

Analysis of the need for ICT (Information and Communication Technology) based biology teaching materials at the high school level

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Abstract

Based on the demands of the learning curriculum in the classroom, it must create an atmosphere that is active, creative, analytical, and critical in solving problems through the development of thinking skills. However, the involvement of students in learning activities in class is still low. The research aims to determine the need for ICT-based biology teaching materials and the constraints in applying them. The research used a qualitative descriptive approach, the subjects of the research were class X students, biology teachers, ICT teachers, and Deputy Principal for Curriculum. The sampling technique used purposive sampling technique. The research procedure goes through three stages, namely preparation, implementation, and member check. Based on the research results, the biology learning process still uses contextual models and lecture methods. It is also that 83.3% of students said they needed ICT teaching materials to understand the material, concretize abstract material, and increase interaction in the learning process. Constraints in implementing ICT-based teaching materials are classified into physical and non-physical facilities. Physical facilities in the form of learning equipment, while non-physical means lack time and lack of training in designing ICT-integrated learning. Teacher expertise in ICT-based teaching needs to be trained so that students can be more active in the learning process.

Abstrak

Berdasarkan tuntutan kurikulum pembelajaran di kelas harus menciptakan suasana yang aktif, kreatif, analisis, dan kritis dalam pemecahan masalah melalui pengembangan keterampilan berpikir. Namun keterlibatan peserta didik dalam kegiatan pembelajaran di kelas masih rendah. Penelitian bertujuan mengetahui kebutuhan bahan ajar biologi berbasis TIK dan kendala dalam menerapkannya. Penelitian menggunakan pendekatan deskriptif kualitatif, subjek penelitian adalah peserta didik kelas X, guru biologi, guru TIK dan Wakil Kepala Sekolah Bidang Kurikulum. Teknik pengambilan sampel menggunakan teknik purposive sampling. Prosedur penelitian melalui tiga tahap yaitu persiapan, pelaksanaan, dan member check. Berdasarkan hasil penelitian, proses pembelajaran biologi masih menggunakan model kontekstual dan metode ceramah. Diketahui pula 83,3% peserta didik mengungkapkan membutuhkan bahan ajar TIK untuk memahami materi, mengkonkretkan materi yang abstrak, serta meningkatkan interaksi dalam proses pembelajaran. Kendala dalam menerapkan bahan ajar berbasis TIK digolongkan menjadi dua yaitu sarana fisik dan non fisik. Sarana fisik berupa peralatan belajar, sedangkan secara non fisik adalah kekurangan waktu dan belum terlatihnya dalam mendesain pembelajaran terintegrasi TIK. Keahlian guru dalam melaksanakan pembelajaran berbasis TIK perlu dilatih agar peserta didik dapat lebih aktif dalam proses pembelajaran.

A. Introduction

21st century technology cannot be separated from the development of information and communication technology. Indirectly, the rapid development of technology has resulted in educational activists being required to take advantage of advances in technology and information in the learning process so as to create more advanced education. A country can be said to be advanced if education activists, both teachers and academics, are able to use and apply computers and online sites in the learning process, so that learning in class is more effective and efficient (Wimboasto, 2017).

Changes in the learning process are urgently needed to carry out reforms in the learning system from conventional to intensive dynamics of the times. Utilization of information and communication technology in education can help the learning process in the classroom. For example, material in teaching materials can be displayed in various formats and forms that are more interesting and interactive. The use of technology can increase the knowledge and skills of students (Tekege, 2017)

In order to solve the problem of low involvement and activeness of students in participating in class learning, according to the demands of the learning curriculum in the classroom must create an atmosphere that is active, creative, analytical and critical in solving problems through the development of thinking skills. So that students are required to be actively involved in the learning process in class (*Student Learning Center*) (Boiliu & Sinaga, 2021). The activeness of students is one of the important factors in the success of learning in the classroom. According to Wicaksana (2020), student activeness is one of the main principles in the learning process.

The lack of teaching materials used during learning activities can result in students finding it difficult to find additional references related to the material. In general, students are only guided by textbooks circulating from the government, but these books contain language and material that is difficult to understand. This is in line with research according to Irawati & Saifuddin (2018), that teaching materials are an important component in the fluency and active learning of students in the classroom. Teaching materials are an important element in the learning process because teaching materials are a teacher's guide in delivering material. Especially ICT-based teaching materials, the use of ICT-based teaching materials can make it easier for students to understand the material, increase students' curiosity, encourage creativity,

and make learning more effective and flexible. In addition, ICT-based teaching materials can make learning more effective.

