



Multimedia based on science environment technology and society: The needs analysis human anatomy physiology learning



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ABSTRACT

The importance of information regarding the learning process is to be able to identify the main problems and provide the right solutions according to the predetermined graduate competency standards. This study aims to provide solutions to learning problems in the form of appropriate teaching materials in terms of users and the curriculum. The research method used is descriptive quantitative research through a survey with a research sample of 32.5% of the population or 26 students. The instruments used were questionnaires and interview transcripts. Data analysis was carried out with a student questionnaire, the percentage was calculated and will be explained while the interview transcripts were analyzed descriptively, 57.1% of students need teaching materials, 52.4% need teaching materials with specific learning approaches and models. The results showed that it is necessary to make improvements in the aspects of the learning model, mastery of 21st-century knowledge and skills, and the learning media used. Therefore, teaching materials are needed that include learning activities characterized by learning approaches or models, conceptual descriptions according to content standards, and evaluations that can develop higher-order thinking skills.

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INTRODUCTION

Learning at the higher education level refers to the competency standards of graduates which include attitudes, knowledge, and skills contained in the learning outcomes of the curriculum used. Competency standards of graduates are used as the main reference in implementing content standards and learning process standards. Content standards include the depth and breadth of the material while the process standards cover the characteristics and lesson planning. The



characteristics of the learning process must be interactive, holistic, integrative, scientific, contextual, thematic, effective, collaborative, and student-centered (Kemenristekdikti, 2018). Based on the description above, it is clear that the learning process must follow a curriculum developed by a university which refers to the national higher education standards.

The results of observations made by researchers indicate that there are difficulties in achieving the predetermined learning outcomes. This can be seen in the mastery of the material by students who are still not by the breadth and depth of the material being taught. During the discussion on the human anatomy physiology (HAP) subject, students tend to ask questions about diseases or disorders. In material about the cardiovascular system, students often ask questions about the causes of hypertension rather than the structure and function of the organs that make up the cardiovascular system. Students are only looking for information about hypertension and have not been able to link the basic concepts of the cardiovascular system with the incidence of a disease. Therefore, it is necessary to have a learning process that brings students to understand a concept as a whole through phenomena encountered in life.

The learning process as above affects the knowledge and skills mastered by students. Students have not been able to connect the concepts that have been learned to solve problems. This can be seen from the results of the evaluation given to students which shows that students' high-order thinking skills are still in the low category. The researcher gave 15 questions about the cardiovascular system which refers to the aspects of critical and metacognitive thinking skills. The results obtained were 1 student got the highest score, namely 11 and 21 students got a score between 6 to 1. It can be concluded that 80% of students can think critically and metacognitively which is still lacking. Learning so far has been centered on students and uses a learning model but the learning objectives have not been achieved.

Higher-order thinking skills can be developed through learning activities that involve selection, decision making, and problem-solving. In fact, lecturers often feel that the learning process carried out can develop higher-order thinking skills which are judged by the students' problem-solving abilities, even though these activities are carried out by students only to get an understanding of the material (Chee, Tunku, Rahman, Phaik, Cheah, & Rahman, 2009). Lecturers must have high-order thinking skills to be able to develop students' thinking skills. Lecturers who do not have an understanding of higher-order thinking and how to encourage students to acquire these skills will tend to fail in developing higher-order thinking skills. (Bahr, 2010).

The learning process standards cannot be separated from the learning model and learning media used. In the HAP course, only 45.45% of the material has teaching materials. Teaching materials are one of the main things that must be available in a learning activity to teach according to the standard of learning content, namely the breadth and depth of the material. The form of teaching materials needed is one that contains novelty aspects, not just material (Qomariyah & Prayitno, 2018a). Lack of digital teaching materials that are by the development of information technology and the unavailability of teaching materials that are integrated with learning models that can develop students' thinking skills (Hidayati & Irmawati, 2019a). The innovative learning approach is one of the important things in developing students' thinking skills. Science, environment, technology, and society (SETS) is an approach that integrates the concept of knowledge to solve problems related to the environment and society which is supported by the development of technology. The SETS approach aims to teach concepts contextually. Students are faced with the surrounding situation to apply the concepts learned in the form of technology for the benefit of society. These learning activities can stimulate thinking knowledge (Suriyanto & Alinata, 2016). The module using the SETS approach was able to improve collaborative problem-solving skills in junior high school students in Jember (Tamimiya, Gani, & Putra, 2017). Science

process skills can be improved through the use of SETS-based modules (Hayati, Rosana, & Sukardiyono, 2019).

