

Increasing Understanding on Basic Aquaponic Topic with Animation Video

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Abstract Aquaponics is a sustainable agricultural system with a combination of aquaculture and hydroponics in a symbiotic environment. This study aims to determine students' knowledge and understanding of the essential basics of aquaponics with video-based learning. This research uses a descriptive quantitative method—data obtained by giving a questionnaire involving 20 middle school students. The questionnaire was given in stages. The first stage was given before the respondents watched the animated video about aquaponics, and the second questionnaire after watching the animated video. Respondents were given multiple choice answers, namely, A (Right) and B (Wrong). This study used six questions about basic aquaponics knowledge. The data were analyzed using a comparison of the frequency of answers and the t-test of two pairs of samples. The results showed that there were significant differences in students' answers before and after watching the video. Students before watching the video had a 28.3% correct answer percentage, and it increased after watching the video to 89.2%. Learning based on aquaponic animation videos can increase students' knowledge and understanding. The use

of video-based technology in learning is more comfortable for students to understand than manual learning. Animated video-based learning can be applied in classroom learning.

Keywords Basic Aquaponic Topic, Animation Video, Video-Based Learning

1. Introduction

Food is a basic need that plays an essential role in the sustainability of the life of the nation and state. Several countries experience difficulties in fulfilling the need for food security to maintain the continuity of people's lives [1]. Aquaponics is an agricultural alternative that can be developed to solve food and environmental problems. Aquaponics is a combination of aquaculture and hydroponics, becoming a planting technique with cultivation waste [2]. Aquaponics is a forward-looking technology that needs to be developed at all school levels [3]. The existence of an aquaponics system is considered

capable of contributing to sustainable food security [4].

Industrial development 4.0 is not only developing in the industrial world but is starting to develop in the world of education. Industry 4.0 helps in technology-based learning systems in the classroom [5]. Rapid technological developments affect the learning system in the classroom. Teachers and students can access learning resources and teaching tools widely available on the internet. The existence of this extensive information makes learning more exciting and can stimulate student understanding in the classroom [6]. One of the strategic formulations that can be considered is through the education system and teaching and learning process [7].

The world of education is never free from problems related to the teaching and learning process. One of them, the boredom and loss of motivation experienced by students in learning, will affect student achievement [8]. Technological developments can build animated video-based learning in class so that learning boredom can be avoided. Animated video-based learning can be used as a medium for learning science subjects on aquaponics topics. Learning media is a learning resource that can help solve problems related to the teaching and learning process. Learning media is an integral part of the classroom learning program [9]. Learning media can affect student learning and the ability of students to absorb information conveyed by the teacher [10].

Teachers must be able to integrate their abilities in managing classroom learning so that students easily understand it. Teachers can use the media to facilitate the delivery of material, as well as facilitate the acceptance of subject matter by students. Efforts are needed to bridge learning problems for the success of teaching in the classroom. Animated video-based learning can be used as a learning medium in the classroom. Animated video media can display and explain audio and visual lessons to students. The lessons provided are visualized in the form of animated images that are more meaningful and exciting, more comfortable to accept, understand, and more able to motivate students in learning. The use of animation and special effects can attract students' attention in learning situations, both early and late courses [11].

The use of animation in education has received much attention of late. Learning using animated video is a medium to improve student learning in the class [12]. Representation of learning media using animation technology can be useful in helping the teacher's discussion and learning process [13]. The combination of text, images, audio, music, or video in one unit that supports each other can create excitement during the teaching and learning process. Animated video-based learning will increase children's motivation during the teaching and learning process to achieve maximum learning goals [14]. Students find it easier and more interested in video animation with 2D and 3D views when

compared to drawing objects on the blackboard [15]. Video animation can convey knowledge in a unique and easy-to-understand way so that it can facilitate the transmission of knowledge to students [16].

Limitations of learning media can cause children to get bored quickly, so they lose interest in learning. The development of information and communication technology has greatly influenced the culture of life today, especially in the field of education. The application of technology in the teaching and learning process provides new changes in teacher pedagogical techniques. The use of technology has revolutionized teacher teaching techniques, learning methods, and ways of handling education as a whole in line with current developments [17]. With advances in computer technology, it certainly makes it easier for teachers to prepare learning media. Traditional methods, such as using chalk and blackboard, are not able to convey stories and emotions well, so students find it difficult to accept information. The traditional teaching and learning process that emphasizes memorization makes students become bored and lose interest in learning [18]. So this research needs to be done to determine the effectiveness of using video animation during the teaching and learning process in the classroom. The current education system emphasizes the preparation of students for high achievement, competitiveness, and fostering critical thinking skills in students.

2. Research Method

This research uses a descriptive quantitative method. Quantitative research methods are concerned with planning, design, and implementation of strategies for collecting and analyzing data [19]. Quantitative data is suitable for research that uses questionnaires and tests to obtain research information. The data were obtained using a questionnaire involving 20 high school students. The questionnaire was given in stages. The first stage was given before the respondents watched the animated video about aquaponics, and the second stage after watching the animated video.

