

Student Needs Analysis of the Scientific Literacy Oriented Interactive Multimedia on Living Cells Matter

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Abstract

Scientific literacy defines as multidimensional skills that students should have to prepare a life after school. One thing that can improve scientific literacy is the quality of teaching materials. Teaching materials are one of the main components in learning including living cell matter. Currently, teaching materials that are widely used in Indonesia are still in the form of printed teaching materials and according to PISA results, these teaching materials have not a significant impact on students' scientific literacy. Nowadays, technological advances are very rapid and have a very positive impact on life, including in education. One of the benefits is the integration of interactive multimedia as the basis for teaching materials. The purpose of this article is to analyze the students' needs regarding interactive multimedia-based teaching materials containing scientific literacy in the learning of the living cells matter and to analysis of scientific literacy aspects in the previously used teaching materials. The research method used is descriptive qualitative with data collection techniques using questionnaires and interviews. The research subjects used were 3 Biology teachers and 81 students of class XI of science program at one of high schools in Sukabumi City, Indonesia. The results showed that students need interactive multimedia-based teaching materials containing scientific literacy on living cell matter and currently the teaching materials that students use have several components that are not as expected and the components of scientific literacy in these teaching are still not balanced. Therefore, it is necessary to develop interactive multimedia-based teaching materials containing scientific literacy on living cell matter to improve students' scientific literacy.

Keyword: Student Needs, Teaching Materials, Multimedia Interactive, Scientific Literacy

INTRODUCTION

Education is an organized social organization to transmit significant experiences from generation to generation. One way to get education is by taking training courses in educational institutions (Krishnamurthi 2021). To date, many curriculum and teaching models designed to improve the quality of science teaching and learning have been implemented (Lederman et al., 2013). Now days education is currently at a critical crossroads. After a profound and accelerated change the process of reconfiguring the current nature of society (see also Bauman, 2005; Sarid, 2018). Educational theorists and practitioners engage in heated debates about certain types of educational theory or this approach is functionally relevant or ethically desirable for today's sociocultural climate (Sarid, 2018). However, the change is intended to improve human quality.

In the learning process there is an interaction between various components, the learning components can be grouped into 3 categories, namely: teachers, teaching materials, and students. (see also Abdullah, 2017; Ananda, 2019; Baderiah, 2018; Nur Habibullah, 2000).

Teaching materials are a set of subject matter that refers to the curriculum used with the aim of achieving competency standards and basic competencies that have been determined in the curriculum (Magdalena et al., 2020; Nurdyansyah, 2018). Teaching materials are important tools in studying every subject in the school curriculum. They enable students to interact with words, symbols and ideas in ways that develop their abilities to read, listen, solve, see, think, speak, write, use media and technology (Bukoye, 2019). Teaching materials refer to alternative communication channels, which classroom teachers can use to concretize a concept during the teaching and learning process. Traditionally, classroom teachers have relied heavily on 'talk-chalk' method during their teaching. But lately, teaching materials help provide a variety of ways in which message was sent (Abigail Agbo et al., 2019). In using teaching materials, teachers and students not only expand their reach sense organs that we use but also expand the range of materials used to convey the same message through the same organ. For example, in teaching a topic, a teacher can manipulate a real object or use its stimulator. Instructional material is therefore a medium of exchange through which message transactions are facilitated between a source and receiver (Abigail Agbo et al., 2019). Teaching materials play an important role for teachers to clarify, interpret and enforce national standards (Choppin et al., 2020). The essence of producing teaching materials is to facilitate the teaching and learning process. When presenting various learning theories, it must be ensured that a classroom teacher is guided by expert ideas during the production and utilization of teaching materials, provide a concrete basis for concept thinking and reduce meaning, less work response to students because it makes learning more permanent, teaching materials have a high interest for learners because they offer reality experience, which stimulates student self-activity and teaching materials develop continuity of thought (Abigail Agbo et al., 2019).

Interactive Multimedia is a media program that contains a combination of two or more information components such as text, images, sound, animation and video (see also Putra et al., 2020; Sari & Ridwan, 2020; Siregar et al., 2020). Several studies have shown that interactive multimedia has many benefits including increasing student character (Indah Septiani et al., 2020), interactive multimedia helps explain abstract lessons (Nurtanto et al., 2020), Interactive multimedia provides a learning environment that can provide students with many opportunities to explore, discover, and relate concepts to enable learners to increase knowledge, based on their own strategies, and to satisfy their inner curiosity (Shahzad et al., 2021).

