



The Effectiveness of Animated Learning Media in Enhancing Vocational High School Students' Environmental Conservation Awareness

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ABSTRACT

This study examines the effectiveness of animation-based learning media in enhancing environmental conservation awareness among vocational high school students. A quasi-experimental pretest-posttest control group design was applied, involving an experimental group using animated media and a control group receiving conventional instruction. Data were collected through questionnaires measuring students' environmental knowledge, attitudes, and behaviors. The results show a significant increase in environmental awareness after the intervention, with improvements across all three dimensions. Students also perceived the animated media as engaging, clear, and effective in delivering environmental messages. These findings indicate that animation-based learning is a practical and impactful approach to promoting environmental conservation awareness in vocational education. Integrating animated media into environmental learning is therefore recommended to foster sustainable attitudes and behaviors among vocational students.

INTRODUCTION

Environmental conservation has become a pressing global concern, requiring systematic educational efforts to cultivate sustainable knowledge, attitudes, and behaviors among younger generations. Schools play a strategic role in shaping environmental awareness, particularly in vocational education where students are prepared to enter industrial sectors that directly interact with natural resources. In this context, strengthening environmental awareness among vocational students is essential to ensure that future workers adopt environmentally responsible practices in their professional activities. International organizations such as UNESCO emphasize that environmental education should foster not only knowledge but also pro-environmental behavior and values that support sustainability.

Environmental awareness is commonly conceptualized as comprising three interrelated dimensions: knowledge, attitude, and behavior. According to Schultz (2020), effective environmental education must address these dimensions simultaneously to produce meaningful behavioral change. However, environmental instruction in many vocational classrooms still relies on conventional lecture-based approaches, which often fail to engage students emotionally and cognitively. As a result, students may understand environmental concepts theoretically but lack the motivation to apply them in real-life contexts.

The integration of technology into learning environments offers promising opportunities to address this limitation. The use of multimedia and visual learning tools has been widely recognized for its potential to improve students' engagement and comprehension. Mayer's Cognitive Theory of Multimedia Learning (2020) explains that combining visual and verbal channels through animation can reduce cognitive load and enhance meaningful learning. Animated media, in particular, can transform abstract environmental concepts into concrete visual experiences that are easier for students to understand and remember.

Previous studies have shown that animation-based learning significantly improves conceptual understanding and student engagement across various disciplines. Lee et al. (2019) found that animated instruction enhanced students' comprehension of environmental topics by presenting dynamic visualizations of ecological processes. Similarly, Brown and Green (2021) reported that interactive multimedia increases learners' motivation and retention compared to conventional teaching methods. Wilson (2023) further highlighted that technology-enhanced learning environments can stimulate emotional engagement, which is crucial for developing positive environmental attitudes.

In the context of environmental education, Kim and Stepchenkova (2021) demonstrated that interactive visual media effectively promotes environmental awareness and pro-environmental behavior among students. These findings align with Odum and Barrett's (2020) assertion that conservation education must encourage behavioral change, not merely knowledge acquisition. For vocational students, who are typically oriented toward practical and visual learning, animation-based instruction is particularly relevant and potentially impactful.

Despite the growing body of research on multimedia learning, most prior studies have focused on primary and general secondary education. Limited research has explored the application of animated learning media in vocational high schools, where students have distinct characteristics, learning preferences, and future professional responsibilities related to industry and environmental sustainability. This gap highlights the need for empirical studies investigating the effectiveness of animation-based learning in vocational environmental education.

Therefore, this study aims to examine how animated learning media can enhance environmental conservation awareness among vocational high school students through a quasi-experimental approach. By measuring changes in students' knowledge, attitudes, and behaviors before and after exposure to animated media, this research seeks to provide empirical evidence for integrating animation into vocational environmental learning practices.

METHODOLOGY

This study employed a quasi-experimental approach using a pretest-posttest control group design to examine the effectiveness of animation-based learning media in enhancing environmental conservation awareness among vocational high school students. The design enabled a comparison between students who learned through animated media and those who received conventional instruction. Both groups completed a pretest prior to the intervention and a posttest after the learning activities to measure changes in environmental knowledge, attitudes, and behaviors.

