

## EVALUATION OF STUDENTS' KNOWLEDGE AND ATTENTION OR CONCERN USING LEARNING VIDEOS ON RENEWABLE ENERGY

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### Abstract

*This research describes the evaluation of students when learning videos on renewable energy to increase students' knowledge and awareness about reducing fossil energy. Learning models, namely learning videos and other features, support student learning processes. Some of the learning videos describe Biodiesel or renewable energy sources derived from vegetable resources, namely used cooking oil, which is one of the current crucial problems regarding reducing fossil energy that must be addressed immediately. Students, as the nation's young generation, are less concerned about this problem, so there is a need for a learning model about renewable energy that can increase student knowledge and concern about the current reduction in fossil energy. One alternative learning model to clarify this subject is through Renewable Energy themed Learning Videos in Audio Visual class. The research method used is a descriptive qualitative method and a quantitative method. Respondents in this study were 60 students from the Audio Visual subject group. The Learning Model fully uses Learning Videos. Evaluation of the impact of this learning model shows that, in fact, with this learning model, the knowledge and attention or concern of students increases after participating in the learning process using learning videos with the theme of renewable energy.*

**Keywords:** evaluation, learning model, learning video, renewable energy

### Abstrak

Penelitian ini mendeskripsikan hasil evaluasi siswa ketika mempelajari video energi terbarukan untuk meningkatkan pengetahuan dan kesadaran siswa tentang pengurangan energi fosil. Model pembelajaran yaitu video pembelajaran dan fitur lainnya mendukung proses belajar siswa. Beberapa video pembelajaran menjelaskan tentang Biodiesel atau sumber energi terbarukan yang berasal dari sumber daya nabati yaitu minyak jelantah yang merupakan salah satu permasalahan krusial saat ini terkait pengurangan energi fosil yang harus segera diatasi. Pelajar sebagai generasi muda bangsa kurang memperhatikan masalah ini, sehingga perlu adanya model pembelajaran tentang energi terbarukan yang dapat meningkatkan pengetahuan dan kepedulian siswa terhadap pengurangan energi fosil saat ini. Salah satu alternatif model pembelajaran untuk memperjelas mata kuliah ini adalah melalui Video Pembelajaran bertema Energi Terbarukan di kelas Audio Visual. Metode penelitian yang digunakan adalah metode kualitatif deskriptif dan metode kuantitatif. Responden dalam penelitian ini adalah 60 siswa dari kelompok mata pelajaran Audio Visual. Model pembelajaran sepenuhnya menggunakan video pembelajaran. Evaluasi dampak model pembelajaran ini menunjukkan bahwa sebenarnya dengan model pembelajaran ini pengetahuan dan perhatian atau kepedulian siswa meningkat setelah mengikuti proses pembelajaran menggunakan video pembelajaran bertema energi terbarukan.

**Keywords:** evaluasi, energi terbarukan, model pembelajaran, video pembelajaran

## **1. INTRODUCTION**

Today, the hottest topic discussed in the world is energy issues. Humans are moving towards a future with dwindling fossil fuel reserves and deteriorating environmental conditions. However, several studies show that public attention to the availability of fossil energy is still low; for example, a 2009 survey in America showed that out of 1001 random samples of adults in the US, as many as 40% could not name fossil fuels, and renewable energy resources, approx. 60% mentioned US dependence on Middle East oil. Likewise, in Indonesia, most people still depend on fossil energy which will run out over time, including the young generation who will continue the nation, namely young people or students who also have no concern for the availability of fossil energy which will rapidly begin to decrease. Therefore, it is necessary to learn about renewable energy for students, hoping that students' knowledge of renewable energy will increase. By increasing knowledge about renewable energy, students will be seriously concerned about the importance of renewable energy available for all Indonesian people, nations and states.

Effective energy education should focus on knowledge input and development, exploring attitudes and values, and opportunities to use and develop decision-making skills. According to Lawrenz, "The ultimate goal of energy education is to develop a well-informed society with a positive attitude towards energy conservation." Indeed, modifying energy attitudes and guiding values is a critical challenge in educating students for the future. Hofman argues that "to produce energy literate society, must begin in the affective domain."

Recent surveys show that people are becoming more knowledgeable about renewable energy sources. However, they still need clarification about many other issues, such as how energy is produced and consumed within their homes and communities. School-based energy education programs, in this case in tertiary education, which are practical and seek to influence student energy literacy, can improve this situation so that there is growing awareness of the importance of renewable energy. One of the renewable energy that is being developed in Indonesia is Biodiesel; this energy development is based on the many abundant resources in Indonesia, various renewable energy sources, including *Jatropha* seed oil, sunflower seed oil, palm oil and what is still not widely used is from used frying oil or used cooking oil.