Meanwhile, scientific literacy is one of the most important aspects in learning, especially science learning (see also Dragoş & Mih, 2015; Gucluer & Kesercioglu, 2012; MacDonald, 2021). The educational process must implement scientific literacy indicators (Dragoş & Mih, 2015) which cover science as body of knowledge, science way of investigating), science way of thinking, and interaction between science, technology and society (Cansiz & Turker, 2011; Chiappetta et al., 1991). Students have the capacity to use scientific knowledge, to identify questions and to draw evidence-based conclusions to understand and help make decisions about nature and the changes made through human activity (OECD, 2008). So, scientific literacy is very necessary where as a human being is related to the ability to function as a citizen in society to make decisions and act as a responsible person (Church, 2020).

One of the most difficult materials to teach is living cells because they are considered abstract and there is no media that can help explain the concept (Mei Indra Jayanti, 2018; Rulia, 2019). Based on this description, this article will discuss (1) the needs of students for interactive multimedia on living cell matter and (2) scientific literacy content on living cell matter teaching materials used today.

METHOD

Descriptive qualitative research in this study used to comprehensive summarization, in everyday terms, of specific events experienced by individuals or groups of individuals (Lambert & Lambert, 2013). The research subjects are three Biology teachers and 81 students of class XI Science Program SMA Pesantren Unggul Al-Bayan Sukabumi. Data collection techniques were obtained through interviews, questionnaires and assessment of aspects of scientific literacy in teaching materials by teachers. The interviews conducted were semi-structured interviews given to Biology teachers. While the questionnaire was carried out by distributing questionnaires to students with 23 statements containing 11 statements regarding students' needs for teaching material based on Interactive Multimedia and 12 statements regarding students' needs for teaching materials containing scientific literacy in living cell learning. A statement Likert scale consists of 5 points with the criteria of strongly agree the value is 5, agree is 4, slightly disagree is 3, disagree is 2, and strongly disagree is 1 (Joshi et al., 2015). Furthermore, the assessment of aspects of scientific literacy in teaching materials by teachers is carried out by providing an assessment instrument equipped with a rubric for assessing aspects of scientific literacy which includes science as a body of knowledge, science a way of investigating, science a way of thinking, and interaction of science, technology and society (Chiappetta et al., 1991). Data analysis was carried out through four stages which

included pre-field analysis, data reduction (data reduction), data display (data display), verification (conclusion drawing). Pre-field analysis was carried out on the data from the previous preliminary study, data reduction was carried out by summarizing and focusing on the objectives. Meanwhile, data presentation is done in the form of descriptions, charts, tables, and so on. The last is verification through drawing conclusions based on research questions. The following is a descriptive qualitative research flow (Figure 1):

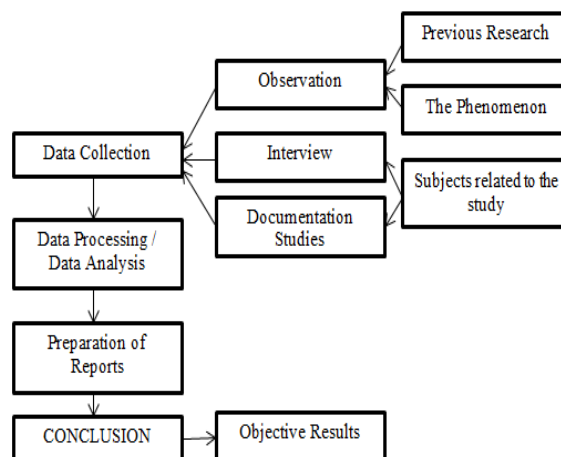


Figure 1. The Flow of Descriptive Qualitative Research

RESULTS AND DISCUSSION

Analysis student need of the scientific literacy based interactive multimedia on living cells matter carried out through two approaches. The approach includes an analyze students' needs regarding interactive multimedia-based teaching materials containing scientific literacy in learning living cells and to analyze scientific literacy aspects in the previously used teaching materials.