The use of ICT is expected to encourage the emergence of creativity and be able to solve problems faced by educators and students, one of which is by using ICT-based teaching materials. ICT-based teaching materials can increase students' interest, because the learning process is much more flexible. This is because opportunities for interaction between teachers and students as well as learning materials are wide open because students can communicate with teachers anywhere and anytime. Along with the development of information and communication technology, it is expected to be able to utilize technology optimally, especially in applying ICT-based teaching materials (Utami & Muqowim, 2020). Utilizing computers and internet networks, several graphics can be visualized clearly so that learning becomes more interesting and easy to understand and increases student motivation in the learning process (Murni et al., 2020).

Biology subjects are closely related to how to systematically find out and understand nature. Biology subjects are not just mastery of facts, concepts or principles but also include the process of discovery (Berutu & Tambunan, 2018). Biology subjects have various characteristics and objects, both in terms of size, affordability, safety, language and so on (Nisak, 2021). So that biology material is often seen as difficult to learn. One of the reasons is the use of Latin in biology subjects makes it difficult for students to understand the material. In addition, problems in the textbooks used by students are also a factor in the difficulty in learning biology material (Eurika & Melasari, 2023)

Based on the results of teacher interviews in Senior High School (SMA) on Jambi Province, the use of biology teaching materials in these schools is still limited. Students only use student worksheets (LKPD) and only use modules downloaded from the internet a few times. Supported by student statements based on observations which say that the LKPD that has been used so far makes students less interested in reading and seeking information on learning materials, this is because the material is monotonous with language that is difficult to understand. Based on the results of a preliminary study of ten students, nine students said that biology was a difficult subject to understand, so ICT-based teaching materials were needed to make it easier to understand the material. However, teachers rarely use interactive teaching materials, resulting in students being less active in the

learning process. This is in line with the results of interviews with biology teachers who teach class X who say that they rarely use ICT-based teaching materials during the learning process due to inadequate supporting facilities and infrastructure in Jambi Province. The study aims to describe the biology learning process, the need for ICT-based biology teaching materials, and the constraints in applying ICT-based biology teaching materials at SMA Jambi Province

B. Material and Method

The approach in this study uses a descriptive qualitative approach. In this study, researchers will describe the implementation of the biology learning process, the need for ICT-based biology teaching materials, the constraints in applying ICT-based teaching materials, and the facilities and infrastructure that support implementing ICT-based teaching materials. This research was conducted at Jambi Province Senior High School.

The data assessment technique uses purposive sampling. According to Sugiyono (2013), purposive sampling is a sampling technique by considering certain things. In this study, the research subjects were class X biology teachers, ICT teachers and deputy principals for curriculum, and class X students who took part in the biology learning process with a total of 188. The sampling criteria selected to be the subject of this study were participating in biology lessons in 2022-2023, getting the highest score, getting the average score, and getting the lowest score in each class.

According to Arikunto (2012), if the total population is less than 100, then the total sample is taken as a whole, but if the population is greater than 100 people, then 10-15% or 20-25% of the total population can be taken. Thus the sample taken was 10% of the total 18 students in class X. Data collection techniques used in this study were documentation, interviews (in-depth interviews) and google form questionnaires. Furthermore, this research adheres to the interactive model of Miles and Huberman to process data from research results, the components of data processing include reduction, data presentation (display), and drawing conclusions (verification). Test the validity of the data using member check. The research procedure was carried out in three stages, namely the research preparation stage, the research implementation stage, and the member check stage.

C. Results and Discussion

Based on the results of research on the need for ICT-based teaching materials at the SMA level, it can be described as follows.

1. Implementation of the Biology Learning Process at Jambi Province Senior High School

The learning model that is often used in the learning process of 18 students, it is known that eleven students reveal that the learning model that is often used by teachers in the biology learning process is contextual. Meanwhile, seven students reveal the learning model that is often used by teachers in the biology learning process is problem based learning as well as the results of biology teacher interviews which reveal the model that is often used is contextual but occasionally also uses Problem Based Learning by giving problems and discussing them in groups.

It was concluded that the learning model that is often used by teachers is contextual, the reason teachers use contextual models is one of them can train students to think critically according to the conditions of the surrounding world, besides that it can invite students to associate material with application in everyday life. This is in line with res Hidayat & Darmuki (2023), the advantages of the contextual method, namely creating and providing a more meaningful and real learning process for students, but some disadvantages of the contextual learning model, namely that students take longer to understand the material, the teacher is not only a conduit of information but must manage the class with students to discover students' abilities. While the learning method is known to sixteen students using the lecture method and two students using the discussion method.

Likewise with the results of interviews with biology teachers who revealed the method often used, namely the lecture method, but occasionally interspersed with discussion. So it can be concluded that in the process of learning biology in class, teachers often use the lecture method because it is practical and time efficient so that the material delivered is much more but there are some drawbacks, namely students become passive and there is less interaction in class.