Used cooking or frying oil is commonly found in Indonesia, originating from restaurants, households, and roadside stalls. If cooking oil is used as a raw material for biodiesel production, the problem of diminishing fossil energy can be overcome. However, youth or students' knowledge and concern about this matter still need to be improved, so learning is needed to increase their knowledge. Alternatives that can be used to provide insight into knowledge about used cooking oil resources as a raw material for renewable energy or Biodiesel, one of which is through Renewable Energy Learning Videos.

For this reason, this research was carried out by involving 60 students of the Audio Visual class as respondents. These students come from 2 audio-visual class groups for the odd

semester of 2020-2021; the first group consists of 29 students, while the second group consists of 31 students. Each group of students was given treatment by accessing two videos about Biodiesel made from used oil or used cooking oil. Before and after accessing the video, students are given a questionnaire in the form of a pre-test and post-test.

### **1.1 Impact of Learning Media**

The benefits of learning media include the process of learning, and teaching activities will be more effective and efficient if using learning media. The benefits of learning media in this activity include: communication between lecturers and students will be more harmonious, and students can easily understand any information provided by lecturers using learning media to optimize the learning outcomes that have been carried out (Musfiquon, 2012). Lecturers should use and choose learning media suitable for student characteristics to stimulate student interest and learning outcomes. Thus, the learning process can be carried out as thoroughly as possible and get satisfactory results according to the goals. Learning media has a positive impact on the process of learning activities, including the following: 1) Make it easy for students to understand the material better; 2) Provide meaningful learning experiences; 3) Attract the attention of students; 4) More interactive learning; 5) Creating learning situations that students must remember; 6) Clarify information or learning messages; and 7) Improving the quality of teaching and learning.

### **1.2 Learning Media in Science and Education**

*Education* is a conscious and systematic effort carried out by people entrusted with the responsibility to influence students who have a nature and character according to educational ideals. Education guides all the natural forces in these students so that they can achieve the highest safety and happiness as human beings and as members of society. In this modern era, learning systems are increasingly sophisticated. Therefore, teachers must always keep up with the times so that the learning process follows the conditions. The tendency of boring learning often occurs in the world of education. It happens because the way of delivery the teacher could be more varied, so students feel bored. The impact of boredom is hazardous because the learning process results will not be maximized. Learning media is an essential part of the learning system. Learning media can be interpreted as something that can be used to convey messages and stimulate students' thoughts, feelings, attention and willingness so that they can encourage the learning process. Learning by using learning media is not just using words (verbal symbols). Thus, we expect the results of learning experiences to be more meaningful for students.

### **1.3 Renewable Energy developed in Indonesia**

Renewable Energy developed in Indonesia are Biofuel, Biodiesel and Bioethanol. In general, one of the fuels derived from biomass is biofuel. *Biofuels* are liquids or gases that function as transportation fuels derived from biomass. This energy source is divided into several types, namely biogas, bioethanol and biodiesel. Like biomass, biofuels are

an environmentally friendly energy source from living matter, usually plants (Khanal et al., 2008).

Biofuels derived from vegetable raw materials and organic residues are a renewable energy source that is environmentally friendly and has the potential to significantly reduce the consumption of fossil fuels (Khanal et al., 2008). Biofuels can be one of the sources to meet global energy needs. Fossil fuels have been used as the primary source of Energy for many years; However, their use is unsustainable and causes environmental problems related to the burning of fossil fuels (Oberghassel et al., 2016; Ridjan et al., 2013). Hence, this challenge allows fossil fuels to be replaced by renewable energy sources such as environmentally friendly biofuels (Ridjan et al., 2013)

The produced bioenergy/biofuel can replace natural gas, coal, and electricity, currently used in ethanol and biodiesel plants, and could significantly improve the net energy output of biofuel plants. It is also possible that the produced biogas can be processed to a quality comparable to conventional natural gas and distributed in a natural gas pipeline system (Khanal et al., 2008).

Biodiesel is a mono-alkyl ester compound (methyl ester) produced from the transesterification reaction of triglycerides with methanol. Biodiesel contains oxygen, distinguishing biodiesel from diesel oil which contains carbon and hydrogen. Biodiesel can be used as fuel for diesel engines or mixed with diesel oil. A mixture of 20% biodiesel in diesel oil, or B-20 diesel oil, is an environmentally friendly fuel that can be used directly by diesel engines without changing the engine construction (Ridjan et al., 2013).

