Analysis of the Suitability of Media and Learning Resources Used by Teachers Learning Needs of High School Physics in the 21st Century The Material of Light and Sound Waves

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Abstract. This research aims to analyze the media needs and learning resources used by high school physics teachers regarding light and sound waves. The method used in this research is descriptive research with a quantitative approach. The instrument used in this research was a questionnaire in the form of a Google Form link which was given to class XI students from 6 schools. The results of the analysis show that the learning media that is most widely used in 6 schools regarding sound and light waves is other media in the form of blackboards with an average percentage of 30%. Meanwhile, the most widely used learning resource is printed books with a percentage of 40%. Based on the results of the analysis, it can be concluded that IT-based learning media in schools is still not optimal. So that students become intelligent, critical, creative and hardworking individuals, who are no less competitive than other competitors, the solution provided so that students' learning resources are in line with technological developments is to use e-modules.

Keywords: learning media, learning resources, light and sound waves.

1.   Introduction

The 21st century is marked by the enormous acceleration of science and technology progress. Science and technology progress has an impact on all sectors of national and state life. The most felt impact is the replacement of most of the human power with machine power. So that the era of the 21st century is also known as the industrial era. Another impact of science and technology progress is information that transcends space and time. Through the help of technology, in a short time information can be obtained from anywhere, at any time, with very large and varied amounts. Consequently the era of the 21st century is also named the information age.

Visible in the middle of society changes in lifestyle and daily attitudes. Society in Indonesia failed to be wise about technology. Time, attention, and people's lives, especially school-age children, are consumed by one source of information, namely smartphones. They neglect to learn and build competence, only to social media, play games, or watch videos that damage their mindset and future. This condition is exacerbated by online learning in a very long period of time. Children, teachers, families and communities are not ready for online learning.

The condition of this society must be addressed immediately, including through educational institutions. Learning in the 21st century era must be able to meet the needs of people's lives. Through education, it is hoped that a society that is wise in utilizing technology will create more benefits for them. They can survive and win the competition in an era where competition is global. The government has adjusted this education policy by establishing 8 Indonesian National Education Standards, to meet the needs of the community. Education in the 21st century is student-centered-based learning, students

are given the freedom to find learning resources [1]. 21st century learning In harmony with the 4.0 revolution at this time.

To support the achievement of learning objectives, learning resources are needed. One source of learning that has an important role in the learning process is the media and learning resources. Learning media consists of several types including audio, video, visual, audio visual, interactive multimedia [2]. Meanwhile, the media based on its form consists of print and electronic media. While the learning resources that are widely used are printed books. Teachers still use conventional media and learning resources. [3] explained that in learning physics the learning resources and teaching materials that teachers use are less varied. Based on the statement above, it is necessary to develop learning media and physics learning resources. Advances in technology bring software and hardware electronic learning media. With advances in technology, learning is currently able to meet the demands of 21st century learning at this time.

Four learning needs of the 21st century that must be met, according to global competency standards, namely collaboration, communication, critical and creative thinking, refers to [4]. The presence of the 4.0 industrial revolution requires the world of education to be able to use technology in the learning process so that they have skills and are able to compete in the world of work [5]. In this context, then the world of education applies 21st Century learning which is synonymous with technological developments. One of the important pillars in the development of technology in the world is Physics [6].

According to [7] physics is an interesting science because physics is able to explain how the processes of work exist in the world. Physics was born and developed out of great curiosity. This curiosity drives and motivates people to always ask and try to answer their questions about what, why, and how about natural phenomena that occur. Curiosity will be answered more easily by using learning media. The use of learning media in the learning process makes students more interested and motivated to learn [8]. Increasing students' curiosity and motivation, of course, has a positive impact on their competence.

The reality on the ground shows that the quality of learning physics is apprehensive. This can be seen from the results of the 2018 Program for International Student Assessment (PISA) released by the Organization for Economic Co-operation and Development (OECD), that Indonesia is ranked 72nd out of 77 countries, with details of an average science score of 396, while the average OECD score is 489. The instrument used by PISA refers to international science learning competencies. So, the results of this PISA measurement show that the competency of high school students in Indonesia is still far below the average [9], [10].