The participants were vocational high school students enrolled in subjects related to environmental studies. A purposive sampling technique was applied to select two comparable classes: one assigned as the experimental group and the other as the control group. The selection criteria ensured that students had relatively similar initial levels of environmental understanding, as indicated by pretest results, had access to digital devices for viewing the animated media, and were willing to participate throughout the study. A total of 52 students completed the pretest, while 43 students completed the posttest due to attendance and technical constraints during data collection.

Data were collected using structured questionnaires based on a four-point Likert scale ranging from strongly disagree (1) to strongly agree (4). The instrument measured three key dimensions of environmental awareness: environmental knowledge, environmental attitudes, and environmental behaviors. Each dimension consisted of six statements. In the posttest, an additional section containing five statements was included to assess students' perceptions of the effectiveness of the animated learning media. The instruments were reviewed by experts in educational media and environmental education to ensure content and construct validity.

The research procedure consisted of several stages. First, educational animated videos focusing on environmental conservation topics were developed and validated by experts. Second, both groups completed the pretest questionnaire to determine their initial level of environmental awareness. Third, the experimental group received instruction supported by animated learning

media integrated into classroom activities, while the control group was taught using conventional lecture-based methods. After the intervention, both groups completed the posttest questionnaire. Observations were also conducted during the learning process to capture students' engagement and responses to the instructional media. Data collection was conducted online using digital forms distributed by teachers who acted as facilitators.

Quantitative data from the pretest and posttest were analyzed using paired sample t-tests to measure changes within each group and independent sample t-tests to compare differences between the experimental and control groups. Descriptive statistics were used to analyze students' perceptions of the animated media. Observational data were used to support the interpretation of quantitative findings related to student engagement and behavioral responses.

The effectiveness of the animation-based learning media was determined based on several indicators: a minimum 20% increase in environmental awareness scores after the intervention, positive student perceptions of the animated media, and validation scores of at least 80% from expert reviewers. These criteria were used to evaluate whether the animated media functioned as an effective instructional tool in promoting environmental conservation awareness in vocational education.

RESEARCH RESULT

The results demonstrate a significant improvement in students' environmental conservation awareness after the implementation of animation-based learning media. The analysis focused on three main dimensions of environmental awareness knowledge, attitudes, and behaviors measured through pretest and posttest questionnaires.

A total of 52 students participated in the pretest, while 43 students completed the posttest due to attendance and technical constraints during online data collection. Despite this difference, the data remained sufficient to identify patterns of change after the intervention.

Pretest Results

The pretest results indicated that students' initial environmental awareness was at a moderate level. The average score for environmental knowledge was 15.8 out of a maximum of 24 (65.8%), environmental attitudes scored 14.7 (61.3%), and environmental behaviors scored 13.2 (55.0%). The overall average score of environmental awareness in the pretest was 43.7 out of 72 (60.7%), categorized as moderate. These findings show that before the intervention, students had basic knowledge of environmental conservation but lacked strong attitudes and consistent pro-environmental behaviors.

Table 1. Pretest Results of Environmental Awareness (n = 52)

Dimension	Maximum Score	Mean Score	Percentage	Category
Environmental Knowledge	24	15.8	65.8%	Moderate
Environmental Attitude	24	14.7	61.3%	Moderate
Environmental Behavior	24	13.2	55.0%	Low
Total Average	72	43.7	60.7%	Moderate

Posttest Results

After students in the experimental group were exposed to the animated learning media, the posttest results showed considerable improvement across all dimensions. The average score for environmental knowledge increased to 19.7 (82.1%), attitudes increased to 18.5 (77.1%), and behaviors increased to 17.2 (71.6%). Additionally, students' perceptions of the effectiveness of the animated media scored 17.1 out of 20 (85.5%), categorized as very good. The overall average posttest score reached 72.5 out of 92 (78.8%), indicating a high level of environmental awareness after the intervention.