Furthermore, biodiesel is a fuel made from plant oils, such as soybean, rapeseed, castor, and even sunflower. In Hawaii and Japan, biodiesel is made from used cooking oil (used cooking oil). Unlike in Indonesia, most biodiesel is produced from crude palm oil. Biodiesel can also be made from animal oils, but most countries make it from plants. Biodiesel can replace motor vehicle fuel (Ridjan et al., 2013).

Vegetable oil will be the raw material for obtaining biofuels, replacing the fossil fuels currently used in diesel engines. This solution is straightforward to adopt, considering that the first fuel used by Rudolf Diesel was vegetable oil (Knothe et al., 2015). However, with the current fleet of diesel vehicles, its use is only sometimes feasible, as it results in bioethanol remaining in the gasoline engine. Although most biodiesel's rheological properties are optimal for biofuel use in today's diesel engines, the demonstrated high viscosity is a significant problem.

*Bioethanol* is a liquid resulting from the fermentation of sugar from a carbohydrate source (cellulose type) using the help of microbes. This energy source is from cellulose plants, such as wheat, sugarcane, corn, cassava, sweet potatoes, fruits, and vegetable waste. This bioethanol can be used for fuel but is mixed with gasoline at a specific dosage (Knothe et al., 2015).

Bioethanol is ethanol obtained through a biomass fermentation process with the help of microorganisms. Bioethanol obtained from fermentation can have various levels. Bioethanol with a 90-94% content is called industrial-grade bioethanol. If the bioethanol obtained is 99.5%, it is called very high-grade bioethanol; generally, this type of bioethanol is used for fuel (Knothe et al., 2015).

#### **1.4 Multimedia and Interactivity**

Multimedia has a different characteristic: it allows for interaction. Students can interact with information in different ways. Access to information can be done in various ways; different items can be connected according to students' interests and practices, as well as complex process simulations such as the biodiesel production process it is possible to make (Amatller & Simo, 2007). According to England & Finney (2011), Interactive multimedia integrates digital media, including electronic text, graphics, animation, and sound, into a structured, computerized digital environment that allows users to interact with data as needed.

Audiovisual is one of the popular multimedia components in education. Didactical videos or audiovisuals can provide students with a multisensory learning experience rather than textual information. On the other hand, paper-based pedagogical materials, such as books or articles, allow students to think and analyze the content provided. The multimedia material in this study presented in the Learning Videos can present two types of material simultaneously. First, it enables the inclusion of Audiovisual content into an array of educational materials. Second, it also allows the inclusion of textual information (Amatller & Simo, 2007).

The use of technology multimedia in the world of education, facts revealed that multimedia is capable of being a positive and effective communication media because through these media, text, audio, video, as well as animation with various colours and patterns can be displayed on a screen at a time the same time. Besides that, Interactive media can attract attention and is easier to understand than static or soundless materials. Vaughan (2011) stated that interested users will pay more attention to the content of the information they want to be delivered, and so on; this will make the process of conveying information more effective. All this strengthens the mind, which states that multimedia is suitable for teaching and learning. The study also found that multimedia technology has received a positive response from students from various disciplines and age levels.

#### **1.5 Short Film / Short Movie**

As a medium of mass communication, the film plays an important role. The film is an audio-visual communication medium to convey a message to a group gathered in a specific place (Effendy, 2013). A short film of 6 – 40 minutes (or less) of duration eases the teacher's teaching of the students since it is short. Short films can be repeated, and students become more focused on a specific subject in the film (Kadabayi, 2012). Moreover, a short film must be short of delivering the meaning by giving the spectators a simple (not too complicated) idea or basic idea (Cooper & Dancyger, 2015).

### **1.5.1 Instructional Media**

"Media is all forms of physical tools that can present messages and stimulate students to learn" (Briggs, 1970 in Sadiman, 2018, 6). "Media is everything that can be used to channel messages from the sender to the recipient so that it can stimulate the thoughts, feelings, concerns and interests and attention of students in such a way that the learning process occurs" (Sadiman, 2018, p. 7)

Sadiman (2014: 7) argues that "The National Education Association (National Education Association / NEA) has a different meaning. Media is a form of communication both printed and audiovisual as well as its equipment". Media should be manipulated, can be seen, heard, and read. Based on the experts' definitions above, it can be concluded that the media is an intermediary that can provide information or messages to the receiver, so there is good communication between the sender and recipient" Sadiman (2014).

### **1.5.2 Video Tutorial**

"Video is a series of motion pictures accompanied by sound that form a unit that is strung together into a plot, with messages in it for the achievement of learning objectives that are stored by the storage process on tape or disk media" (Arsyad, 2004: 36 in Rusman et al. 2011: 218). "Video is an audio-visual medium that displays motion" (Sadiman, 2018, p. 74).