Technology has an important role in the advancement of education, one of which is by utilizing technology as the basis for teaching materials(see also Fitriana, 2021; Sholeh & Basuki, 2019; Urhan et al., 2018). This doesn't just help with the transfer of knowledge or content learning, but also facilitates students in developing communication, problem solving, and higher order thinking skills. Therefore, the development of technology-based teaching materials such as interactive multimedia is needed, here are the results of the analysis of student needs for interactive multimedia-based teaching materials (Tabel 1).

Table 1. Results of the analysis of student needs for interactive multimedia-based teaching materials

No	Statement	Alternative Choices (%)				
		Strongly Disagree	Disagree	Slightly Disagree	Agree	Strongly Agree
1	I like science teaching materials with pictures, audio, animation and graphics compared to textbooks	1,15	2,30	1,15	32,18	63,22
2	It is easier for me to understand science material through teaching materials that contain visual elements (images or videos) rather than text.	1,15	2,30	13,79	33,33	49,43
3	The learning material for Living Cells that I do uses a variety of teaching materials	2,30	26,44	27,59	37,93	5,75
4	The illustrations/ modeling images presented in the Living Cells teaching materials help me understand the concept of the material.	0,00	3,45	18,39	63,22	14,94
5	My school has a proper computer laboratory to support learning activities	2,30	1,15	6,90	33,33	56,32
6	I am skilled at using computers for learning activities	0,00	1,15	8,05	52,87	37,93
7	I know interactive multimedia in learning	1,15	6,90	21,84	40,23	29,89
8	I often use interactive multimedia as teaching materials in learning.	5,75	17,24	43,68	26,44	6,90
9	Learning Science of Living Cells has used interactive multimedia-based teaching materials.	11,49	27,59	37,93	20,69	2,30
10	I agree if the development of interactive multimedia - based teaching materials is carried out on Living Cells as teaching materials to support the learning process	0,00	0,00	2,30	32,18	65,52
11	I agree to use interactive multimedia-based teaching materials on Living Cells as teaching materials to support the learning process	0,00	0,00	2,30	31,03	66,67

In Table 1 it can be explained that most students like teaching materials accompanied by pictures, videos, animations or audio because students can more easily understand learning materials, making the learning environment more fun and more real with these types of teaching materials compared to textbooks (see also Khoiriah et al., 2016; Limbong et al., 2021; Singh, 2021). Most students also already know about the use of interactive multimedia in learning and they are also skilled in using computers, but in learning about living cells most of them have never used interactive multimedia-based teaching materials and the majority of students strongly agree to develop and use interactive multimedia as teaching materials on living cell study.

Table 2 Result of analysis students' needs of the scientific literacy based teaching material on living cells matter

No	Statement	Alternative Choices (%)				
		Strongly Disagree	Disagree	Slightly Disagree	Agree	Strongly Agree
1	Learning science and technology is important for human life	0,00	0,00	0,00	19,54	80,46
2	Learning science and technology made me interested in working in this field	0,00	0,00	11,49	59,77	28,74
3	In learning Science, I often associate the occurrence of natural phenomena with science.	0,00	0,00	4,60	70,11	25,29
4	In learning Science, I know a lot about the history of how scientists discovered concepts/materials	1,15	10,34	43,68	35,63	9,20
5	I have difficulty in learning Science, especially in Living Cells	0,00	16,09	27,59	45,98	10,34
6	Learning Living Cells is one that is still abstract.	1,15	14,94	36,78	39,08	8,05
7	The Living Cells teaching materials that I have used so far have made me interested and enthusiastic in learning.	0,00	10,34	54,02	34,48	1,15
8	The Living Cells teaching materials that I have used so far have made me interested in increasing my thinking activity.	0,00	8,05	43,68	42,53	5,75
9	The Living Cells teaching materials that I have used so far have made it easy for me to understand information through tables or graphs	3,45	12,64	20,69	48,28	3,45
10	The Living Cells teaching materials that I have used so far have made me less motivated in learning activities	4,60	31,03	44,83	17,24	2,30
11	I don't get a lot of information outside the context of the subject matter, such as issues around science in the Living Cells teaching material	3,45	14,94	20,69	51,72	9,20
12	I don't get a lot of information on issues regarding the sustainability of the world from living cell teaching materials	1,15	14,94	29,89	49,43	4,60

