Need Analysis of Audio-Visual Media Development to Teach Science Materials for Young Learners

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Article Info	Abstract
   Research Article	This qualitative study aims to obtain an overview of the current situation of instructional media use, and learning media needs formulation in science teaching process in junior high school by understanding their accessibility potential by knowledge, types of media used, and to state their perceptions to adopt media in science teaching on the static electricity and digestive system materials. The participants are 20 teachers and students in three junior high schools around Surakarta. The data were collected through two parts of electronic questionnaire during the odd semester of 2019/2020 academic year. The results indicated that 1) the current instructional media use in the science learning process has not been carried out optimally since they have the convenience of choosing and using variations of media. 2) There are challenges in the material delivery of abstract, conceptual, and procedural materials since the teacher needs a media to visualize the process and explain it correctly in and so that students have detail conceptions about the process. 3) There is a need for learning media to be developed in science learning, especially in form of audiovisual media. This result can be a consideration in developing science learning media for junior high school. **Keywords**: need analysis, media, audiovisual, static electricity, digestive system

1. INTRODUCTION

The learning process will be useful if students' understanding of the concepts is achieved. In learning science, understanding the idea and procedure to students determines the learning success since the process of understanding the idea makes the primary knowledge foundation of further learning. Understanding the science concept and procedure is one of the crucial goals to learn science. It provides comprehensive theory and procedure taught to students are not merely rote but must be clearly understood. Understanding the concept of biology and physics is also one of the learning objectives conveyed by the teacher because the teacher acts as a guide for students during learning to achieve the expected idea (Yahya, Hermansyah, & Fitriyanto, 2019).

Science is a human effort in understanding the universe through proper observations of targets, using structured procedures, and explained with scientific reasoning to get a conclusion. The Indonesian 2013 curriculum stated that junior high school students are expected to master several essential science competencies, such as static electricity and digestive process. The core of learning static electricity material is applying the concept of electrical circuits, energy, and electric power, sources of electrical energy in daily life, including alternative sources of electrical energy, as well as various efforts to save electricity (Hasbi, Kosim, & Gunawan, 2015). Thus, materials of digestive system and processes contain an amount of abstract and conceptual (Susantini, Nuur, & Thamrin, 2013), and extensive and complex material. It includes a number of processes that occurred in inner organs with many foreign terms, so it is difficult to make direct observations and has a high level of complexity understanding. Based on the scope of those subjects, the teacher is required to convey the conceptual concretely so that students can easily understand, and there is no misconception of concepts.

Science is not only a collection of knowledge about objects or living things, but it is a knowledge that requires work, ways of thinking, and ways to solve problems. Learning science can be conveyed by bringing everyday problems experienced by students in the classroom. Through learning process, hopefully, students can develop scientific attitudes (Indrawan, Jampel, & Mahadewi, 2019). The issues learned during the learning process must be able to make students understand the concepts of science and pursue students to discover facts and new knowledge out of class as application of scientific methods and experience in everyday life. Understanding student concepts will greatly influence learning success. The idea of the humans' static electricity and digestive system is closely related to everyday life, so students must understand the concepts. However, based on the results of interviews conducted with science teachers in junior high school in Surakarta, the teacher explains that the learning process is not optimal. The teacher only uses students' books and the teacher's book as the only one learning resource. The teacher also explains that media is very rarely used in the learning process. Teachers are more likely to use the lecturing method and ask students to note. There is no laboratory or practice activity since the lack of facilities and capability. This situation makes students feel bored with science lessons, especially on static electricity and humans' digestive system material and other conceptual matters. Laboratory activities provide a huge role in building an understanding of concepts, verification or proof of a concept, and foster basic skills of scientific work and affective abilities of students (Dhang, Jana, & Mandal, 2017). This

condition is also supposed to build students' lack of understanding and low grades achievements.