One of the solutions provided is to identify the main problems in the HAP learning process so that it is by the competency standards of graduates. Identification in the HAP course needs to be done to determine learning strategies in the form of determining learning models, developing higher-order thinking skills, and appropriate teaching materials to achieve learning objectives. The form of teaching materials currently available is still limited to one topic and does not accommodate thinking skills (Setiawan & Arifin, 2017). Similar research on the development of teaching materials is devoted only to certain materials (Qomariyah & Prayitno, 2018b). Similar research shows that teaching materials are developed only to apply appropriate research results to one material (Sari & Iza, 2018). The three studies have not explored much information about the main problems in a learning process so that the available teaching materials still do not accommodate the learning process in the classroom and do not stimulate students' thinking skills. The purpose of this study was to obtain information about the main problems in the HAP course to provide the right solution in terms of the teaching materials to be used.

RESEARCH METHODS

Research Design

Survey research is a research design used by researchers. Survey research is a descriptive quantitative research type (Zubaidah, 2018). Survey research is widely used in educational research as a basis for planning and problem solving to determine perceptions, responses, attitudes, achievements, etc. Survey research is used to gather information and create comprehensive descriptions and relationships between variables (Zubaidah, 2018). This research is a preliminary study in the context of research on the development of multimedia assessments in the HAP course.

Population and Samples

The total population in this study was 80 students who had taken the HAP course in the Biology Education study program class of 2017. The sampling technique in this study was simple random sampling because the sample was taken randomly without considering the strata in the population (Sugiyono, 2007). The sample used was 26 students or 32.5% of the population. The research sample also involved two teaching lecturers in the human anatomy physiology course.

Instruments

The instruments used in this study were transcripts of interviews with lecturers and questionnaires to students. Survey research instruments can be in the form of questions that are directly given to respondents or can be in the form of questionnaires and interview transcripts (Zubaidah, 2018). Interview transcripts given to lecturers include the learning model used in the HAP course (reasons for choosing learning models and student responses, types of learning approaches, aspects of skills developed and not yet developed, the urgency of higher-order thinking skills, a material considered difficult by students, form material printed and non-print teaching, evaluation forms used, online learning constraints, and online learning support for online platforms).

The student questionnaire contains questions with different answer choices. The contents of the questions given to students include the availability of a semester implementation plan, the response to the use of learning media, the types of printed and non-printed teaching materials used, the learning media needed, materials that are considered difficult, the form of teaching materials that have been used, the availability of evaluation teaching materials, the media learning that facilitates learning activities, learning media based on learning approaches/models, and online

learning support platforms. Interview sheets and student questionnaires are given to lecturers and students in the online form via google form. The instruments of interview sheets and student questionnaires are prepared based on needs and go through the assessment stage by experts. The appraiser is a lecturer in educational evaluation so that the instrument being assessed can be used as a tool to explore research data.

Procedures

The procedures in this study include the preparation of instruments in the form of a questionnaire, selecting the method of collecting the questionnaire, selecting the samples to be used, data collection and data classification, and data analysis (Adiyanta, 2019). A schematic of the survey research procedure is presented in Figure I.

