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To cite this article: Desnita *et al* 2020 *J. Phys.: Conf. Ser.* **1481** 012103

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Comparison of learning media using teachers of Physics Senior High School in West Sumatra with curriculum demands

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Abstract. The revised 2013 edition of the curriculum requires daily context-based physics learning and the ability to solve problems. Learning as expected will be realized if supported by the right learning media. Research has been conducted to determine the compatibility between the learning media used by senior high school Physics teachers in West Sumatra and the demands of the curriculum. Applying survey research methods, using questionnaire instruments and observation sheet. A survey of 24 unit of senior high schools in West Sumatra was conducted. Information was obtained that almost teachers in the school observed using Power Point, less than half used experiment equipment and simulation programs such as PhET only for three competencies, the rest conventional learning only using Point Power. This shows that learning does not take place in accordance with the demands of the curriculum, because the curriculum requires students as subjects and centers of learning, while learning with both media used by the teachers does not facilitate students to do or work. From the observations obtained information that laboratory equipment available in schools is not used, because it is not in accordance with the demands of the curriculum. This information shows that senior high school physics learning requires learning media in accordance with the demands of the curriculum. One of the physics learning media that is in accordance with the demands of the curriculum and millennium is based-ICT. This is contextual physics-based learning videos. This media is more appropriate because it can involve all the senses of students in learning. Therefore it is necessary to develop Contextual-based learning media.

1. Introduction

Given various designations for the 21st century such as the global era, the millennium era, the information age, and other designations. The words that represent the 21st century refer to the characteristics of life or civilization of this century. Globalization not only enters the world of trade and industry, but also penetrates other sectors such as politics, social, education, and culture; which is reflected in changes in mindset, lifestyle, and values in almost all parts of the world. So that the younger generation is not eroded by the negative effects of the global era, education systems and policies are needed. Where the system is able to meet the needs of the community, but there are limits on values that filter information and values that are in accordance with prevailing customs and norms.

CCR defines knowledge, skills, character, and metacognition as the four dimensions of 21st century education. Creativity and innovation in learning are aimed at meeting the learning needs of the 21st



century. Creative learning is expected to build skills that are appropriate to the life needs of the millennium. These skills are critical thinking & problem solving, communication, collaboration, and ICT literacy [1]. The revised edition of the 2013 curriculum sets the same terms as what was determined by the CCR. In the 2013 curriculum the skills are known as 4C plus ICT Literacy.

Critical thinking is an ability which is beyond memorization. When students think critically, they are encouraged to think for themselves, to question hypotheses, to analyze and synthesize the events, to go one step further by developing new hypotheses and test them against the facts [2]. Students are not passive but active while they are realizing critical thinking [3]. Critical thinking was constructed from skills, such as spotting conclusions, examining premises, forming conclusions and diagnosing fallacies [4]. To make active the students need instructional media and learning resources that facilitate students to do learning, not receive information from the teacher.

Instructional strategies that employ students' higher-order thinking skills lead to improved critical thinking skills [5], [6], [7]. One of the instructional strategies that can improve the critical thinking order is IDEALS are to Identify, Define, Enumerate, Analyze, List, and Self-Correct This problem-solving technique guides students through the critical thinking process and utilizes learner collaboration [8]. The use of this instructional technique in learning while cultivating two 21st century skills; that is critical thinking and collaboration.

Creative thinking will not be achieved before students reach critical thinking skills. Creative thinking can foster perseverance, self-discipline, and a full practice, including mental activities such as: 1) asking questions, 2) consider new uncommon information and ideas with an open mind, 3) building linkages, particularly between different things, 4) linking various things freely, 5) applying imagination in every situation to produce something new and different, and 6) listening to intuition are the indicator of creative thinking skills [9].

Collaboration in learning can be built through cooperative learning. Through cooperative learning students are facilitated to build competencies in accordance with the four dimensions of 21st century education. As revealed by Arends, the three objectives of cooperative learning are academic achievement, tolerance, and acceptance of diversity, and the development of social skills [11]. In the cooperative class, students are expected to help each other, discuss, argue, to gain knowledge and eliminate differences between students [12].

A learning approach that can strengthen mutual collaboration in learning while solving daily problems is a contextual approach. Contextual teaching and learning integrates inquiry, problem and project based learning, cooperative learning and authentic assessment [13]. Contextual Teaching and Learning is a learning process that has the purpose of supporting students to understand educational material that is learned by students by linking subject matter with student life situations such as student environment, social situations, and culture [14]. Contextual Teaching and Learning is filled with seven components, namely constructivist, inquiry, questioning, learning community, modeling, reflection, and authentic assessment [15]. The seven components of the contextual approach illustrate the learning needed to build the four established educational dimensions. Contextual Teaching and Learning experimental method can improve critical thinking and cognitive learning out comes of physics education student [16].