The alternative effort that can be used by teachers is by presenting a series of procedures of static electricity and digestive system more concretely by media. The media will overcome the absence of laboratory activities that lead misconceptions by visualizing the concept (Saragih & Utami, 2019). The use of instructional media can improve learning efficiency, facilitate students in understanding concept be more concrete (Liu, He, Tian, Fan, & Yao, 2018) and clarify the presentation of messages and information served by teachers (Dewi & Mukminan, 2016) and improve the process and learning outcomes. The use of instructional media should be a concerning part for the teacher in every teaching and learning process (Dosi & Budingsih, 2019). Therefore, teachers should have an intention and need to learn how to use learning media to effectively achieve learning objectives in the teaching and learning process (Komalasari & Saripudin, 2017), especially conceptual and abstract materials. Many researchers have tested the use of media in science learning to introduce abstract concepts to early childhood learning. Characteristics of young learners who need concrete visualization will be targeted points. Audiovisual media with the features of visual and audio combination will help very well toward the mastery of concept (Hotimah & Muhtadi, 2017). The materials in static electricity and human digestive system are selected since perceived as representative of conceptual and procedural elements among other challenging science learning materials.

Based on the above background, this research needs to be carried out as a preliminary study in the development of learning media on science learning for junior high school. The formulation of the problem in this study are: 1) to what extent the description of the current use of instructional media as a source of teaching in the science learning process? 2) what are the perception and challenges faced by teachers in junior high school on the delivery of the science materials? 3) how is the formulation of learning media needs to be developed in learning science for junior high school?

2. METHODOLOGY

This research is limited to the need analysis survey (need assessment) sourced from initial observations in junior high school. This qualitative research used the phenomenological approach to find out the reality in the field related to the implemented learning process.

Respondents of this study are 20 science teachers from three different schools in Surakarta, Indonesia. The science teachers (and students are also included) are randomly selected to provide information about potential and problem of the science learning process in classroom situations and current use and acceptance of media in the learning process. Each school has different characteristics according to the facilities and conditions of the school.

The data collection technique in this study is in the form of a questionnaire. The questionnaire is used as a needs analysis instrument for teachers and students. The survey was designed with questions related to the use of media and perceptions about audiovisual media, which consisted of 2 parts. The first part consists of three items that collect information about the use of media, teacher's knowledge about media, and the types of media used. This part is partly adapted from the need for technology integration by Zhu (2018). The second part measures students' perceptions of the application of learning media in class, which consists of two questions about the acceptance of use media in class and followed by open-ended questions about the reasons for choosing an agreement statement. This part of the questionnaire is partly adapted and modified from the perception of technology by Hanif et al. (2018). Item reliability of those two questionnaires was estimated as α=0.94.

The survey was conducted from August till October 2019 in the 2019/2020 semester (odd semester) and distributed by email. The completed response sheets were collected, compiled, and statistically analyzed to compute the results using Microsoft Excel. Data from questionnaires filled out by respondents will be analyzed descriptively and qualitatively. The percentage method was used to present the result of data reduction.

3. FINDINGS AND DISCUSSION

Use of science learning media

Based on observations made by researchers at the three schools, it found that the learning process in schools has not been implemented as expected. Educators, especially science teachers, sometimes encounter difficulties in the process of delivering learning material. Even though the students' reactions were quite enthusiastic, there were still some passive students. The teachers encountered problems due to the absence of media for some of the materials science. The materials require visualization of objects to explain a series of physics and biological processes that are not able to be observed directly. The use of pictures in books is

insufficient to support this problem. As a result, students do not master the material concepts well. In static electricity material, the concept of electrical circuits, energy and electric power, sources of electrical energy in daily life, including alternative sources of electrical energy, as well as various efforts to save electricity, are perceived as challenging to be mastered. Thus, some other abstracts and conceptual materials such as photosynthesis, cell division, and metabolism, according to the teachers, need to be visualized. The absence of laboratory equipment made the practice of learning hard to be executed. (Sypsas, Kiourt, Paxinou, Zafeiropoulos, & Kalles, 2019) All teacher respondents stated that the subject matter included difficult material since hard to find the visualization. In the delivery, there are also obstacles, the difficulty of understanding students at each stage of digestive organs because the process occurs in inner human organs. Hence, students have trouble understanding and imagining the process. As a result, student misconceptions can occur on the subject of digestive organs, a series of digestive processes, digestive problems, and nutritious foods. Those problems can be investigated in several paths below.

Knowledge about learning media.