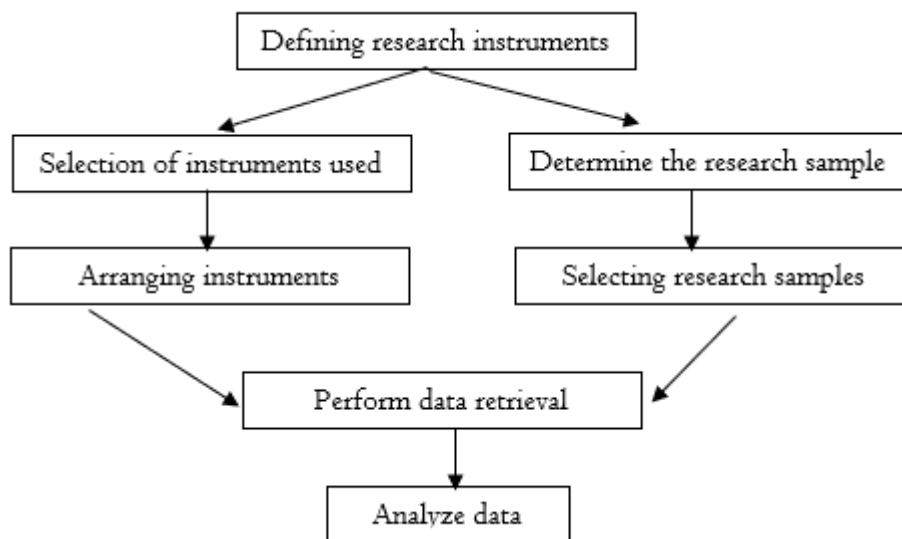


Figure I. Research procedures used by researchers

Data Analysis

The data obtained were analyzed descriptively. The results of the lecturers' interviews were described in narrative form and the results of filling out questionnaires by students were analyzed by percentage and narrated. The results of filling out the questionnaire by students are added up per question indicator which is then presented by dividing the number of answers selected by the student by the number of student samples then the result is multiplied by 100.

RESULTS

The data obtained from the study are described as follows: 1) Description of problems in HAP learning is obtained from interviews with lecturers and filling out questionnaires by students; 2) The results of curriculum analysis and the accuracy of learning based on the curriculum used; 3) The results of the analysis of skills that students must master; 4) The results of the analysis of the use of learning media. Descriptions of interviews with teaching lecturers are described as follows.

The learning methods that have been used most often are lectures, presentation discussions, and role-playing (on certain materials only). The learning media used are concept maps (concept maps prepared by students), autoplay, quiziz (on I material), and Adobe Flash (on the material on muscle systems, nervous systems, and sensory systems). There are 63.63% of materials that do not have teaching materials. Based on this, it can be concluded that it is necessary to make improvements to HAP learning which includes learning models and learning media. The learning

era is currently done online or online. So that learning media that only contains a collection of materials or concepts cannot support the learning process properly.

Table I. The student questionnaire results about human anatomy physiology learning

No	Item	Percentage	Description
1	There is a plan to implement the semester at the beginning of each lecture	73.80%	Lecturers provide RPS
2	Use of learning media	57.10%	Students strongly agree
3	The types of printed teaching materials that have been used in learning HAP courses	47.60%	Modul
4	Types of non-printed teaching materials that have been used	61.90%	Microsoft Power Point
5	Types of learning media that students need	40.50%	Multimedia
6	Frequency of use of media in HAP lectures	57.10%	Only 3 topics
7	Material that students find difficult	45.00%	Cardiovascular system
8	Availability of evaluation of printed teaching materials used	65.00%	Not yet available
9	The type of content on the learning media used	81.00%	Contains material only
10	The multimedia form used in HAP lectures	78.60%	contains text along with images
11	Types of learning media that are suitable in online learning	71.40%	Multimedia
12	There is an evaluation of interactive learning media	59.50%	Agree
13	Learning evaluation becomes one of the multimedia contents that motivates students	69.00%	Agree
14	Types of learning activities that are of interest to students in assigning assignments	59.50%	Independent
15	Learning activities that are of interest to students	40.50%	Solution to problem
16	Learning with the SETS approach that has been carried out by students in courses outside HAP	7.10%	Never
17	If HAP learning uses the SETS approach	52.40%	Strongly agree
18	Problem-based learning in the Anfisman course	57.10%	Agree
19	The type of learning that has been done	42.90%	live and online
20	The level of difficulty of the questions in the Anfisman course	66.70%	Difficult
21	Online learning platform ever used	66.70%	Whatsapp Grup

The aspects of knowledge and skills that have been developed and measured in the HAP course are more in the cognitive domain. while learning outcomes must include affective and psychomotor. However, in the current era, learning outcomes are still lacking because learning demands are more on higher-order thinking skills such as critical thinking skills and metacognitive skills. Critical and metacognitive thinking skills can be developed through an innovative learning process and provide opportunities for students to have higher thinking skills.