Based on the data in Table 2, it can be explained that the living cell teaching materials used by students so far when viewed from the aspect of scientific literacy are dominated by the presentation of science as a body of knowledge and science a way of investigating. Meanwhile, aspects of science a way of thinking, and interaction between science, technology and society have not been widely displayed in these teaching materials. It can also be seen that the teaching materials have not explained the nature of science in the

creation of knowledge and have not been able to increase students' motivation and enthusiasm in learning. The teaching materials that have been used so far have also not explained the current issues related to learning materials and issues regarding world sustainability.

Based on a preliminary study conducted on 81 students of class XI MIPA at SMA Pesantren Unggul Al-Bayan, the results show that 56.32% of students think that the material for living cells is a biology learning material that is difficult to learn. According to the results of the questionnaire, 47.13% of students thought that the material for living cells was still abstract, 53.62% considered the teaching materials used in learning to be less varied, 64.37% stated that the teaching materials used did not attract students' enthusiasm in learning. Meanwhile, 95.40% of students really like teaching materials accompanied by pictures, audio, animation and graphics compared to textbooks and 82.76% of students find it easier to understand the material through teaching materials that do not contain visual elements (images or videos) than text. (writing). According to the results, 97.70% of students agreed to develop interactive multimedia-based teaching materials on Living Cells as materials to support the learning process and 97.70% of students also provided it to use them. Meanwhile, based on the results of the analysis of teaching materials and interviews with 3 Biology teachers at the Pesantren Unggul Al-Bayan High School, it was stated that the teaching materials used in learning living cells were still in the form of textbooks and the content of scientific literacy in the book was mainly in the aspect of science as stems. only a body of knowledge, while the other three aspects, namely Science as a way of thinking, Science as a way of investigating, and the interaction between science, technology and society has not yet been established. many integrated, so the content of scientific literacy in the book is not balanced. Teaching materials that refer to four categories of scientific literacy with a balanced proportion, namely 2:1:1:1 (Wilkinson, 1999).

Meanwhile, the results of interviews with 3 biology teachers showed that the teaching materials for living cells matter used by students and teachers have not been able to attract students' interest in the learning process. Teacher visualization problems in the textbooks used have not been effective in explaining the learning matter so that it becomes one of the obstacles in learning. Considering that textbooks have a very important role in the learning process, the teacher hopes that effective teaching materials will be available to shape the learning process, as well as being able to attract attention and increase students' learning motivation. Then according to the teacher's assessment of the 4 categories of scientific literacy in teaching materials, the results showed that the components of scientific literacy were not balanced. The teacher component that Science as a body of knowledge still

dominates compared to the 3 components of scientific literacy. According to (Chiappetta et al., 1991) science as a body of knowledge is the result of various scientific fields which are the product of human discoveries, science as a way of thinking includes belief, curiosity, imagination, thinking, cause-and-effect relationships, self-examination, doubt, objective, and open-minded. Science as a way of investigating learns about how scientists work to make discoveries, so science as a process provides an overview of the approaches used to develop knowledge such as developing scientific process skills, using the scientific method, and paying attention to the inquiry process and science as a form of interaction between technology and society means that science, technology and society are elements that influence each other. Many scientists' discoveries are influenced by their interactions with technology and with social society. The results of the analysis of the questionnaire and the development of the limitations on the cell material books used by teachers and students. Thus, it is necessary to develop teaching materials for living cells connected to ICT which are filled with scientific literacy that can help teachers and students to facilitate the learning process, increase learning motivation and provide skills for students.

CONCLUSION

Based on the results of the questionnaire on the students needs, it can be concluded that there is a need for biology teaching materials on living cells matter that are integrated with ICT and contain scientific literacy that can help the learning process. This is also supported by the results of interviews and assessments of teaching materials used by biology teachers regarding the limitations of teaching materials and components of scientific literacy in these teaching materials which in fact have not been able to increase students' learning motivation and scientific literacy. Analysis of the need for teaching materials for living cells that are integrated with ICT and contain scientific literacy can be a reference in biology learning to develop teaching materials for living cells matter that are integrated with ICT and contain scientific literacy.

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