The decision to use media will be influenced by the teacher's ability. Teachers' knowledge in media is a dominant factor in the use of media in classroom. The experience will drive the teacher to use media variation to perform better teaching. Illustration of expertise in learning media by teachers can be illustrated through access to technology tools and the type of media used in the diagram below. The chart shows that 95% of 20 teachers have their own electronic devices or at least have access to electronic computing devices. Access to computer equipment also includes teachers who do not have their personal computer equipment, but they still can use the computer of the school or the facilities of other family members at home. Only 5 % of teachers indicated that they have no access to computer devices.
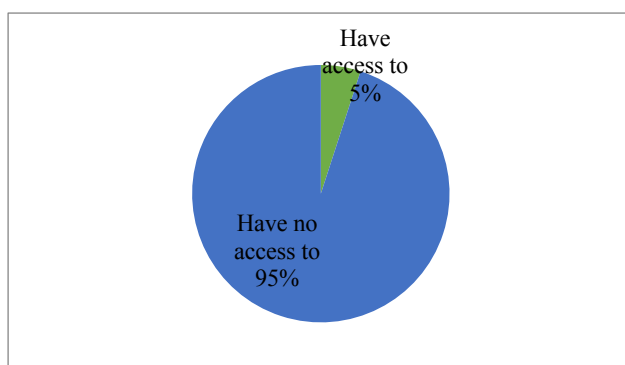

Figure 1. Percentage of access to computer equipment

This depiction indicates that the teacher can be involved in using media if the teachers have intention to apply learning media in the classroom because almost all teachers have sufficient access to computer equipment.

Types of learning media used by teachers.

Furthermore, teachers who have computer devices use various media. Computer devices might help teachers to use digital interactive media. However, from those teachers, very few teachers utilize or create audio-visual media as a learning media. This condition shows that audiovisual media must be considered as the media of choice when designing learning for them because of the potential for adequate audiovisual users in the class. From the results of observations (Figure 2). From these results, it can be concluded that the use of instructional resources in the form of audiovisual media is still less in utilization. It is contradictory to an assumption which physics and biological material requires more visualization of objects and procedure in detailed than verbal explanations. All teacher respondents also stated that abstract and conceptual content needs to be delivered by presenting object visualizations and also showing and explaining scheme processes in detail. Therefore, the use of appropriate teaching resources or media needs more attention.
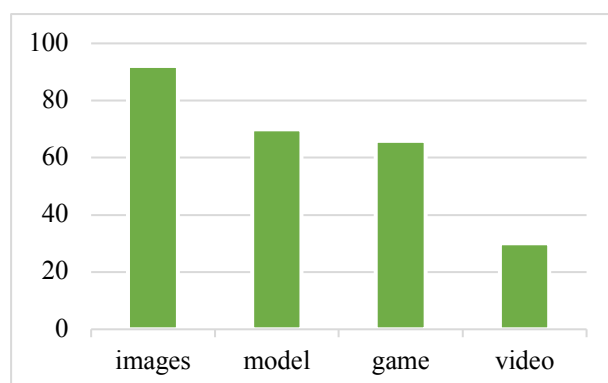

Figure 2. Distribution of types of learning media used

In the diagram above, in general, there are five types of media used by students. Images or pictures are a type of media used to explain shapes in two dimensions. This type of application is also used by 92% of the total teachers. The second type is model. A model such as torso dolls is used to show three-dimensional shapes in silence. This application has the most significant percentage of users, with 70% of total students. It means that many teachers often used this type. Game and entertainment refer to several games and entertainment-type applications for its users. As many as 66% of teachers have used this type in their learning. Media video is a

combination of audiovisual that are combined to reveal and get information. This type is only used as much as 30% of the total number of teachers actively using instructional media. The chart is also indicated less number of interactive media. The teachers prefer to utilize still pictures rather than animated or motion picture as visualization media. While 5% of students exclusively own other types of media outside the 4 types above. The assumptions of these findings indicate the range of learning media used by the teacher. The teacher will have the convenience of choosing and using variations in the types of media in the classroom, which are very varied.