Overall, the HAP course material has a high level of difficulty because it has to link the structure (which is studied in terms of cellular) with the function of each component of the organ system in humans. So that the role of learning media in this course becomes important. However, if detailed again, the learning resources that are often used are the HAP textbook published in 2004 which is circulating in a limited circle of an institution, learning videos available for free on



Youtube, and the concept of material taken from websites whose accuracy is unknown. Research journals are used as supporting material, but students still don't understand the contents of written journals. Research articles are more specific for each sub-topic of subject matter that is studied in-depth, so one must understand basic concepts that are not widely understood by students. The data obtained from the results of filling out questionnaires by students about learning activities in the HAP course is presented in [Table 1](#).

Data from filling out a questionnaire about HAP learning shows that learning media is needed by students to support learning activities. The types of teaching materials that have been used can be printed or non-printed. However, if examined further, most of the learning media used are only limited to material descriptions, not yet fully containing learning and evaluation activities. This means that student learning activities are still carried out through presentation discussions with the lecture learning method. This fact shows that the use of learning media is not optimal because it has not been able to change the learning atmosphere in the classroom. This means that student learning activities are still carried out through presentation discussions with the lecture learning method. This fact shows that the use of learning media is not optimal because it has not been able to change the learning atmosphere in the classroom.

The second data obtained from this study is the result of a review of the curriculum used with the lecture activities that have been implemented. The learning outcomes of the HAP course include aspects of knowledge and skills, including being able to apply logical, critical, systematic, and innovative thinking in the development of science and technology, skilled in carrying out activities in the laboratory, mastering the principles of biology and the environment, and mastering the concept of biological applications. and technologies relevant to applications in learning and the environment. The sub-subjects used are 1) identifying the organs that make up the cardiovascular system, circulatory mechanisms, and identifying the use of technology and disease and 2) identifying respiratory system organs, respiratory mechanisms, and abnormalities in the respiratory system. So that when viewed from the learning outcomes of these subjects, HAP learning activities must be carried out by paying attention to aspects of mastery of knowledge, higher-order thinking skills, utilization of technology, and application of knowledge in learning.

The form of learning media used is still limited to a description of the material. Only 5 of the 11 materials in the HAP course have model-based learning media or specific learning approaches that are also equipped with evaluation. Meanwhile, the other 6 materials are still not equipped with relevant learning media. In other HAP classes, the learning media used is only one material so that the optimization of appropriate learning media is still lacking.

DISCUSSION

The results of interviews with a lecturer who teaches the human anatomy physiology course obtained an overview of the problems in this course, including the use of learning models that are still lacking, there is not yet complete learning media for all materials, and student skills are still not optimized. The solution offered for this problem is to compile learning media that contains material descriptions, learning activities according to certain learning approaches or models, and evaluations that can measure 21st-century skills.

The results of this research are in line with Hidayati & Irmawati (2019a) and Hidayati & Irmawati (2019b) that students in HAP learning need learning media that is integrated with information technology and learning models that familiarize themselves with critical thinking skills. Learning HAP needs to use the integrated multimedia approach and learning model that suits the character of the students and the curriculum. El-Sayed & El-Sayed (2013) argues that HAP learning will be more effective by using interactive media than conventional media and the use of

interactive media makes it easier to achieve learning goals. Bioscience learning such as HAP learning will be more active and meaningful if it uses multimedia (Rolfe & Gray, 2011)

Learning media that contains a learning approach can solve complex problems in the HAP course because the lecturer arranges the learning media according to the needs analysis. Selection of appropriate teaching materials or learning media can have a positive impact on learning (Atno, 2011). The process of selecting teaching materials is an important activity in achieving learning objectives because it is adjusted to the characteristics of the users of teaching materials and the material being taught. The determination of learning media must be adjusted to the needs analysis to achieve the expected goals (Hidayati & Pangestuti, 2017). Teaching materials must be developed by lecturers according to the needs of students and the curriculum (Hidayati & Irmawati, 2019a).