Contextual approaches may not necessarily be present in learning, unless learning media are used which presents various contexts related to the subject matter. It is important to know whether the learning media used by senior high school physics teachers in West Sumatra currently supports the implementation of contextual approaches or not. Directly answering this question will give an idea of the level of conformity between the media used by the teacher and the demands of the curriculum.

2. Method

This study applies survey research methods, with instruments in the form of observation formats and interview guidelines. In the senior high school physics curriculum there are six basic competencies related to motion, momentum, and energy. For each competency the teacher conveys the learning media used, by putting a check mark in the appropriate place. The choice of media available in the instrument

is the set of experiments, interactive simulations, demonstration tools, power points, photos, videos, and other media.

The population of the study is a senior high school physics teacher in West Sumatra. Thirty three schools were selected as samples, representing schools in the city of Padang in a number of other regencies / cities in West Sumatra. The data generated from these instruments are in the form of learning media that are used by high school physics teachers to teach motion material, momentum, and energy. Data in the form of qualitative data and quantitative data and analyzed using simple statistical methods.

3. Result and Discussion

A questionnaire was distributed to 24 physics class XI senior high school teachers. Obtained a number of information about the learning media used by the teacher. That there are three types of media used by senior high school physics teachers; i.e. set of experiments, PPT, Video and interactive simulations. There is no other media used by physics teachers in Class XI High School in teaching. The average usage of the three media taken for 12 Basic Competencies is presented in the following Table:

Table 1. Learning media used by physics teacher.

Learning Media	Condition of Media		
	There is no... (%)	exist but not used (%)	Used (%)
Set of experiment	37.5	50	12.5
Power Point	72.9	14.6	12.5
Video	72.9	27.1	0
Interactive Simulation	50	21	29

Based on observations made on the school where the sample of this study was assigned, it was found, that more experimental sets that were owned by the school were damaged because they were not used (dusty, rusty conditions, or could not be used because the buttons or tools were rigid. There were only 37, 5% of teachers invited students to do experiments in the laboratory, and even then only for 2 of the 12 main materials. No documents were found that show students have learned from objects or events that are around the school or their place of residence When asked the teacher from the media used, information was obtained that only 12.5% of the power points were made by the teacher, none of the video was used by the teacher, the teacher stated that he had used a simulation program, but for the past three years he was no longer used

The media in the form of power points, which are dominantly used by teachers today, only present one-way learning from teacher to student. Students just become spectators. If teachers are not good at combining learning methods, students will only passively accept lessons, lessons will also only enrich knowledge with low cognitive levels. Because power is informative, without analysis. It is impossible for media like this to be able to foster 4C skills plus ICT literacy in students

The revised edition of the 2013 curriculum emphasizes that every basic competency in the high school physics curriculum contains demands for increased knowledge and science skills. The lack of experimental activities shows that the learning process has not been carried out according to curriculum demands. Students have not been given experience in conducting scientific activities in the form of observations in the laboratory according to the demands of the curriculum. When asked the teacher why not use experimental equipment for more than 80% of the competence, the answer varies. Some stated that there was not enough time, the demands of the final exam were only for knowledge, the tools available were not appropriate, and a number of other answers. All the answers given by the teacher showed that the teacher was not creative in choosing and choosing physics learning media.

The lack of media variation used in physics learning is an illustration or an indication, that the lack of teacher creativity in choosing media, the lack of analysis of students' needs, analysis of potential confusion, and analysis of basic competencies and learning objectives. If the teacher does all the analysis

before choosing the media, of course the choice of media will vary greatly. This can be interpreted that the learning needs and curriculum demands have not yet been reached.

Not yet achieved the learning needs and curriculum demands will be seen if a deeper analysis of the data is carried out. The lack of use of experimental sets or experiments shows that the teacher has not tried to achieve competence in the scientific skills group through physics learning. In terms of through experimental activities can be trained in critical thinking skills, creative thinking, collaborating, and communicating. This means that the teacher has closed the four competency development platforms for students. This condition also reflects the low understanding of teachers about the nature of physics and physics learning.

Physics is a branch of science that studies related matters with natural phenomena that appear around. Physics studies cover objects with sizes that are affordable to the five human senses to very large and very small objects, so they are not reachable by the five senses. Various events with the duration of time are monitored by the human eye until very short or very fast intervals. Also do not escape the study of physics events or objects that can be presented directly or that are simulated or modeled using learning media.

In line with the character of physics, physics learning is the process of building knowledge in studying various physical phenomena that occur in the universe. Based on the educational dimension of the 21st century and referring to the character of physics and its learning, the goals of physics learning are: Adding faith; Demonstrate scientific behavior; Respect individual and group work and foster scientific attitudes; Develop experience to use scientific methods; Develop the ability to reason in thinking inductive and deductive analysis; The achievement of physics learning objectives means that the learning objectives of the 21st century are also achieved.