Respondents were asked to answer all questions related to aquaponics before watching and after watching the animated video. Respondents were given multiple choice answers, namely, A (True) and B (False). This study used six questions about basic aquaponics knowledge. Data analysis used a comparison of the frequency of answers and the T-test of two pairs of samples. Analysis with the T-test was used to determine the effect of video-based learning aquaponics on students' knowledge and understanding. If the value is sig smaller than 0.05, video-based learning affects students' knowledge and understanding. If the sig value is more significant than 0.05, then animated video-based learning does not affect students' knowledge and understanding.

3. Result and Discussion

The results of respondents' answers before and after watching the animated video on the basics of aquaponics can be seen in table 1.

Table 1. Aquaponic Test Results Before and After Watching A Basic Aquaponic Video Animation

No.	Question	Answer	Pre-test		Post-test	
			Freq.	%	Freq.	%
1	What is a combination of aquaponics?	Right	3	15.0	17	85.0
		Wrong	17	85.0	3	15.0
2	What are the planting media used in aquaponics?	Right	17	85.0	20	100.0
		Wrong	3	15.0	0	0.0
3	Aquaponic is defined as a plant that can grow without?	Right	4	20.0	17	85.0
		Wrong	16	80.0	3	15.0
4	How does aquaponics help the environment?	Right	4	20.0	13	65.0
		Wrong	16	80.0	7	35.0
5	In aquaponics, what can plants provide for fish?	Right	3	15.0	20	100.0
		Wrong	17	85.0	0	0.0
6	Name three living organisms in the nitrogen cycle?	Right	3	15.0	20	100.0
		Wrong	17	85.0	0	0.0
Average percentage RIGHT answer			28.3%		89.2%	

The first question about the aquaponic combination pre-test results showed that 15% of students answered correctly, and 85% answered incorrectly. The post-test results showed an increase in students' understanding of aquaponic combinations by obtaining a percentage of 85% who answered correctly, and 15% answered incorrectly. The second question about the media used in aquaponics, the pre-test results showed 83% of students answered correctly. The post-test results show an increase where 100% of students can answer questions correctly. The third question about aquaponic growth, the pre-test results showed that 20% of students answered correctly, and 80% answered incorrectly. The post-test results showed an increase in student answers, where 85% of students answered correctly, and 15% of students answered incorrectly.

The fourth question is about the implications of aquaponics for the environment showing the pre-test results of 20% of students answered correctly, and 83% of students answered incorrectly. The post-test results showed an increase where 65% of students answered correctly, and 35% of students answered incorrectly. The

fifth question is about the effect of aquaponics on fish. The pre-test results showed that 15% of students answered correctly, and 85% of students answered incorrectly. The results of the post-test showed that 100% of the students were able to answer correctly. The sixth question about the nitrogen cycle pre-test results showed that 15% of students answered correctly, and 80% of students answered incorrectly. The post-test results showed an increase in student understanding because 100% of students could answer correctly.

Based on Table 1, it shows the results of the pre-test mean answers of 28.3% of students answered correctly, and the results of the post-test showed an increase in answers to 89.2% of students who answered correctly. Animated video-based learning can improve students' understanding of the basics of aquaponics. These results indicate that animated video-based learning is more comfortable and more accessible for students to understand.

The results of the T-test analysis on the effect of video-based learning on students' knowledge and understanding can be seen in table 2.

Table 2. T-Test Result of Respondents' Answers Before (Pretest) and After (Posttest) watching Animated Video

Paired Samples Test				
	Paired Differences 95% Confidence Interval of the Difference Upper	t	df	Sig. (2-tail ed)
Pre-Test – Post-Test	-3.24044	-18.65 3	19	.000

Based on table 2, the sig value obtained is 0.000 smaller than 0.05, so that the animated video-based learning affects students' knowledge and understanding. Video-based learning can make participants more active in discussions and generate more ideas than traditional learning [20]. One of the goals of video-based learning is that students can solve problems independently of the problems that are around them [21]. The latest technological developments can attract students to learn and easily understand their lessons [22]. Teachers need to apply the use of technology in teaching in class to increase student understanding. The technology-based learning model is expected to improve students' ability to solve problems creatively with effective learning [23].

4. Conclusions

Animated video-based learning can increase students' knowledge and understanding of the basics of aquaponics. This is supported by the results of the correct pre-test answers of 28.3%, increasing to 89.2% during the post-test. Animated video-based learning can be applied to the learning system in the classroom. Video-based learning can attract students' attention so that students do not get bored

while in class. The development of information technology requires teachers to act as facilitators during the teaching and learning process. Students need guidance and instruction from teachers to relate the theories taught in the classroom to the real world.

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