The perception and challenges of the audiovisual media

The second part of the questionnaire was used to collect data on students' perceptions of audiovisual media. Good media can produce success if students do not respond to the media. For this reason, students should be invited to make use of all their senses, and the teacher tries to display stimuli that can be processed with various senses (Hanif, Asrowi, & Sunardi, 2018). The more sensory devices used to receive and process information, the more likely is understandable and can be retained in memory. Audio messages in learning are needed to focus student attention, so a lesson that has audio and visual dimensions will give the message given be stronger since combining the two delivery systems. Audio-Visual Media means audible and visible media, which means it can be heard and seen. Audio visual-based media can help students understand and comprehend the material being studied(Aravind, 2016). The objects and events which become the material teaching can be visualized realistically to resemble the real situation.

Audiovisual media acceptance

The first part of this perception describes the level of student acceptance of the audiovisual learning media system in teaching and learning activities.
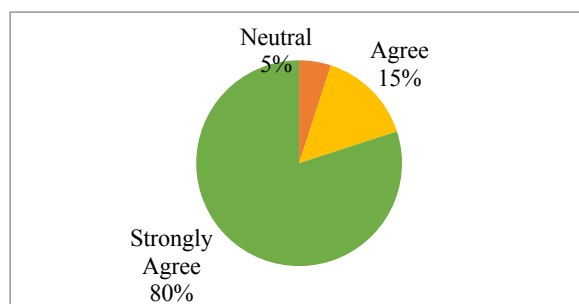

Figure 3. Percentage of student in agreement

For this section, all participants stated their position to choose to agree or disagree and followed by their reasons. The results show that all students prefer to accept (agree) to use audio-visual media in class. The level of student acceptance of audio-visual media is represented by the statement " Strongly agree " and " Agree ", while rejections are represented " Strongly Disagree 'and' Disagree.'. The chart above shows that almost all students have the will to apply audiovisual in science class. There is no intense student who will refuse the use of audiovisual media in classroom learning. Only 5% of all students answered neutrally, while 15% of students agreed, and 80% strongly agreed.

The highest number of students who strongly agreed to use audio-visual media in learning, namely 8%, also proved the active encouragement of students to actively contribute to the learning process when later using audio-visual aids. Subsequent analysis will only focus on the level of acceptance because no student does not agree to apply audiovisual media in their class.
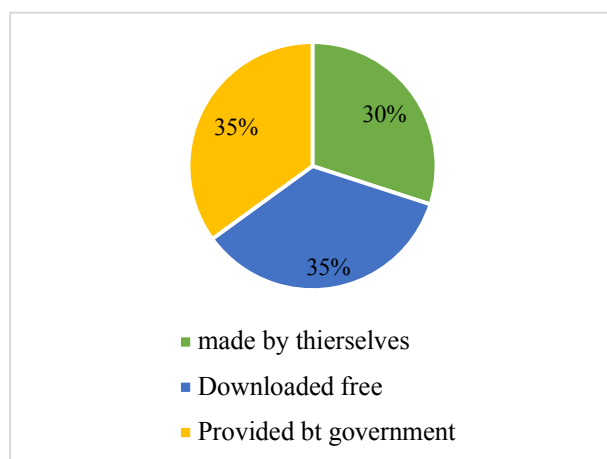
Teaching and learning resources

Figure 4. Top 3 teaching and learning resources used

In reality, as many as 70% of teachers did not create their own teaching resources but obtained from the internet or only used books from publishers. The fact that only 30% of the teachers in these three schools make their own material. It explains that there is an intention to develop the learning resource independently. The teacher has tried to make their own media or teaching resources, but in making them face obstacles such as in making it difficult to develop more detail, inadequate facilities, and require more accuracy and patience.

The observations also found that 100% of students are more interested in learning by using a variety of media. Students prefer to learn with media that shows how to work, pictures, or

material in more detail and realistic than learning by only using textbooks, modules, or textbooks. Learning resources obtained from the internet, if not sorted correctly, can cause students' misconceptions of the material being taught. Teaching sources from publishers are also considered to be less varied and cannot be used as a complete source of reference in the delivery of material. The teacher has tried to make their own media or teaching resources, but in making them face obstacles such as in making it difficult to develop more detail, inadequate facilities, and require more accuracy and patience. As a result, the media or teaching resources used by the teacher cannot function optimally by students and still lack understanding of the material being taught.