In order to realize the goals of physics learning that are so holistic and deep, appropriate media and learning resources are needed. The instructional media is packaged in such a way that leads students to reach 4C plus I. The media is expected to utilize ICT in order to provide ICT utilization experience in building competencies. So students become IT literate. One of the major topics in the study of physics learning is motion, momentum, and energy. The subject matter is very close to human life, because it is clearly illustrated in various contexts. But not all events of motion, momentum, and energy can be presented in class or studied using media in the form of a set of experiments. Because of various limitations. Learning media are needed that can represent various objects or events and present them as objects of physics learning. One of the physics learning media that meets these needs is Contextual Based Physics Learning Videos.

Learning media is a means to achieve the learning objectives themselves. There should be harmony between the media used and the learning objectives. Learning objectives will not be achieved if the learning media does not support the learning process. Keep in mind the extent of compatibility between the learning media used by physics teachers and the needs of the learning media.

Especially for matter of motion, energy, and momentum, which have many applications in everyday life, in technology, and also in the activity of living things; The media used by the teacher should be more interesting and better suited to the learning needs of students, namely to improve critical thinking skills, think creatively, collaborate, and communicate. plus ICT literacy. The teacher can present various events related to motion, energy, and momentum in the classroom. Either directly, using a model, or applying technology. But the use of learning media which is dominated by power points alone, of course learning cannot train 4C Skills plus ICT literacy.

Many things can be done by the teacher to present events related to the learning material in learning activities. The easiest and instant is to browse and download via the internet. Although it does not completely solve the problem, because it is not necessarily in accordance with the conditions around students or not necessarily familiar with students.

The teacher can model various events related to motion, energy and momentum, if the teacher has good skills in utilizing ICT, then the teacher can also create his own interactive simulation program. The teacher can also record various events that are familiar to students, both in daily life, and in the technology that students use or the community uses video. These media will be more memorable for

students, more interesting, and of course they will present learning that is more in line with student needs, compared to the media currently used by the teacher.

In accordance with the character of the material motion, energy, and momentum that are generally familiar to students, because the application is very much around even the students themselves. The most appropriate choice of media is video recording. But videos need to be packaged in such a way that they are not only watched by students. Video recordings must be equipped with learning instructions, so that the recording of various events related to the subject matter can be analyzed by students, both individually and in collaboration with friends.

The use of video recordings of various events related to the lesson, will direct students to conduct various analyzes, which provide opportunities for students to practice exploring the problems of various everyday events and technology, find out why these events occur, and relate one event to another event and knowledge of physics, so they find their own answers to questions about events in the video. Learning like this can certainly train critical thinking skills as well as critical thinking skills

A teacher who is trained in combining media and learning methods and approaches, can utilize learning videos that contain a number of related material contexts or CTL-based videos as a medium for training communication and collaboration skills. Through the application of the cooperative learning model, the teacher can divide students into a number of small groups, assigning each group to analyze a video related to the physics knowledge learned, this can train students to elaborate in learning. Exchanging opinions after discussing in small groups or presenting the results of problem analysis using video, opening opportunities for students to practice the ability to collaborate and communicate.

The application of a certain type of cooperative model in using CTL-based videos is expected to provide opportunities for students to explore or expand knowledge, because they in one study group will discuss a variety of cases. The activity of exploring various problems related to physics knowledge that is learned through video recording, conducting analysis, and solving these problems both individually and in groups, is also expected to open opportunities to practice elaborating, or on the other hand is called to train creative thinking skills. In accordance with the characteristics of creative thinking include finding many answers.

Referring to the analysis conducted, we want to convey that the problem of high school physics learning media has been very critical, because it supports the implementation of learning in accordance with the learning needs of the 21st century, as well as not in accordance with curriculum demands. This problem cannot be allowed to continue without trying to find a solution.

Specifically for the material of motion, energy, and momentum the right solution is to develop media that can bring various everyday events and technology into the classroom, through the utilization of ICT services, which are called CTL-based physics learning videos. With this media teachers are expected to provide learning experiences that can hone 4C skills plus ICT literacy, so that learning needs are met in the 21st century. If the five skills have been trained in learning, it can also be interpreted that learning has taken place in accordance with curriculum demands.

4. Conclusion

Based on the results and discussions that have been submitted, it can be concluded that the level of appropriateness between the learning media used by physics teachers in West Sumatra and curriculum demands is very low. For the material of motion, energy, and momentum it is recommended that the teacher develop instructional media in the form of contextual-based physics learning videos.

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