



The Feasibility of Supplementing *Shisha* Research-Based Teaching Materials on Circulatory System Materials to Improve High School Students' Concept Understanding

Wildha Alma[✉], Lisdiana¹, Wiwi Isnaeni¹

¹Biology Department, FMIPA, Universitas Negeri Semarang, Indonesia

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Abstract

Teaching material supplements were developed based on an analysis of students' needs in the use of learning resources used in everyday life. In the process of learning biology, understanding the concept is very important to be mastered by students. Concept understanding helps students remember the lessons they have learned over a long period of time. This study aims to determine the feasibility of teaching material supplements in biology learning. This research is a Research and Development study which refers to the steps (1) potential and problems; (2) data collection; (3) product design; (4) design validation; (5) design revision; (6) product testing; (7) product revision; (8) final production. The parameters of the feasibility of teaching material supplements are seen from the material validation, media validation, teacher responses, student responses and concept understanding tests. The results of the study obtained data that the validity of the material showed a score of 83.7% with very valid criteria, the validity of the media showed a score of 95.1% with very valid criteria, the responses of students' responses showed 82.625% results with very feasible criteria, the teacher's response showed 86.6% results with very feasible criteria. as well as classical completeness of the concept understanding test reached 91.17% provided that students achieved a mastery score of ≥ 70 and an average n-gain of 0.55 in the moderate category. The conclusion of this research is that *shisha* research-based teaching material supplements are suitable for use as learning materials on the circulatory system.

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[✉]Address Correspondence:

D6 Building 1st Floor Jl Raya Sekaran Gunungpati Semarang

E-mail: wildhaalma28@gmail.com

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INTRODUCTION

Understanding the concept is very important to master, especially in the biology learning system. Understanding concepts helps students remember the lessons they have learned in the long run. Through a good understanding of the concept, it will bring up the mindset of students who are critical (Febriyanto, 2018). This requires teachers to be able to design learning activities to improve students' understanding of concepts (Rismawati, 2018). The ability to understand the concepts of students through media assistance will be better than the ability of students in expository classes (Gifts, 2016). Understanding the concepts possessed by students can be used to solve a problem that is related to problems in everyday life (Tendrita, 2016).

Understanding the concept is very important to master, especially in biology learning systems. Understanding concepts helps students remember lessons they have learned over a long period of time. A good understanding of the concept will lead to a critical student mindset (Febriyanto, 2018). The ability of students to understand concepts through media assistance will be better than the ability of students in the expository class (Karunia, 2016). Understanding the concepts possessed by students can be used to solve a problem that is related to problems in everyday life (Tendrita, 2016).

Understanding the concept is needed in learning biology. Research conducted by Sari (2018) explains the conceptual understanding of students learning using media shows better results than learning with conventional learning. This is comparable to the results of students' understanding of the concept of learning without the support of any learning media, showing a classical completeness of 8.8%. Students who learn without using media have low concept comprehension skills. Based on this, there is an opportunity to develop supplementary media for teaching materials that can improve high school students' conceptual understanding of circulatory system material.

Based on the results of interviews with SMA N 1 Ungaran teachers, the implementation of learning resources has been implemented optimally by using the LKS, internet and 2013 curriculum textbooks. However, the relevance of the latest research information on the sub-material of circulatory system disorders is still low. Based on this, teaching materials are needed that can contain real examples in learning. Good teaching materials are media that can be used to achieve learning objectives. One means of achieving learning objectives is through the development of teaching material supplements that contain real examples of research results.

In research Aydin & Aytakin (2018) states that good teaching materials have the principle of reflecting real life as much as possible. Cigarettes are a growing problem and no solution has been found. In the last decade, the existence of cigarettes from the Middle East, known as shisha, has become more prevalent. Although in Indonesia the use of shisha is still limited and can only be accessed in certain places, it is not impossible that this habit will become more prevalent if there is no preventive effort to control it (Yudha, 2014). This can be a source for the development of teaching materials based on shisha research by integrating other relevant research results in learning biology.

Research is considered appropriate to be integrated in teaching materials. The results of science-based research produce real data, not the opinion of a subject. Based on questionnaire data, students expect teaching materials that reveal more facts. This will make it easier for students to understand the material. Teaching materials developed by integrating research results are effective in learning because they are more applicable and contemporary (Parmin & Peniati, 2012).

Teaching material supplements are very important for both teachers and students in the learning process. Without teaching material supplements, it will be difficult for teachers to achieve learning goals. Likewise, without teaching material supplements it will be difficult for students to follow the learning process in class, if the teacher teaches material quickly to complete certain materials. This can cause students to lose track, without being able to trace back what has been taught previously. Based on the background, there is no literature review that makes teaching material supplements with a focus on understanding the concept so it is necessary to develop teaching material supplements based on shisha research to improve the understanding of high school students' learning concepts.