Discussion

The external factor that can affect the learning outcomes of science learning is the use of instructional media. The use of appropriate learning media in delivering sciences material can make students understand the material delivered by their teacher. Learning media is a tool for students in order to gain a significant learning experience. (Novianto, Degeng, & Wedi, 2018). Affordability rate and high enough access to technology will facilitate subsequent teachers implement audiovisual media in learning. On a smaller scale, schools or class, it is also essential to consider the number of teachers who do not have access to technology. School authorities need to deepen how the number of minorities who do not have access to computer technology will still be able to make the learning process using audio-visual media.

The material of static electricity and human digestive system are some representative of challenging junior high school science material. This material is considered by students and teachers to be quite tricky because it is conceptual and requires a lot of media such as pictures and videos, and other types of interactive media to visualize, so students understand more about the procedure and process. Media or learning resources used so far only use teacher books and student books. The use of this book as the only learning resource is unable to facilitate students, especially when teachers have not used the media to support the learning process. This lack of media use and laboratory activity, according to Masril, Hidayati, & Darvina (2019), arises a problem of students' lack of understanding of the concept. Less interaction and understanding of the concept and eventually cause not optimal learning achievements. Learning science must provide an opportunity to think logically by gathering facts found with their potential to form a

conscientious and critical personality so that the laboratory activity and discovery should provide by teacher during learning.

Based on the explanation above, it can be concluded that learning science must provide an opportunity to think logically to students by gathering facts found with their potential to form a conscientious, critical personality and not easily give up. The material of static electricity and the human digestive system is full of abstract concepts that require media features to describe the concept. The limited laboratory facilities in school cause the inability and capability to provide practice and discovery learning.

The alternative solution to the problem is to develop a learning multimedia product that contains static electricity and digestive system material in humans. This multimedia development is assumed to be able to overcome the issues described above, the use of multimedia learning in delivering content has its own benefits and advantages, from several relevant studies the use of multimedia learning will make science learning more effective, making students more enthusiastic, especially can improve students' understanding of concepts, especially on the digestive system material in humans (Zhu, 2018).

Utilization of multimedia in education, especially in delivering material, is beneficial for students and teachers, as explained by Incedayi that school requires multimedia technology because by using multimedia students can immediately see and hear the things being learned, students can also choose the material they like (Incedayi, 2018). Interactive multimedia empowers the educational process by means of increased interaction between teachers and students. The application of multimedia technology in instructional media development is able to integrate aspects of knowledge and skills (Rajendra & Sudana, 2018). Students' attention will also be more focused on learning, and their curiosity will increase because the multimedia used attracts their attention. Babiker (2015) argues that using multimedia in teaching can benefit students by helping to meet the demands of information related to the material being studied. Multimedia also allows students to interact with information in different media. Kareem (2018) added that multimedia is described as a system for conveying information that combines various types of communication such as text, video, audio, photos, sounds, animations, images and interactive content (Hat, Hamid, Sha'ari, & Zaid, 2017) which is then packaged using a computer.

The teacher also states that the learning resources needed to be developed and can be used as a source of independent learning for students are audiovisual learning media. Audio-visual

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material can only be meaningful if it is used as part of the teaching process. By using audio-visual media, students can utilize technology and media in a series of ways to enhance their learning as an alternative source for independent learning (Hapsari, Hanif, Gunarhadi, & Roemintoyo, 2019). But in the schools observed, both the teacher and other developers had never developed audio-visual media before. Therefore, it is necessary to create a media that can demonstrate learning materials (Shi, 2017), especially static electricity and human digestive system, that are abstract or not directly observed.

Another proposed solution to provide meaningful learning capabilities within the limitations of laboratory facilities and infrastructure is to do practicum virtually (Yahya, Hermansyah, & Fitriyanto, 2019; Masril, Hidayati, & Darvina, 2019). This virtual practicum is one alternative model in overcoming the problem of practicum implementation in schools, which sometimes requires a lot of time and expensive costs. Liu et al. (2018) revealed that to modify a complete practicum can be done with a virtual form, especially for abstract physics concepts.