Table 2. Posttest Results of Environmental Awareness (n = 43)

Dimension	Maximum Score	Mean Score	Percentage	Category
Environmental Knowledge	24	19.7	82.1%	Good
Environmental Attitude	24	18.5	77.1%	Good
Environmental Behavior	24	17.2	71.6%	Good
Perceived Effectiveness of Animation	20	17.1	85.5%	Very Good
Total Average	92	72.5	78.8%	Good

Comparison of Pretest and Posttest Scores

A comparison of pretest and posttest results revealed significant improvements in all aspects of environmental awareness. Environmental knowledge increased by 24.6%, attitudes by 25.9%, and behaviors by 30.3%. The total average score increased by 28.1% from the pretest to the posttest. This substantial increase indicates that animation-based learning media effectively enhanced students' understanding, attitudes, and behaviors related to environmental conservation.

Table 3. Comparison of Pretest and Posttest Scores

Dimension	Pretest Mean	Posttest Mean	Increase	Percentage Increase
Environmental Knowledge	15.8	19.7	+3.9	24.6%
Environmental Attitude	14.7	18.5	+3.8	25.9%

Dimension	Pretest Mean	Posttest Mean	Increase	Percentage Increase
Environmental Behavior	13.2	17.2	+4.0	30.3%
Total Average	43.7	72.5	+28.8	28.1%

Student Engagement and Perceptions

Observational data during the learning process showed that students in the experimental group were more engaged and attentive when learning through animated media compared to conventional instruction. Students demonstrated higher participation in discussions and expressed greater interest in environmental topics. The perception questionnaire further confirmed that students found the animation media attractive, easy to understand, and helpful in conveying environmental messages.

Summary of Findings

Overall, the findings indicate that animation-based learning media had a positive and significant impact on improving environmental conservation awareness among vocational high school students. The improvement was evident not only in cognitive aspects (knowledge) but also in affective (attitudes) and behavioral dimensions. These results support the effectiveness of animated media as an innovative instructional tool for environmental education in vocational settings.

CONCLUSIONS

This study confirms that animation-based learning media is effective in enhancing environmental conservation awareness among vocational high school students. The quasi-experimental findings show clear improvements across the three core dimensions of environmental awareness knowledge, attitudes, and behaviors after students were exposed to animated instructional content. The substantial increase in posttest scores indicates that animated media not only supports students' conceptual understanding of environmental issues but also strengthens their emotional engagement and encourages pro-environmental actions.

Students' positive perceptions of the animated media further reinforce its instructional value. The media was considered engaging, easy to understand, and effective in delivering environmental messages compared to conventional teaching methods. These results demonstrate that animation-based learning can bridge the gap between theoretical environmental education and meaningful behavioral change, particularly for vocational students who tend to prefer visual and practical learning approaches.

Overall, the study concludes that integrating animation into environmental learning is a practical and impactful strategy to foster sustainable awareness and behavior among vocational students, preparing them to adopt environmentally responsible practices in their future professional environments.

RECOMMENDATIONS

Based on the findings, several recommendations are proposed:

1. **For Teachers and Schools**

Teachers are encouraged to incorporate animated media into environmental and character education lessons to increase student engagement and understanding. Schools can integrate animation-based materials into environmental programs such as green school or eco-school initiatives to promote continuous environmental awareness.

2. **For Educational Media Developers**

Developers should design contextual, visually appealing, and easy-to-understand animations that align with vocational students' learning characteristics. Interactive elements such as quizzes or mini-games can be added to enhance student participation.

3. **For Future Researchers**

Further studies are recommended with larger and more diverse samples across different vocational fields. Researchers may also apply mixed-method approaches to explore students' experiences and long-term behavioral impacts of animation-based learning.

4. **For Policymakers and Educational Authorities**

Educational authorities are encouraged to support the development and dissemination of animation-based learning resources as part of environmental education strategies. Training programs for teachers on the effective use of digital and animated media should also be expanded to promote innovative teaching practices

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