductive System Teaching Materials

The effectiveness of teaching materials can be seen based on students' cognitive learning outcomes that is on classical completeness criteria and improvement of the N-Gain test. Teaching materials effective in 1) student learning outcomes showed $\geq 75\%$ of participants succeeded in reaching the KKM limit (KKM value=70) and, 2) students who reached $g \geq 0.3$ (moderate to high criteria) were in the percentage of $\geq 76\%$.

Student learning outcomes obtained from the pretest and posttest to determine the classical completeness and N-Gain test. The percentage of classical completeness, pretest and posttest, and N-gain test are presented in the Table 5.

Table 5 Classical completeness obtained by students of grade XI MIA 4

Information	Total
Students who completed	25
Students who do not completed	5
Classical completeness (%)	83

Classical completeness in grade XI MIA 4 After learning using research-based teaching materials, obtained a percentage of 83%. Based on the results of the classical completeness recapitulation, the developed teaching materials have met the specified effectiveness standards.

Table 6 Pretest and posttest scores obtained by students of grade XI MIA 4

Information	Score pretest	Score posttest
Lowest score	17	27
Highest score	77	100
Total score Class	1629	2513
Average Class	54,3	83,8

Based on the Table above there is an increase in the value between the pretest score and the posttest score obtained by students. The improvement of student learning outcomes was analyzed through the results of the pretest and posttest by looking at the classical completeness of the class and also the N-gain test. The following is a Table percentage of N-gain test results with formula calculations in *Excel*.

Table 7 Percentage of N-gain test results for class XI MIA students

Information	Number of students	Percentage
Learners with high N-gain scores	18	60%
Learners with moderat N-gain scores	6	20%
Learners with low N-gain scores	6	20%

The effectiveness of the developed teaching materials is based on classical completeness and increased learning outcomes based on the N-gain test. The completeness obtained in this study was 83% and percentage of N-gain test results in Table 7 is that 60% of students get N-gain scores with high criteria, 20% with moderate criteria, and 20% with low criteria. The supplement that was developed was effectively used as a learning resource because it had met the determined effectiveness standards, namely the learning outcomes of students showed that 85% of students reached the KKM limit (KKM value = 70). The percentage of students who get $g \geq 0.3$ (moderate to high criteria) is in the percentage of 80%.

Table 7 are the results of the N-gain test that has been carried out. In this study, it was obtained an average N-gain score of 0.67 in the moderate category. In a study conducted by Latief et al. (2014) the results of the N-gain test obtained in the control and experimental classes were 0.28 and 0.48, respectively. In the control and experimental classes, there are significant differences in learning outcomes, which means that the contextual learning model in the experimental class is more significant than the control class with the conventional model. The study was said to be successful because of the difference in the results of the N-gain test between the control and experimental classes and the results obtained in the control class were good, namely being in the moderate N-gain criterion. The score obtained means that the teaching material is effectively used to improve student learning outcomes, it's just that the effectiveness of the teaching material has not reached the high category when viewed from the average score of all students.

Effective learning is learning that in the process can make behavioral changes in students. changes in behavior can be seen from the aspect of learning outcomes. The learning outcomes themselves have three aspects, namely cognitive, affective, and psychomotor aspects. In this study, the aspect assessed is the cognitive aspect, where the learning resources selected for the study have shown sufficient criteria to be used as a learning resource for biology. Research-based learning used in this study is feasible and effective to be used as a learning resource. According to Slameto (2016), based on research that has been done, it is stated that research-based learning can be used to improve student learning outcomes because research-based learning is contextual and scientific learning that can create inspirational learning.

CONCLUSION

Based on the research conducted it can be concluded that research-based teaching materials of reproductive system materials are feasible and effectively used in the biology learning process. The Suggestions for future research are that assessment of learning outcomes from affective and psychomotor aspects can also be assessed, so that learning outcomes are assessed not only on cognitive aspects and it is also expected that teaching materials can be mass produced so that new information can be accepted by all levels of society.

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