Extending the MVD Model and Produce a Video to Foster Students' Understanding of Climate Change

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What is the Greenhouse Effect?

The greenhouse effect is essential for life on Earth. It governs temperature because the greenhouse gases in the atmosphere (carbon dioxide, methane, water vapour and other gases) first absorb the Earth's infrared radiation and then release this absorbed energy, heating up the surrounding air and the ground below it (Fig. 1).

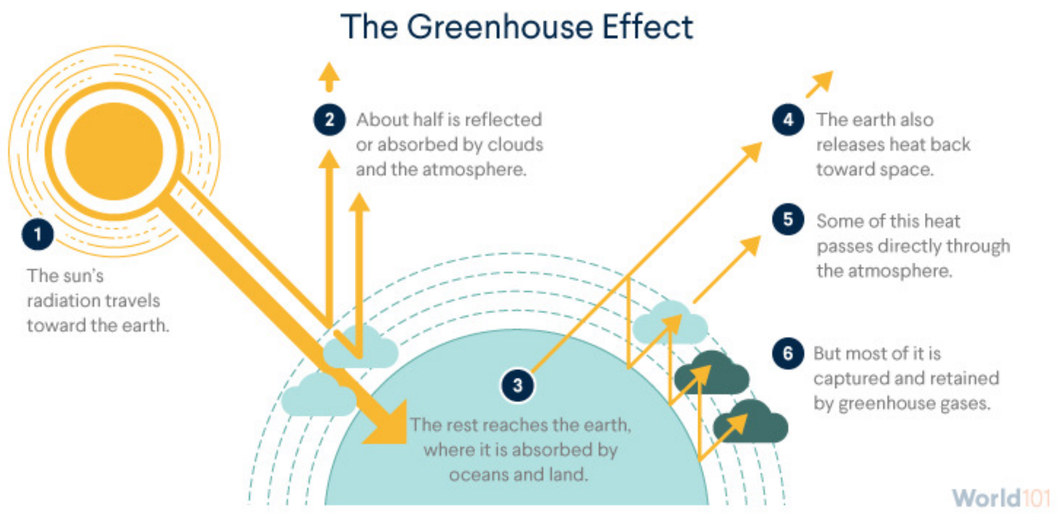

Figure 1:The Greenhouse Effect.

The purpose of this work is to investigate the functions of video as an educational tool, but also the proper use of multiple representations, in order to address students' misconceptions about climate change and the greenhouse effect.

Materials & Methods

The Methodology for educational Video Development, or MVD for short (Lefteris Moussiades, Ioannis Kazanidis and Anthi Iliopoulou, 2019), was used for the creation of the educational video. However, this is not a mere repetition of previous work on a different subject. The method in this work is extended with an extra part for the evaluation of the technical aspects of the video. The purpose of MVD is to reduce the difference between the original content and the final video output (Fig. 2).

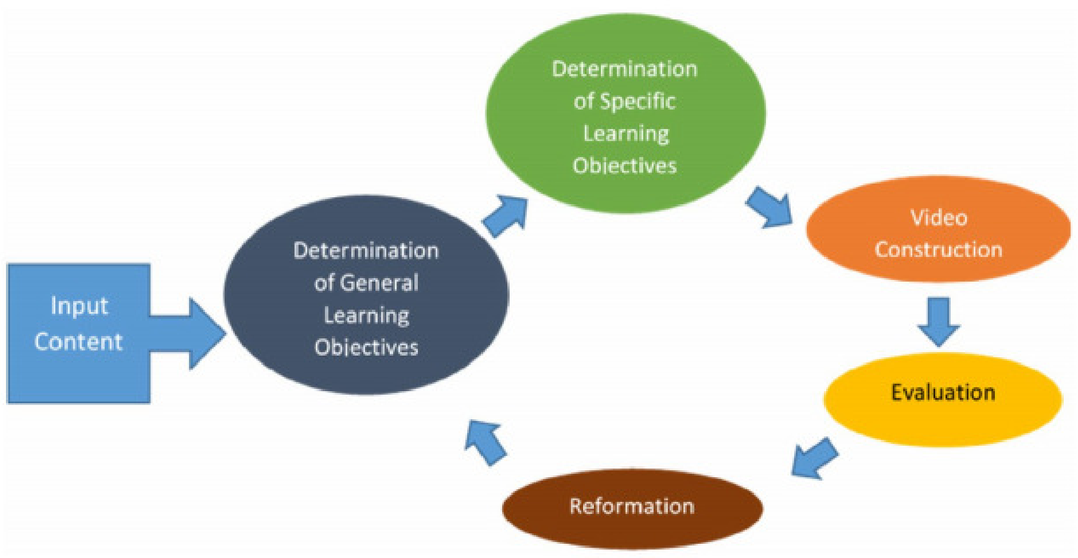

Figure 2:The Methodology for educational Video Development.

Results

In the last stage of the MVD methodology, a statistical analysis, through Excel and SPSS statistical package, of the data of the questionnaire results was carried out. In this way, the advantages of the video that contributed positively to the fulfillment of the learning objectives were identified, as well as the disadvantages, which were highlighted. Video evaluation is divided into two parts: content management and content presentation.

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Content Management

A paired sample t-test was performed that compared the mean difference between the questionnaires. Each correct answer was assigned 1 point out of 10. Students achieved cognitive progress that was statistically significant ($t(23) = 10.61$, $p < 0.001$) (Fig. 3).

