

Increasing Understanding of General Knowledge of Plastics with Video-based Learning

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Abstract This study was motivated by video-based learning materials on general knowledge, which is getting more popular. In many cases, video-based education is one of the best ways to learn in today's digital technology. The purpose of this study is to explore the increasing student understanding of learning general knowledge about plastics. This research was conducted using fundamental quantitative analysis in a video tutorial involving 28 respondents from polymer technology students at Mara University Technology (UiTM). The data were collected by giving tests to students before (pre-test) and after (post-test) watching the video. There are five questions students must answer. Data were collected and analysed using the Statistical Package for Science for Windows software Version 21.0 (SPSS V21.0). The frequency and percentage are re-coded to compare the results between pre-test and post-test. A positive response means an increase in the ratio and the percentage of students who get the correct answer on the post-test. This treatment shows a positive response to video-based learning from students. The study results concluded that there was a significant increase compared to before and

after the test. Instructional videos make the learning environment more attractive than textbook learning. In this way, learning can provide many benefits for students and teaching staff in increasing their understanding of general knowledge about plastics.

Keywords General Knowledge of Plastics, Thermoplastics, High-density Polyethylene Video-based Learning

1. Introduction

The development of digital media technology in the twenty-first century has led to rapid developments, such as moving pictures or videos, as the development and changes in information technology can change community activities, not least in the world of education [1]. The teaching and learning process has experienced extraordinary changes due to the advent of the internet [2]. The internet is the real media in the development and

transformation of information technology in education. With the development of the internet, learning models such as e-learning, distance learning, web-based learning, and other IT-based education terms emerged. The internet is a global computer network that facilitates and accelerates access to information and knowledge (learning materials). The content in the teaching and learning process can always be updated [3]. It should be that in the application of education available internet access.

In this globalization era, teachers need to be creative and innovative in strengthening the teaching profession so that educators are always up to date with the latest information technology [4]. However, there are still many teachers who use teaching and learning techniques that are not interesting. With the internet network, information search becomes very easy, convenient, and fast because one of the functions of the internet is as a virtual library, providing various types of information for users, including information about teaching and learning techniques. The teacher must know that there are many student learning styles. The term 'learning style' refers to how individuals differ about what teaching or study methods are most useful for them [5]. The use of video in learning is one of the visualization learning styles that significantly influence teaching and learning practices in the classroom, and the use of video in education is recommended. It can be adopted as a way to enhance teacher professional development [6]. Students enjoy their learning more and perform better in an interactive video-based learning environment than students in non-interactive environments. Combining student profiles with content metadata provides opportunities to add value to analytical knowledge obtained from video-based learning [7]. Video-based education is one of the best ways to teach and learn in the era of globalization. There are many advantages to video-based learning, such as increasing interactivity, encouraging thinking, reducing costs, and allowing access through many devices.

Students who ignore the teacher in delivering learning material in class and do not participate during the learning process make them unfocused and unable to understand the topic. With the high development of technology, students become eager to use technological devices to facilitate their learning. Active student participation and high-quality interactions make their learning process meaningful and sustainable [8]. The study [9] shows that the newly designed, enhanced video learning environment is a teaching tool that is superior to standard video learning environments in terms of student learning performance. Besides, video-based learning has developed from passive linear broadcasting into an interactive video experience interesting for students [10].

Plastic is very close to human life. Plastic is one of the materials that is easily found. According to research conducted by [11], plastic that is not following it can cause various health problems because it can cause cancer

triggers and tissue damage in the human body (carcinogenic). Plastics consist of repeating units called monomers that bind together to form long chains or polymers [12]. Vinyl plays a vital role in improving the standard life of humans for more than 50 years. Thus, plastic has many social impacts, negative impacts, and positive impacts [13], [14].

Most products used by humans every day are made of plastic, such as toothbrushes, eyeglasses, and more. Students only know that their products are made of plastic. However, unfortunately, students lack knowledge about how to process plastic products and how to treat plastic waste. Students will appreciate each object made of plastic and use it wisely if they understand how to create and manage their waste. The basis of the 4R strategy in the language of waste management is to reduce, reuse, recycle (materials) and recover (energy), with landfills as the least desirable management strategy.

The composition of waste generated from human activities is 60-70% organic waste, and the rest is 30-40% inorganic waste, while the second-highest composition of inorganic waste is 14% is plastic waste. Inorganic waste is complicated to be degraded or even wholly degraded by nature. Inorganic waste that is most often found in the community is plastic waste. Most plastic waste is a type of plastic bag or plastic bag in addition to plastic packaging [15]. In the opinion of [16], plastic has considerable potential as waste, so it is better to utilize this plastic waste to be creating products and services to manage plastic waste properly so that plastic supports human life. Plastic waste management is crucial to reduce diseases that threaten the health of ecosystems and human livelihoods [17].

As polymer technology students, students need to know about the types of plastics that can be recycled to increase awareness about the environment. Today, we can see that many people always throw plastic trash everywhere without thinking about its effects. In 2015, 6300 MT of plastic waste was generated, of which 9% was recycled, 12% burned, and 79% accumulated in landfills or the natural environment [5]. This figure can cause pollution. So, awareness is critical to ensure our environment is not polluted. Plastic recycling is one method to reduce environmental impacts and depletion of resources [18].