Video learning is a media that is designed systematically based on the applicable curriculum and, in its development, applies learning principles so that the program allows students to understand subject matter more easily and interestingly. Learning videos can be uploaded to Youtube or Teachertube, Websites and other online media.

Learning Video Media presents audio and visuals with good learning messages, which contain concepts, principles, procedures, and theory application of knowledge to help understand a learning material. Videos are material audio-visual learning that can be used to deliver messages/subject matter. It is said to look heard because audio (audio) and visual/video (visible) elements can be presented by Riyana (2007) simultaneously.

## **2. RESEARCH METHOD**

The research method used is a descriptive qualitative method and a quantitative method. According to Sugiyono (2018), the qualitative descriptive method presents an overview of the object of the design, which in this study is in the form of a short film production. Qualitative research methods describe students' interest and concern for the current crucial problem, namely energy problems and the use of renewable energy, which must be done immediately. The quantitative method is done by distributing questionnaires to respondents in this study.

The procedures used in this study consisted of selecting populations and samples and collecting data and instruments. The population for this study consisted of all fifth-semester students in the audio-visual group at the Visual Communication Design study

program at Dian Nuswantoro University in Semarang. Semarang is considered ideal for this research because it is one of the big cities in Indonesia.

Purposive sampling with several criteria was used to select the population and sample used in this study because time and resources were too limited for random sampling. The sample consisted of 2 classes of students taking audio-visual courses in semester V of the 2020 - 2021 odd academic year (Tongco, 2007).

The Visual Communication Design Study Program at Dian Nuswantoro University in Semarang was chosen because there are audio-visual courses which are a means for producing videos. The entire population consisted of 6 groups of 32 students each, so the total population was 192 students, of which 31,25% (60 out of 192) students were selected as samples in this study.

The data collection method used in this study is described as follows:







- a. Interview. Interviews are conducted by communicating directly or interrogating respondents to gain a detailed understanding of the problem being investigated. In this study, interviews were conducted online due to the Covid 19 pandemic, and interviews were conducted between researchers and fifth-semester students in online audio-visual classes. Interviews were conducted before and after the primary research. The duration of each interview is around 30 - 60 minutes. Interviews were conducted directly with students by recording and copying the interview results. The informants consisted of all groups of respondents.
- b. Study of literature. Theoretical background information was collected from a literature review on the problem under study.
- c. Survey. Quantitative data were collected by giving survey questionnaires to respondents both before (pre-test) and after (post-test); the research was carried out in class (Luen, Fook, & Yong, 2012). The respondents completed the pre-survey questionnaire or Pre-Test before the research. The respondents completed the post-survey or Post-Test questionnaire after the research was carried out or after all respondents accessed and watched the learning videos. Questionnaires were developed, especially Questionnaires about knowledge & concern for renewable energy. Two phases of data collection were carried out using Instrument A (students' concern about renewable energy issues) and Instrument B, a test of knowledge about renewable energy. Students answer questions about renewable energy online, carried out before (pre-test) and after (post-test) the application of the Learning Video learning model on the theme of Renewable Energy.

### **3. FINDINGS AND DISCUSSION**

#### **3.1 Renewable Energy Learning Videos**

The learning video used in this study has the theme of Renewable Energy, which is about Biodiesel made from used cooking or cooking oil. This video can be accessed by students online after completing the pre-test questionnaire. After finishing watching the video about renewable energy, students returned to filling out the post-test questionnaire.

Table 1. Learning Video of Renewable Energy (Biodiesel) sources from used cooking oil  
 [Source: Research Documentation Film]

No	Video Stages of Making Biodiesel from Used Cooking Oil		
1	Preparation of Raw Materials		
		Video about Raw Materials for making renewable energy from used cooking oil. duration: 2.2"	Oil filtering process video waste duration: 3.5"
2	Biodiesel Production Process from used cooking oil		
		Video of used cooking oil filtering results, ready to be processed duration: 2.7"	Weighing of NaOH catalyst and other catalysts for Biodiesel manufacturing process duration: 1.5"
3	Biodiesel yields from used cooking oil		
		Biodiesel final result video, consists of 3 layers duration: 2.5"	Video about Biodiesel that can lights up when burned duration: 2.3"



### 3.2. The Impact of Renewable Energy Learning Videos

The results of the development of the Renewable Energy Learning Video or learning model on students' knowledge and concern for renewable energy issues based on questionnaires distributed to students before and after the implementation of the learning model are as follows:

Table 2. Knowledge of students about Renewable Energy  
[Source: Author Documentation]