This is in line with research Mansir (2020), the use of the lecture method resulted in the teacher dominating and becoming a subject in the learning process this resulted in students becoming passive. So that when using the lecture method it is hoped that the teacher must insert the question and answer method so that there is interaction in the class and an interesting learning atmosphere. Furthermore regarding the interactions that occur in the biology learning process aims to determine the interaction between teachers and students in asking and answering questions in the learning process in class, based on the results of

questionnaires from 18 students, it is known that only one student revealed that he often responded and answered questions while studying while twelve participants said sometimes and five students said they never responded and answered questions while studying as well as the results of interviews with biology teachers who revealed that in the process of learning biology in class there were some students who were very active in asking, answering questions, express opinions, some are less active.

Some of the reasons educators often use contextual models and lecture methods are because learning resources in schools are still lacking, and there is resistance, a lack of enthusiasm in changing or providing new innovations in the learning process. To increase student interaction in the learning process, namely by providing a learning and teaching atmosphere, students must be given freedom and a sense of security to express opinions. In addition, the need for innovation in the learning process so as to motivate students so as to provoke interaction in the learning process, and must be supported by the use of methods, models, and the use of teaching materials that are suitable for the material. (Nuraida, 2019).

2. The Need for ICT-based Teaching Materials in High Schools in Jambi Province

Based on the results of the questionnaire, all students revealed that the teaching materials used in the biology learning process were LKPD. Likewise, what was revealed by the biology teacher, based on interview results, it is known that this school is only in its first year using the Merdeka Curriculum, so there is still very little teaching material used, so far the school has only provided worksheets for other teaching materials, there has been no provision from the government, so students only study using LKPD and occasionally using modules sourced from the internet.

The teaching materials used are only in the form of LKPD. Although LKPD is a teaching material that is quite effective in the learning process, schools should pay more attention to the diversity of teaching materials, because a variety of quality and varied teaching materials can help students actively read, broaden knowledge, and improve students' ability to solve problems and question. If participants only rely on LKPD, students will have difficulty understanding biology material because of the lack of references. This is in line with research research Kliyanti et al. (2018), LKPD should not be the main teaching material but only as supporting teaching material because some of the material presented in the LKDP is not complete,

the lack of pictures listed on the LKDP, as well as the many questions students have to work on, the presentation of material that is less interesting to read, besides that also the material is presented in a language that is difficult to understand and the LKPD includes teaching materials that are less interactive. According to Vioreza et al. (2022), the importance of providing teaching materials that are more diverse and varied. So it is important to use additional teaching materials that can make it easier for students to understand the material, because the variety of teaching materials used really helps students absorb learning material more quickly.

Based on the results of the questionnaire regarding the need for other teaching materials in the biology learning process from 18 students, it was found that 15 students or 83.3% of students stated that they needed additional teaching materials, because in the biology learning process the school only provided LKPD, and in biology learning there were many material that requires clear visualization, and learning media in the biology laboratory provided by schools are not very complete, so there is still a lot of material that cannot be conveyed if you rely on LKPD alone. If in the learning process there is a shortage of teaching materials or less varied teaching materials, the teacher will experience difficulties in increasing the effectiveness of the learning process and students without teaching materials will experience difficulties in learning.

Based on the results of interviews with biology teachers, it was revealed that ICT-based teaching materials were needed because they could assist in conveying material that was abstract or difficult to explain to students, in the learning process several times using learning videos, and using Power Point. Supported by data of interest in ICT teaching materials, it is known that 16 students or 88.9% of students express a liking for learning using ICT-based teaching materials, so it is known that teachers and students need ICT-based teaching materials to help students understand material, concretize abstract material, adding reading material or references, creating an interesting learning atmosphere, and increasing interaction in the learning process. The need for ICT-based teaching materials is also supported based on the results of research on learning styles 50% of students are known to have an auditory learning style, 27.7% of students have a visual learning style, and only 22.7% of students have a kinesthetic learning style, by using ICT-based teaching materials, biology material can be presented audio-visually, students will more easily remember and

understand learning material if it involves two senses for example sight and hearing, so it can be concluded that teachers and students need ICT-based teaching materials, using teaching materials ICT-based can overcome problems such as difficulty understanding biology material that only comes from LKPD, and can support a more active, collaborative, enthusiastic learning process, and can equip students in their lives (life skills) and provisions to continue to a higher level.

This is in line with research Khotimah et al. (2020), The advantages in applying ICT-based teaching materials are that they can provide students with a deeper understanding of the material being discussed, can concretize abstract material, help teachers present interesting material and make it easier for students to understand the material, easy to remember, create a pleasant learning atmosphere, interesting, increasing attention, motivation, creativity as well as the interaction between the teacher and students, forming the attitude of students from the affective and psychomotor aspects and making it easier for students to repeat (playback) learning material.