With video-based learning, students can understand plastic subjects more efficiently and increase their understanding of general plastic knowledge.

2. Research Method

This research was conducted to access general knowledge video-based learning materials about plastics. The research was conducted using quantitative analysis. This study involved five students of the Mara University Technology (UiTM) polymer technology. The research

instrument consists of objectives consisting of 2 multiple-choice questions, namely A (Yes) and B (No). Students must answer all test questions based on their knowledge. The questions were distributed on paper to students twice, namely pre and post-test. The pre-test was carried out before the students watched the video, while the post-test was carried out after the students watched the video. Respondents watched a 15-minute video uploaded on YouTube before answering the post-test. Data were analysed using Statistical Package for Science (SPSS) version 21. Data were analysed statistically descriptively to find frequencies and percentages.

3. Result and Discuss

Based on the introductory aquaponic video, five questions have been developed. The results consist of tests before and after watching introductory aquaponic animation videos. Results are recorded in frequency and percentages. The purpose of this objective question test is to determine the level of student knowledge. This objective question test aims to assess the level of student knowledge. The results of the pre-test and post-test research can be seen in table 1.

The first question is the definition of thermoplastics—more at the level of student cognition in memory. From table 1, the percentage shows that students

who failed to answer correctly for the pre-test for question one was 75.0%. The results of the answers above indicate that four respondents could not answer this question correctly. For the post-test, the percentage of students who cannot answer correctly is 14.3%, which means that only one student failed to answer it. From table 1, it can be seen that there is an increase in students' understanding before and after watching the video. Five students can answer correctly in the post-test, and one student cannot answer correctly due to misunderstanding or being unfocused while watching the video. The findings [19] show that the majority of students who use video are useful for accepting some types of enhanced learning, including increased understanding of topics and greater ease of learning.

Question 2 is about thermoplastic characteristics. Students must choose incorrect answers about thermoplastic components because, in the subject, it states the word 'except.' From table 1, only 17.9% of students who were one student answered correctly during the post-test, of which only one student got the correct answer. After watching the video, it shows the percentage of students' responses successfully increased by around 50%, i.e., four students got the right answers. In contrast, the other two students got the wrong answer because they did not carefully read the question.

Table 1. Respondents' answers to each question

No.	Question	Respondents Answer	Pre-Test		Post-Test	
			Frequency	Percentage	Frequency	Percentage
1	What are thermoplastics?	Yes	7	25.0	24	85.7
		No.	21	75.0	4	14.3
		Total	28	100.0	28	100.0
2	The characteristics of Thermoplastics	Yes	5	17.9	19	67.9
		No.	23	82.1	9	32.1
		Total	28	100.0	28	100.0
3	The type of thermoset resin	Yes	3	10.7	26	92.8
		No.	25	89.3	2	33.3
		Total	6	100.0	6	100.0
4	Symbol of High-density Polyethylene (HDPE)	Yes	14	50.0	28	100.0
		No.	14	50.0	0	0
		Total	28	100.0	28	100.0
5	The injection molding process	Yes	0	0	23	82.1
		No.	28	100.0	5	17.9
		Total	28	100.0	6	100.0

In question 3, students need to choose the type of thermoset resin. Students need to understand the character of thermoset resin. Students must compare each type of plastic before answering this question. For the pre-test, the percentage of students' wrong answers was 89.3%, while the post-test was 7.2%. The results above show a decrease of about 82.1% of students answered incorrectly. During the pre-test, only two students answered correctly, while in the post-test, the number of students who answered correctly was four students. This result shows students' understanding of the characteristics of increased thermosets after watching the video.

In question 4, students need to choose the HDPE symbol. This symbol is more about remembering. In the initial exam, only half of the students who got 50% got the correct answer. After watching the video, all students get the right answer. Based on the results, this shows a significant percentage increase. This result indicates that students can remember symbols when displayed in colourful background. Besides, it also improves students' understanding of high-density polyethylene. Therefore, video-based learning is safe and can attract students' attention to watch. This finding is in line with the opinion [20], who believe that students who learn to use technology have a higher score than those who do not use it. The learning through video is more precise and more detailed. However, according to [21], watching videos with short duration will be more exciting than videos for an extended period.

In question 5, it is about the order of the injection molding process. To sequence the process, students must understand the process so students will choose the correct answer. Table 5 shows that all students gave incorrect answers for the pre-test because they messed up the order of the process. However, after watching the video, it showed that the percentage of students getting the wrong answers decreased by around 82.1%. Students can see the accurate processing of injection moulds in the video compared to just seeing in the picture from the video. In the video, you can see how to process products from raw materials into products using injection moulding. Thus, it can be concluded that video-based learning impacts students in understanding the injection moulding process. Job enrichment encourages more skilled and skilled workers in their fields and can complete more massive tasks on their terms, including in education [22].

4. Conclusions

The findings of this study indicate that video-based learning increases students' general understanding of plastic topics. The post-test results after watching the video showed an increase in the percentage of students who got the right answer. Video-based learning also makes the learning environment more interesting besides textbooks.

Thus, video-based education provides many advantages for students in improving understanding of general plastic knowledge.

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