	Pre-test	Post-test
Know Renewable Energy	41,67%	76,67%
Didn't know Renewable Energy	58,33%	23,33%

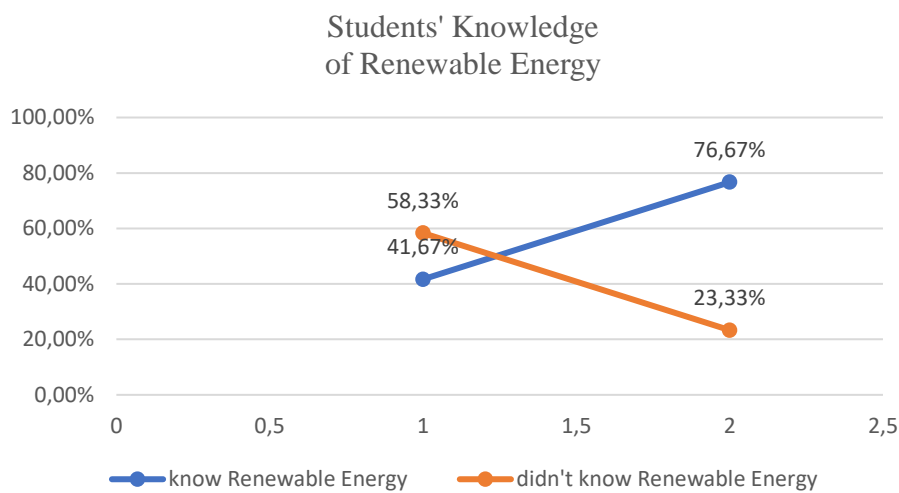


Figure 1. Graph of Students' Knowledge  
[Source: Author Documentation]

The results of the pre-test and post-test indicated that the impact of this learning model can be evaluated, which shows that the post-test results regarding student knowledge and concern are far better than the pre-test results. Before applying the Learning Video learning model about renewable energy, most respondents, as much as 58.33% (35 out of 60), did not know about renewable energy, and 50,00% (30 out of 60) students did not care about renewable energy issues.

Table 3. Students' Care about Renewable Energy  
[Source: Author Documentation]

	pre test	post test
care Renewable Energy	46,67%	73,33%
didn't care Renewable Energy	50%	26,67%

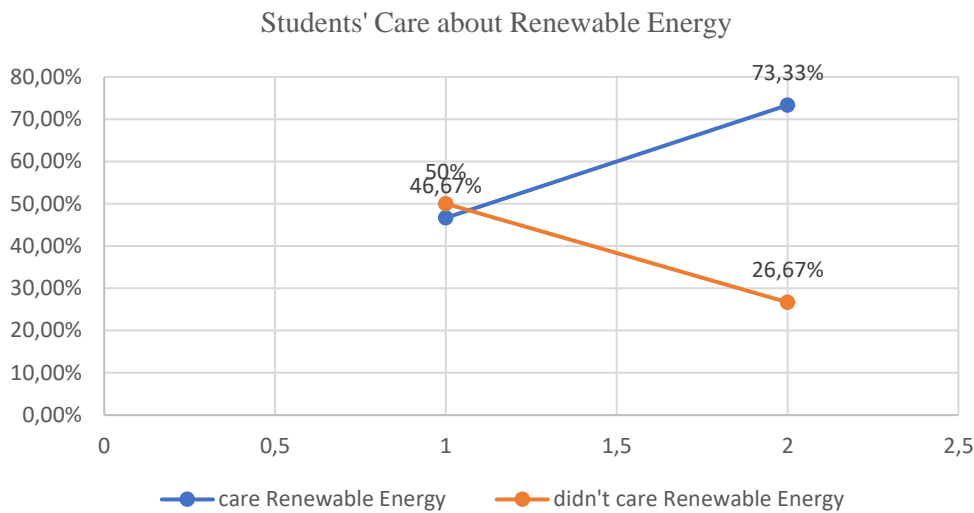


Figure 2. Graph of Students' Care about Renewable Energy  
 [Source: Author Documentation]

After implementing this Learning Video about renewable energy, most respondents (76.67%, 46 out of 60) know about renewable energy, and 73.33% (44 out of 60) students care about renewable energy issues. With this learning model, students' knowledge and attention or concern increase after studying videos with the theme of renewable energy.

#### 4. CONCLUSION

The learning model using Learning Videos about Renewable Energy increases student knowledge and concern. The learning model uses learning videos about renewable energy with group learning strategies to influence student knowledge and help students in class experiments. The level of student concern about energy issues has also increased; this can be seen from the results after studying or watching learning videos about renewable energy much better than before studying or watching learning videos about renewable energy.

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