Some cognitive-perceptual development of first-grader of junior high school children develops in aged 11-12 years. Children begin to have a more abstract way of thinking: in this developmental stage. They already have the ability to find solutions in solving a problem without the real object of the problem and are able to remember information that has previously been stored. Children have good enough memory capacity to be able to sort, organize, classify, and classify a problem at hand. (Syawaludin, Gunarhadi, & Rintayati, 2019). This skill is needed to solve a complex problem. The issue can be solved by several solutions, not just one solution. Fostering the students to enjoy the challenges, do research, find information, and solve a problem with the idea that has been previously owned and explore information from the internet and encyclopedias can be a better method to be selected.

From some of the above opinions, it can be concluded that educators must be able to create learning media that is tailored to the development of students. Learning activities are structured to generate active, independent, and systematic thinking skills. Students are in school to learn does not mean students do not have any knowledge, but students already have the experience to help them construct their knowledge at a later stage. Therefore, educators need to combine learning activities with various methods, media, and use appropriate approaches to the stage of their development to be able to provide a deep understanding and develop their thinking skills. An audiovisual learning media in the form of a virtual laboratory, in this case, seems appropriate to bridge the potential issue.

4. CONCLUSION AND SUGGESTIONS

The results of this study are: 1) the use of instructional media as a source of teaching in the learning used science subject so far has not been executed optimally, 2) there are obstacles in the delivery of conceptual material, especially theoretical material which its nature cannot be directly observed or abstract, 3) the complex material on static electricity and humans digestive system is a challenging material in its delivery in junior high school level since the developmental students' ability of cognitive visualization, so the teacher needs a media that can help to visualize the procedure of creating an electrical circuit and digestive process, 4) the learning media needs to be developed in learning the subject of is in the form of media audiovisual by some consideration on characteristic and basic need of students' level.

Based on the above conclusions, it is recommended 1) the development of audio-visual media the subject of static electricity and humans digestive system for junior high school in the form of virtual laboratory, 2) for every teacher in junior high school, it is hoped that later they can use audio visual-based or another media to support the visualization the subject of static electricity and humans digestive system or other similar conceptual material and are also expected to be able developing themselves for several different media and material, 3) for local government and school leaders can provide both moral and material support related to the use of audio-visual based media through the provision of facilities and infrastructure in schools, improvement, and understanding of its importance the use of media to teachers, foster the potential of teachers to create their self-developed media and create a sense of security and build motivation in learning for students.

Fen Materyallerinin Öğretiminde İşitsel ve Görsel Ortamların Geliştirilmesine Yönelik İhtiyaç Analizi

Özet

Bu nitel çalışmanın amacı, ortaokul fen öğretimi sürecinde eğitim ortamlarının kullanımının mevcut durumu hakkında genel bir değerlendirme yapmak ve statik elektrik ve sindirim sistemi konularında ihtiyaç duyulan öğretim araçlarını belirlemektir. Çalışmanın katılımcıları, Endonezya- Surakarta'da yer alan bir ortaokulda 20 öğretmen ve öğrenciden oluşmaktadır. Veriler, 2019-2020 akademik yılında çevrimiçi ortamda anket aracılığıyla toplanmıştır. Sonuçlar, fen öğrenimi sürecinde mevcut öğretim aracı kullanımının, seçme ve kullanma kolaylığına sahip olduklarından etkili ve verimli bir şekilde gerçekleştirilemediğini göstermiştir. Ayrıca sonuçlar, öğretmenin ders sürecini görselleştirmek ve konuları doğru bir şekilde açıklamak için bir araca ihtiyaç duyması nedeniyle zorluk yaşandığını göstermiştir. Buna ek olarak sonuçlar, fen öğreniminde özellikle görsel-işitsel araçların geliştirilmesine ihtiyaç bulunduğunu göstermiştir. Bu sonuçlar, ortaokul fen derslerinin tasarlanmasında ve öğrenme ortamlarının geliştirilmesinde dikkate alınabilir.

Anahtar kelimeler: ihtiyaç analizi, medya, görsel-işitsel, statik elektrik, sindirim sistemi

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