RESEARCH METHOD

This research is a Research and Development study which refers to the steps (1) potential and problems; (2) data collection; (3) product design; (4) design validation; (5) design revision; (6) product testing; (7) product revision; (8) final production. The parameters of the feasibility of teaching material supplements are seen from the material validation, media validation, teacher responses, student responses and concept understanding tests. This research is divided into two stages. The first stage regarding research on the effect of shisha on rats was carried out at the Biology Laboratory of the State University of Semarang. The second stage is the initial observation and product testing. The subjects of this study were students of class XI SMA Islam Sudirman Ambarawa. This research was started in December 2019 until it was completed in compiling reports and research results.

RESULTS AND DISCUSSION

1. Validity of the shicisy teaching material supplement media

The data on the validity of the Shicisy teaching material supplements were obtained from the validation results of media expert lecturers and material expert lecturers, especially in the circulatory system. The instrument used is guided by the assessment of textbooks according to the 2014 BSNP which has been modified and adjusted as needed. The supplementary teaching materials that have been validated will then be used as learning materials. Teaching material supplements are said to be valid if the validation results of the media expert validators reach an average standard score of $\geq 75\%$ with valid to very valid criteria.

The validity of the Shicisy teaching material supplement media is the result of validation from an expert lecturer in the media field. The media component consists of one graphic aspect with components including: 1) the size of the teaching material supplement; 2) cover design of teaching material supplements; and 3) content design of teaching material supplements. The data on the results of the assessment by the validator are presented in Table 1 below:

Table 1. Results of Analysis of Media Validity Test for Shicisy Teaching Material Supplements

No.	Rating Indicator	Rating Score (%)		
		Validator I	Validator II	Validator III
1.	Size of teaching material	100	100	100
2.	The cover design of teaching materials	75	92,8	100
3.	This design is teaching material	91,6	97,2	100
Average score		88,8	96,6	100
Average validator score		95,1		
Criteria		Very valid		

Based on the results of the calculation of the validation value by media experts, the mean score of the validator is 95.1% with very valid criteria. The teaching material supplement was designed with the help of software, namely CorelDraw X6 which contains visual elements such as colors, graphics, and icons tailored to the target audience, namely students of class XI SMA. Validation was carried out 3 times until the teaching material supplement was ready for use. Teaching material supplement products are one of the media in increasing concept understanding. Based on the analysis of the students' needs, the design is presented using text, pictures, and is equipped with animations that visualize the material to be interesting. Student books that are equipped with illustrations and the right color selection are able to attract students' attention to read them and reduce boredom (Darmayanti, 2014).

The advantages of printed teaching materials in terms of users, this printed teaching material is self-sufficient, can be used directly or to use it, no other tool is needed, it is easy to carry everywhere (portable) because it is relatively small and light. In addition to having several advantages, printed teaching materials are also not free from shortcomings, namely not being able to present movements, presenting material in printed teaching materials is linear, unable to present events sequentially, it takes a lot of money to make good and needed printed teaching materials. strong reading ability of the reader.

2. The validity of the Shicisy teaching material supplement material

The validity of the Shicisy teaching material supplement material developed is the result of validation by material experts who are competent and relevant in their field. Teaching material supplements are said to be valid if the validation results of the media expert validators reach an average score of $\geq 75\%$ with valid to very valid criteria. Media components consist of three aspects, namely: (1) content validity; (2) presentation validity; and (3) language validity. The data on the results of the assessment by the validator are presented in Table 2 below:

Table 2. Results of Analysis of Test Validity of Shicisy Teaching Materials Supplement Material

No.	Rating Indicator	Rating Score (%)
		Validator I
1.	Validity of contents	87,5
2.	Validity of presentation	86,1
3.	Language validity	77,7
Total score		251,3
Average score		83,7
Criteria		Very valid

Based on the results of the calculation of the validation value by the material experts obtained an average score of 83.7% validity with very valid criteria. Supplement of teaching materials in quality learning takes into account the components established by the National Education Standards Agency (BSNP), namely the components of validity, content, and language aspects. This is also supported by research conducted by Lasmiyati, (2014) that teaching materials in the form of modules can improve concept understanding.

Factors that become students' problems in the circulatory system vary from those students who are less active in seeking information, depending on the delivery of the teacher or the main book that students use as a learning guide. One way to solve this problem is by using effective learning media (Alfionitari, 2019). Effective learning media will greatly assist students in understanding the concept of the human circulatory system in depth and meaningfully (Arfrianto, 2017).