The low competency achievement of the rest of high school for learning science (one of which is physics), is an illustration of the quality of learning that is not in accordance with process standards. Possibly because the media and learning resources are not in accordance with learning needs that are in accordance with the level of thinking of high school students, the character of the material, and learning objectives. According to [11], there are many other elements that can affect learning outcomes, including the atmosphere of the environment when learning, the availability of learning media and so on. Therefore it is necessary to know what is the cause of the low quality of high school physics learning in Indonesia.

Learning resources are things that contain messages or are used to convey messages that will be given to students in the learning process [12]. There are several advantages of using learning resources in the learning process, namely as follows: (1) Being able to explore hidden talents of students that have not been visible so far, (2) Learning materials become easy for students to understand, and (3) Students can study regularly and according to the pace and available time [13].

Through this research, researchers want to reveal the suitability between the media and learning resources used by teachers with standard infrastructure; especially for matter of light and sound waves.

2.   Method

The method used in this research is descriptive research with a quantitative approach which aims to reveal what something is. According to [14] it is a research method that attempts to describe and interpret objects according to what they are. Analysis of initial reading ability is calculated based on data from

observations that have been made, then the score is looked for and concluded using the specified criteria. According to [15] quantitative research requires a lot of use of numbers, starting from data collection, interpretation of the data, nd the appearance of the results. So it can be concluded that quantitative descriptive research in this research is to see, review and describe with numbers the object being studied as it is and draw conclusions about this according to the phenomena that were visible at the time the research was carried out.

The variables in this research are learning media with research subjects namely class XI students consisting of 6 state and private schools. Where an in-depth analysis was carried out regarding the use of learning media in each school. The data collection technique used in this research is a questionnaire given to students via a Google Form link. The student questionnaire contains questions related to the media used in learning, learning sources and how to learn. In these questionnaires, students can choose more than one answer according to their needs. The questions presented relate to the use of media in learning and how to use this media in learning.

The data obtained was described using data frequency analysis techniques using the following equation.

$$D = \frac{B}{C} \times 100 \qquad (1)$$

where D as value, B as score obtained and C as maximum score.

3.   Result and Discussion

Based on the instrument data distributed to students in the form of a questionnaire on the use of learning media. In the learning media instrument, there are five aspects that are analyzed, including 1. Smartphone, 2. PhET Simulation, 3. PPT., 4. Computer, 5. etc. The percentage of using learning media in six schools is shown in table 1.

Table 1. Use of learning media.

No	Percentage of use of Learning Media					Total
	Smartphone	*PhET*	PPT	Computer	etc	
1	0	18	0	0	96	113
2	48	34	48	14	7	152
3	20	27	10	7	60	123
4	64	100	100	78	0	342
5	2	2	9	73	91	176
6	27	30	13	10	53	133
Amount	161	210	181	182	307	1040
Percentage	15%	20%	17%	17%	30%	100%

Table 1 shows that the average percentage of media use from six schools, the lowest average percentage is in Smartphone use by 15% and the highest percentage is in the use of other media in the form of blackboards by 30% even though the use of blackboard media writing cannot train 4C skills and learning also only takes place in one direction, and will not improve students' IT skills. Even though learning in the 21st century uses IT-based learning media, in reality teachers still use a lot of non-IT learning media.

Based on the results of interviews with physics teachers who teach at each school, it is stated that the low use of media in the learning process is due to the low ability of teachers to operate media in the learning process in the classroom, not enough time for teachers to make learning media, especially IT-based which is in accordance with the material to be taught due to the large amount of burden on the teacher other than the teaching duties assigned to him, and the incomplete facilities and infrastructure that support the operation of learning media in the classroom.