Based on the data from the results of filling out the questionnaire by students, it is necessary to make improvements in the learning process by compiling learning media based on a learning model or approach. The learning process which includes models, media, and evaluation is needed to achieve learning objectives. The form of evaluation of teaching materials must also fulfill the evaluation aspect as a measuring tool (Walid, Sajidan, Ramli, & Kusumah, 2019) and meet valid and reliable requirements (Puspitasari, Susilo, & Febrianti, 2019). Learning media must be easy to use by lecturers and students, containing lesson plans, facilitate student independence in learning, facilitate understanding of concepts, be equipped with evaluation, and develop thinking skills. (Hidayati, Pangestuti, & Prayitno, 2019). Learning media developed using a particular learning model tends to improve a person's critical thinking skills (Mujiyati, Wardo, & Sutimin, 2019).

Curriculum analysis is also used as a reference in determining the skills students must master. The skills chosen are students' critical and metacognitive thinking skills because these two skills are higher-order thinking skills that are in line with the demands of the 21st century. Higher-order thinking skills can be developed through a learning process that facilitates the formation of these skills. Teaching material is one of the learning media that supports the learning process in improving higher-order thinking skills (Hidayati, Irmawati, & Prayitno, 2019).

Higher-order thinking skills can also be developed through specific and systematic planning, constructs to stimulate thinking skills, and conditions for the learning process. (Zubaidah, 2017). Students' critical and metacognitive thinking skills are developed by developing a learning process that does not only contain concepts but problems related to the material (Ichsan, Sigit, & Miarsyah, 2019). Higher-order thinking skills can be improved through the selection of learning models, learning tools, worksheets, and learning media (Ichsan, Sigit, Miarsyah, Ali, Arif, & Prayitno, 2019).

The form of learning media must be by the needs, namely to accommodate certain learning approaches or models that can develop students' higher-order thinking skills. One approach that is compatible with learning outcomes in the HAP course is the SETS approach (science, environment, technology, and society). Learning assessments arranged by the SETS approach can make students very active and be able to improve student learning outcomes (Minarti, Susilowati, & Indriyanti, 2012). SETS-based science learning using interactive multimedia can improve process skills, student activities, and get positive responses from teachers and students (Yulistiana, 2015). SETS-based science learning using interactive multimedia can improve process skills, student activities, and get positive responses from teachers and students (Gufron, Darwan, & Winarso, 2018). The use of multimedia in learning makes it easier for students and teachers to carry out learning activities with features of animation, images, video, audio, and text into one unit that can be studied individually or in groups (Munir, 2012). Interactive multimedia with a valid SETS approach can make learning more effective as evidenced by the increase in students' critical thinking skills (Firdaus, Suryanti, & Azizah, 2020).

SETS has components in shaping critical social, decision-making, action, and sustainability so that it can build higher-order thinking skills and problem-solving skills (Nisak, Wartono, & Suwono, 2017). The SETS approach aims to provide knowledge so that it can make decisions about issues related to society. The SETS approach prepares students to be able to think globally by linking SETS components, namely knowledge, environment, technology, and society in problem solving decision making (Khasanah, 2015). The SETS approach can improve higher-order thinking skills because at the SETS stage students are asked to be active in finding concepts and their applications to solve problems related to the environment, society, and technological developments (Maimunah, 2016). Technology-based learning media influence student cognitive learning outcomes (Sari & Supranoto, 2017).

The importance of learning media in HAP courses, it is necessary to develop representative learning media according to the curriculum and the results of the needs analysis. Learning media must be developed according to the needs and have been tested for their feasibility so that they are suitable for use in learning (Prayitno & Hidayati, 2017). Multimedia can improve students' critical thinking skills if they have gone through expert assessment and get a decent and effective category for use in learning (Hidayati & Irmawati, 2019b). Multimedia based on local wisdom according to user needs can improve understanding of the concept of the material being taught (Primiani, Prayitno, & Dinka, 2020).

CONCLUSION

Based on the findings in this study, it shows that the human anatomy physiology course has not been equipped with relevant learning media that is by technological developments and is integrated with an innovative learning approach that accommodates the development of students' higher-order thinking skills. It is necessary to develop teaching materials that are by the need analysis and curriculum for learning outcomes of HAP courses based on science, environment, technology, and society approaches. The learning media chosen is in the form of multimedia by the development of science and technology and current conditions.

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