3. Understanding the Concept

Understanding the concept is a very important basic thing for students, because by mastering the understanding of concepts the next goal of biology can be achieved, such as communication skills, reasoning, and problem solving. Students are expected to understand the concept well because the concepts are related to one another. The relationship between these concepts will be useful for them in solving biological problems (Jurivi, 2018).

The eligibility data for the Shicisy teaching material supplement was obtained from the test results for understanding the concept of the circulatory system, student response questionnaires and teacher response questionnaires. The instrument used is guided by the assessment of textbooks according to the 2014 BSNP which have been modified and adjusted as needed. Supplementary teaching materials that have been feasible will then be used as a reference for learning materials. The teaching material supplement was declared feasible, the results of the student's concept understanding test got a score of 70 with completeness criteria $\geq 75\%$ and the student's concept understanding test got a moderate to high n-gain category. The results of students' concept understanding tests are presented in the table below.

Table 3. Percentage Results of Classical Completion XI IPA 1

No.	Indicator	Total
1.	Total students	34
2.	Students graduate	31
3.	Students do not graduate	3
Percentage of classical completeness		91.17%

Based on the results of the recap in table 3 it shows that the application of Shicisy teaching material

supplements to the circulatory system material carried out at the Sudirman Ambarawa Islamic High School has reached the applied criteria, namely 91.17% of students have completed their learning outcomes with the average category very good. Thus, the teaching material supplement applied is able to provide students with an understanding of the circulatory system material. Based on the recap of the conceptual understanding test scores that have been processed, there were still found as many as 3 students from class XI IPA 1 who were in a deficient position where they still had a value below the specified KKM, namely 70. Achievement of cognitive learning outcomes from the pretest and posttest values can be measured by the gain normality test. (N-gain). The percentage of the N-gain measurement results can be seen in Table 4 below.

Table 4. The results of the N-gain percentage

Range	Qualitative Criteria	Number of students	Percentage (%)
$0.7 \leq g \leq 1.0$	High	8	23.5
$0.3 \leq g < 0.7$	Moderate	26	76.4
$0.02 \leq g < 0.3$	Low	-	-
Average		Category Medium	

The teaching material supplement developed has a positive impact which can be seen from the achievement of cognitive learning outcomes in understanding concepts. The results of students' understanding of concepts were obtained from students' classical completeness and N-gain. The results of the students' classical completeness were 91.17% of the students who scored above the KKM. The classical completeness results have met the feasibility indicator for the development of teaching material supplements, which is 75%. The N-gain results consisted of 8 students in high criteria (23.5%), 26 students in moderate criteria (76.4%). The average n-gain obtained was 0.55 in the medium category. This can show that the shicisy teaching material supplement is suitable for use and can improve students' conceptual understanding of the circulatory system material. Achievement of cognitive learning outcomes shows that learning using shicisy teaching material supplements can help students understand the circulatory system material. The higher the student's knowledge of the circulatory system material, the higher the understanding of the concept that the student gets.

Understanding of student concepts in this study aims to determine student knowledge of the material during the learning process. Indicators of understanding the concepts observed in this study are 1) restate a concept; 2) classifying objects according to certain according to the concept; 3) give examples and not examples of concepts; 4) presents concepts in various forms of representation; 5) developing the necessary or sufficient conditions of a concept; 6) use and utilize and choose certain procedures or operations; 7) applying concepts in problem solving. The recapitulation data of the indicator values of students' concept understanding is presented in the following table:

Table 5. Recapitulation Results of indicator values understanding XI IPA concept 1

No.	Conceptual Understanding Indicators	Percentage (%)	Average (%)
1.	Reiterate a concept	74.7	
2.	Classify objects according to certain properties according to the concept	72.0	
3.	Give examples and not examples	85.2	
4.	States concepts in various forms of representation	80.8	79.4
5.	Developing the necessary or sufficient conditions of a concept	89.2	
6.	Use and utilize and choose procedures	53.9	
7.	Apply concepts in problem solvers	100	

Based on data obtained from the recapitulation of the concept understanding indicator values, it can be seen that the level of understanding of each question indicator shows different results. The percentage results are known that students of class XI Science 1 have a percentage of concept understanding of 79.4% with a high category. The highest percentage of concept understanding is in the seventh indicator that is applying the concept in problem solvers by 100% with a very high category. While the lowest

percentage of understanding is on the sixth indicator, which is using and utilizing and choosing a procedure of 53.9% with a low category.