In this 21st century learning era, it is very important that classroom learning should be able to train students' 4C (critical thinking, creativity, communication, and collaboration) skills and of course IT-based. One of the new learning styles that teachers accommodate is developing media or instruments

[16]. Learning media is a part of learning that contains messages, people and devices, which follow technological developments [17]. This is reinforced by the results of interviews conducted by [18] that students are very interested in utilizing and using Android-based learning media because this learning media can provide convenience for them without knowing the limitations of space and time, so that students can study and use learning media at any time. and wherever they are. By combining knowledge and skills, supported by standards and assessments, curriculum and instruction, professional development, and an adequate learning environment, students are more involved in the learning process and are ready to develop and compete in a digitally interconnected world. Thus, students will become successful and advanced individuals in various aspects of life they live.

In addition, the questionnaire instrument data is in the form of the use of learning resources analyzed, namely printed books, the internet, worksheets, modules, etc. The percentage of using learning resources in six schools is shown in table 2.

Table 2. Use of learning resources

| No | Percentage of use of Learning Resources | | | | | Total |
	Printed books	Internet	Worksheets	Module	etc	
1	93	0	7	0	0	100
2	34	27	2	39	41	143
3	97	17	20	30	0	163
4	64	13	100	99	0	276
5	84	87	85	5	0	262
6	70	33	20	23	13	160
Amount	441	178	234	197	54	1104
Percentage	40%	16%	21%	18%	5%	100%

Based on Table 2, the percentage of the lowest average score is 5% in the use of other learning resources, namely enrichment books, reference books, and dictionaries, which are hardly used in learning activities/activities in the six schools, while the highest percentage of the average score is 40% in the use textbooks in learning activities/activities. According to [19] stated that most learning media is packaged in the form of print media or printouts in the form of textbooks which are less interesting and less practical to use in the learning process. This shows that innovation in learning media that is in line with technological developments is really needed, especially Android-based learning media [18].

The solution provided so that student learning resources are in line with technological developments is to use e-modules. E-Modules are books in the form of soft files that can be opened and read by students anywhere and anytime [20]. Apart from that, the e-module is in the form of an information display that can be read via a computer or smartphone in book format which is presented electronically. E-modules can help students to better understand the material being studied [15].

E-modules have advantages compared to printed modules, including that using e-modules makes learning more interactive, whereas printed modules only consist of material and pictures. By using e-modules the learning process that occurs does not depend on space and time, especially if the e-module has been designed for individual use [21], [22]. Different from ordinary modules, this digital e-module not only contains material in word or PDF form, but can also display videos and animations that allow users to learn more actively [23].

A digital module is an electronic version of a printed module that can be read on a computer or Android, where making digital modules requires software [24]. Android-based digital modules are products that are considered quite ideal nowadays, because they support multi-product use (audio-visual integration in the form of video), high interactivity, and multi-source learning (with an internet network connection) [25]. Digital modules can also improve user interaction and is active, such as paying attention to images, paying attention to writing that varies in color, sound, animation, video which can increase enthusiasm and has high graphic value in its presentation [26].

Based on the results of the preliminary analysis, it shows that IT-based learning media in schools is still not optimal. This is because there are still many teachers who have not used media and learning

resources that are in accordance with the demands of 21st century learning. Even though in the 21st century learning today, IT-based learning media, learning resources, and teaching materials are especially needed in the learning process so that it can train students' 4C skills. so that students become intelligent, critical, creative, and hardworking individuals, who are no less competitive than other competitors. These 4C skills really help students in the world of work later so that they can become competitive human beings and IT literate. Thus, the development of learning media has the opportunity to be developed in explaining dynamic fluid material to make it more attractive, efficient and practical.

4. Conclusion

Based on the results of the analysis, it can be concluded that the most widely used instructional media in 6 schools on sound and light waves is other media in the form of blackboards with an average percentage of 30%. Meanwhile, the most widely used learning resource is printed books with a percentage of 40%. The learning media that is most likely to be used in 6 schools is a smartphone because very few schools use it. This is indicated by the percentage obtained by 15%. Meanwhile, teaching materials that have the opportunity to be developed are in the form of enrichment books, reference books, and dictionaries which are marked with a percentage obtained of 5%. Based on the results of this analysis, it shows that IT-based learning media in schools is still not optimal. In order for students to become intelligent, critical, creative and hardworking individuals, who are no less competitive than other competitors, the solution provided so that student learning resources are in line with technological developments is to use e-modules.

Acknowledgement

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