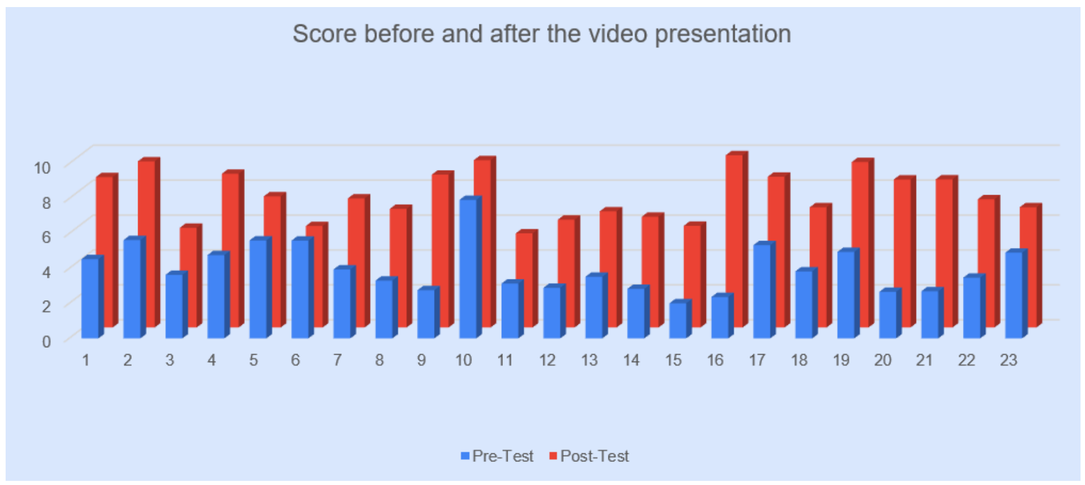

Figure 3:Distribution of pretest scores and post-test scores for the 23 participants.

Content Presentation

The results of the questionnaire about the technical aspects of the video are also satisfactory (3.84 ± 1.05 (st.dev.)) (Fig. 4).

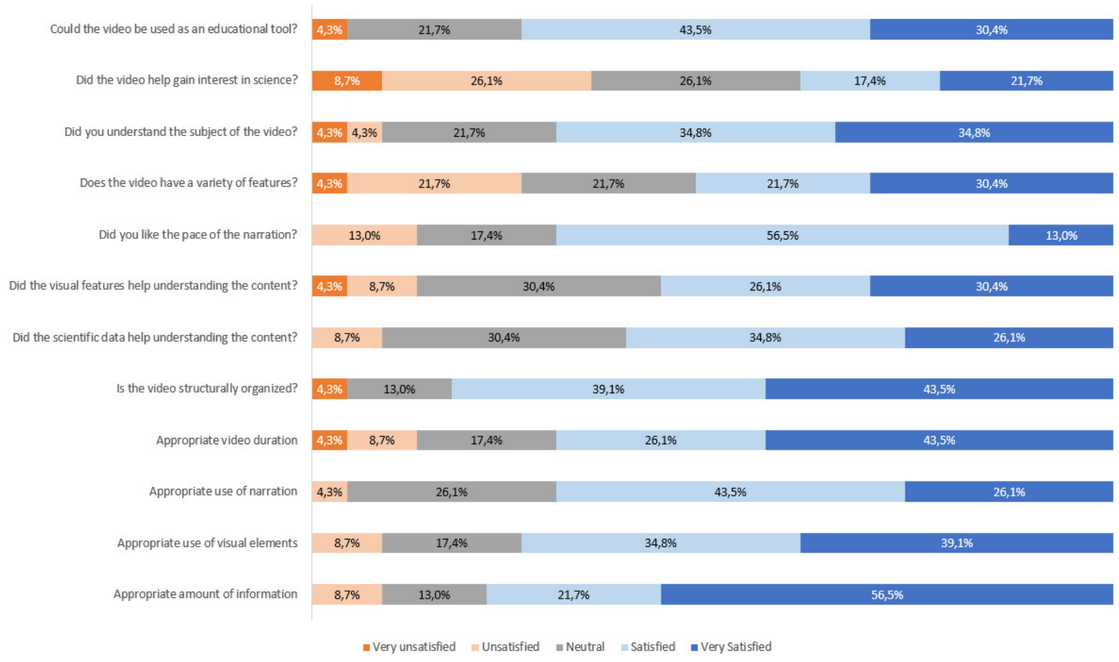

Figure 4:Quantitative results of the technical aspects of the video.

Summarizing the results, the following misconceptions about climate change and the greenhouse effect have been identified and partially overturned:

1. Climate change is due only to the human factor or only to natural causes.
2. The carrier of electromagnetic radiation is the electron.
3. The electromagnetic spectrum consists of electromagnetic radiation.
4. The greenhouse effect does not depend on human activity
5. The ozone hole and acid rain are consequences of the greenhouse effect and climate change.
6. The effects of the greenhouse effect are due to the greenhouse gases.
7. The greenhouse effect alone is a harmful mechanism for life on the planet.

Conclusion

In conclusion, integrating environmental issues into the science classroom is one way to increase students' knowledge and improve students' attitudes and behaviors toward climate change. The educational video is an effective teaching tool in the hands of the instructor. The MVD Methodology, through the research that was conducted, is considered to be effective, as it can be applied to other contemporary social issues.

References

[1] L. Moussiades, I. Kazanidis, and A. Iliopoulou. A framework for the development of educational video: An empirical approach. *Innovations in Education and Teaching International*, 56(2):217–228, 2019.