The highest indicator of concept understanding results in the seventh indicator, which is applying the concept in problem solvers with a percentage of 100% of the overall indicator of concept understanding. The percentage is classified as very high category. Understanding the concept of the indicator applying the concept in the problem solver shows very satisfying results. This is because students are able to use concepts in the circulatory system in solving story problems involving daily life (Hoiriyah, 2019).

The results of indicators understanding the lowest concepts in the sixth indicator. This is because one of the three questions on the sixth indicator there are some students experiencing errors in working on the problems. Students may have understood the difference in the location of the pulmonary veins, posterior vena cava and anterior vena cava, but due to lack of accuracy in understanding the problem many students were trapped in the wrong choice. Low students' interest in reading shows that there are still some students who are not careful enough to understand the purpose of the question (Suraji, 2018). In addition, the lack of interaction that causes no direct guidance during monitoring the online learning process is one of the causes of the low percentage value on this indicator.

The supplement of teaching materials is complemented by a special chapter on "About *Shisha*" which discusses detailed information on *shisha* in the form of infographics. In this chapter students gain new knowledge about *shisha*. In addition, the teaching material supplement developed is supported by the substance of the material that is supplemented with research results, specifically *shisha* exposure to circulatory disorders and other relevant research results on the circulatory system material.

Supplement teaching materials circulatory system materials are equipped with problems that occur in everyday life. The material is supplemented with additional information regarding the Corona Virus pandemic information (Covid-19). An increasing number of corona positive patients in Indonesia continues to grow. Of course the government has made preventive efforts, this needs to be supported through media contributions as education, especially to students. Communication through various media has become a basic component of many of the most effective health promotion strategies providing health risk education. Supplement Shicisy teaching materials provide valuable information to students about other options and perspectives (Sampurno, 2020).

4. Student Responses

Student responses to learning activities were obtained from distributing questionnaire sheets that were filled in by students after learning the circulatory system material using Shicisy's teaching material supplements. Teaching material supplements are declared feasible, the results of student responses get a percentage of $\geq 75\%$ with valid to very valid criteria. This research was conducted in class XI MIPA 1 SMA Islam Sudirman Ambarawa. The response questionnaire was filled in directly by the students after the learning process was carried out, the data obtained was presented in a recapitulation as follows.

Table 6. Percentage of student responses about the application of Shicisy teaching material supplements

No.	Indicator	Percentage of Questionnaire Answers (%)
1.	The graphic aspect	84.14
2.	Presentation aspects	81.25
3.	Aspects of language	82.6
4.	Material / content aspects	82.5
Percentage average		82.625
Criteria		Very decent

Percentages on all items showed satisfying results. Based on the table above, it can be seen that each aspect has exceeded the percentage $\geq 75\%$, which means that most students have felt the superiority of the four aspects in question. The superiority of the learning design that is reflected in each item of questions on the questionnaire is shown by the large percentage of answers to the answers "strongly agree" and "agree". In class XI IPA 1, there were only seven children who gave decent assessments, while others gave

very decent assessments. Students are very interested in the supplement of teaching materials developed. This can be seen from the students' responses when they first got the book, even though they were preoccupied with various other activities, they were able to take the time to glance at and read the contents of the book before learning began. Steps to attract students' interest in reading, books are designed according to the millennial style so students are not easily bored.

5. Teacher Responses

Teachers' responses to learning activities were obtained through giving questionnaire sheets to biology subject teachers at Sudirman Ambarawa Islamic Senior High School, showing the results that overall teachers gave positive responses to Shicisy teaching material supplements on circulatory system material. Teaching material supplements are declared feasible, the results of teacher responses get a percentage of $\geq 75\%$ with valid to very valid criteria. The recapitulation of the results of the teacher response questionnaire is as follows.

Table 7. Percentage of teacher responses to the application of Shicisy teaching material supplements

No.	Indicator	Percentage of Questionnaire Answers (%)
1.	The graphic aspect	90
2.	Aspects of language	85.7
3.	Material / content aspects	83.3
Percentage average		86.6
Criteria		Very decent

Based on the results of the teacher's response shows that of the three aspects proposed, the teacher conveys learning by supplementing Shicisy teaching materials on the circulatory system material can optimize the learning process. In addition, in the midst of a pandemic condition with additional information about Covid-19's disturbances and handling helps educate students to care more about the environment.

CONCLUSION

Based on the results of data analysis and discussion, it can be concluded that the shisha research-based teaching material supplement is suitable for use as a study on the circulatory system material. Suggestions for further research hopefully can examine the understanding of biological concepts more deeply. If possible, develop other types of learning resource media as a solution to improve students' understanding of biological concepts.

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