This is also supported by research Arifin et al. (2020), ICT-based learning can increase student attention, arouse enthusiasm and interest in learning, provide motivation, increase student creativity in learning, provide understanding that makes it easier for students to understand complex learning material, this is because the material is not only conveyed verbally but students can see real, so students can understand the material optimally. In addition, also using ICT-based teaching materials can form the character of students who are independent in learning so that the teacher only guides and directs students so that learning objectives are achieved.

3. Obstacles in Implementing ICT-Based Teaching Materials in High Schools in Jambi Province

Based on the results of the questionnaire from 18 students, students revealed obstacles in implementing ICT-based teaching materials, namely limited internet quota and unsupportive internet signal conditions. Meanwhile, based on the results of interviews with biology teachers, it was stated that some of the obstacles that often occur in applying ICT teaching materials, such as lack of time and not being trained in making ICT teaching materials, and several supporting facilities in using ICT teaching materials have not been installed in class, for example, projectors and speakers, so it takes a lot of time to take the projector from the facilities and infrastructure room. In addition, each

class has not been facilitated if the electrical conditions are unstable, it will result in a loss of internet connection. Likewise, the results of ICT teacher interviews revealed that the obstacles in carrying out ICT learning were that the electricity was unstable, sometimes it suddenly went out during the learning process, or the voltage that was too high also caused the electricity to suddenly turn off, resulting in disrupted internet signals.

It was concluded that in outline the obstacles in integrating ICT-based teaching materials in SMA Jambi Province in learning were divided into two, namely physical and non-physical. Physical constraints in the form of the lack of availability of facilities and infrastructure both in terms of quantity and quality, especially schools located in villages, so that schools still use facilities and infrastructure whose specifications are of less quality, so it is feared that these schools will not be able to compete with the development of ICT which is so advanced. While the non-physical constraints are the low level of teacher confidence in using ICT in the learning process in the classroom, even though the use of ICT in the learning process in the classroom must be done so that students are not left behind by the times, besides that the teacher's knowledge and skills are still limited in designing, integrating, and operating ICT facilities, as well as the persistence of teacher resistance and the low enthusiasm of teachers about the changing dynamics of the times.

This is in line with research (Candra & Sinaga, 2022) the teacher's obstacles in implementing ICT-based teaching materials in the learning process, namely the teacher's lack of knowledge about information technology (computers, laptops, LCD projectors, printers, and the internet) this is caused by the age factor and the teacher's difficulties in finding files, insufficient electric current in schools and the internet does not reach all classes, and the school does not require teachers to teach using ICT-based teaching materials. In line with research (Winda & Dafit, 2021), some of the teacher's obstacles in implementing ICT-based teaching materials, namely teachers still have difficulty designing ICT-based teaching materials, operating ICT-based media, besides that there are obstacles in the form of incomplete facilities and infrastructure and lack of teacher creativity. According to (Azhariadi et al., 2019), Obstacles in the application of ICT in the education sector are caused by the uneven infrastructure that supports the application of ICT in the learning process, and there are still many educators who feel unprepared in implementing ICT-based teaching materials. So, that the

government's role is needed to issue policies and budgets that are evenly distributed between schools in urban and rural areas. So, that there are no differences in knowledge between students in cities and in villages.

Based on the discussion above, it is known that the results of this study are in line with several previous studies regarding the implementation of the learning process, the materials needed and the constraints in applying these teaching materials. The result is a learning process that is carried out using a contextual learning model while the method used is the lecture method. Some of the reasons educators often use contextual models and lecture methods are because learning resources in schools are still lacking, and there is resistance, a lack of enthusiasm in changing or providing new innovations in the learning process. The required teaching materials are in the form of ICT-based teaching materials to help students understand the material, concretize abstract material, add reading material or references, create an interesting learning atmosphere, and increase interaction in the learning process, using ICT-based teaching materials, biology material can be Presented audio-visually, students will more easily remember and understand learning material if it involves two senses, for example sight and hearing. However, the obstacles in implementing ICT-based teaching materials at SMAN 6 Muaro Jambi can be classified into two, namely physical and non-physical facilities, physically in the form of facilities and infrastructure that have not been installed in class such as LCD projectors, speakers and internet networks, while non-physically they are still lack of time and have not been trained in designing and integrating ICT in the learning process, as well as the inherent resistance of educators.

D. Conclusion

Based on the results of the research, it can be concluded that teachers and students need ICT-based teaching materials to help students understand material, concretize abstract material, add reading material or references, create an interesting learning atmosphere, and increase interaction in the learning process. The process of learning biology in class still often uses the lecture method, so there is minimal interaction during the learning process in class and makes it difficult for students to understand the biology material that has been taught. Constraints in implementing ICT-based teaching materials are grouped into two, namely physically in the form of facilities and infrastructure and non-physically such as teacher resistance.

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