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Comparing the Effectiveness between Human-generated Videos and AI-Generated Videos on Learning

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ABSTRACT

The present study investigates the relative effectiveness of AI vs. human-generated educational videos on learning. 19 students between the grades of 8 and 12 were given a video to watch on epigenetics, which they had no prior knowledge of. Eight of the students were given a Visla, an AI generative video platform, video on epigenetics while the other eleven were given a human-created YouTube video on epigenetics. Both videos had the same content. After watching the video students were given a 20-question quiz to complete. Results showed scores on the post-test were virtually identical across the two groups. This suggests that AI-generated videos can be just as effective educationally as human-produced videos. As a result, AI-generated videos may represent a much more cost-effective way of delivering content and without sacrificing educational benefits.

Introduction

Traditional teaching has been highly content driven. Educators create textbooks and lesson plans that rely heavily on the notion that students will be exposed to content, which they will then proceed to learn. In recent times, educational websites such as Khan Academy have extended the traditional text-based content delivery approach to video-based content delivery. In all cases, the content delivery model has, at its core, the common principle that all students see the same content. This constraint is not guided by educational principles, i.e., it is not done because a "one-size-fits-all" content approach has been shown to be the best way to teach. In fact, arguably, the opposite is true. As Emma Camp notes, "American public schools reported, on average, that 49 percent of their students were behind grade level in at least one subject during the beginning of the 2022–2023 school year (Camp, 2023)."

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Rather, students receive the same instructional content because human-generated content is time consuming and expensive to make. Therefore, it is not economically feasible to create a textbook or video for each student. However, with recent advances in AI, it may now be possible to create customized content for each student. Doing so can offer key benefits.

One of the key benefits of AI-based video generation tools is that these tools can generate content for a variety of topics. In fact, Walden University highlights the 5 main advantages of using AI. The first is teachers who use AI have realized that it makes their jobs easier in terms of coming up with lesson plans or quizzes, which allows these teachers to spend more time with students. The second is speed. If a student is stuck on a particular part of his or her assignment, all s/he would have to do is ask an AI and it would very quickly give a response on how that student should craft a response. Third is personalization. AI is able to personalize content, so that students can have different levels of rigor of coursework to complete based on their needs and skills that they have to develop. Moreover, AI can determine what students need to work on and provide customized content to students, which results in more knowledge retention and understanding. Fourth is context. When students learn about historical or scientific topics, AI has to take different perspectives and explain the context in terms of goals or key events that define the subjects students are learning about. Finally, individualization can help students who need their school work to be translated into a different language or be broken up into smaller and more understandable parts (Walden University, 2024).

The notion of using AI-generated content as a substitute for human-generated content is predicated on the idea that students can learn just as well using AI-generated content as that can with human generated context. In a previous study (Namilae and Leddo, 2024), we demonstrated that students actually learned better using Chat GPT-generated content than they did with teacher generated content. The present study extends this investigation by testing the relative effectiveness of AI-generated videos and human-generated videos for teaching students new concepts. The challenging topic of epigenetics is chosen as this is something not typically covered individually in a high school biology course.

Method

Participants

There were a total of 19 participants who ranged from 8th to 12th grade. They were recruited from a medical machine learning class where students learned how to create a virtual doctor to diagnose diseases from photographs. These students had no prior knowledge of epigenetics.

Materials

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Two videos were used to teach these students about epigenetics. The first video was on YouTube in which Hank Green, a science communicator, was teaching epigenetics and explaining in-depth on whether it could or could not affect one's DNA. The second video was created through Visla, which is an AI video-creating software. This video was created by giving Visla the transcript and topics that were mentioned in the YouTube video and entering the instructions to produce a similar video.

In order to see the instructional effectiveness of both videos, a post-test was created. The questions that were formulated contained content that was covered in both videos. The questions that were provided on the quiz are shown below.

1. How does epigenetics challenge the original/traditional view of genetic inheritance within an individual?

2. How can studying epigenetics help contribute to personalized medicine and tailored health interventions?

3. How can environmental factors influence gene expression?

4. What role do chemical/epigenetic tags play in the process of epigenetics?

5. Give an example of an environmental factor mentioned in the video that can affect gene expression.

6. How can diet influence epigenetic changes?

7. What is methylation(methyl groups), and how does it affect gene expression?

8. Explain the concept of histones and their impact on gene expression.

9. How might stress lead to epigenetic changes?

10. Describe the relationship between epigenetics and diseases such as cancer.

11. Can epigenetic changes be inherited? Provide an example from the video to support your answer.

12. How might the study of epigenetics change our understanding of evolution?

13. Discuss how epigenetics can lead to differences in identical twins.

14. What example from the video shows how early life experiences can lead to lasting epigenetic changes?

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15. How can toxins in the environment lead to epigenetic changes?

16. Explain the potential long-term effects of epigenetic changes on human health.

17. How could understanding epigenetics lead to new medical treatments?

18. Why might some people be more susceptible to epigenetic changes than others?

19. How might epigenetic research raise ethical concerns regarding privacy and the potential for genetic discrimination?

20. How do you think epigenetics might influence public health policies in the future?

Procedure

Students were randomly assorted into two groups. One group received the Visla AI instructional video and the other received the YouTube video. Eight students were given the Visla video and eleven were given the YouTube video. Students were then given a Google Form to complete the 20-question quiz on what they had just learned and were monitored through Google Meet.

Results

Students' answers to the quiz were graded for accuracy. For all questions, which were answered in free response format, students could earn either 1 point if the answer was fully correct, half a point if the answer was only partially correct, or 0 if it was incorrect. The average points received by the AI-video group was 16.9 out of 20, and the human-generated group averaged 17.1 out of 20. These results were virtually identical, $t < 1$, $df = 17$, ns. The results were noteworthy in that students averaged about 85% in both groups, suggesting both AI-generated and human-generated videos produced high degrees of learning.

Discussion

The results from the study show that AI-generated and human-generated videos produced learning that was both high and comparable. Although the Visla video was able to give results similar to a common YouTube video, further research is needed to see if these results can be replicated in other educational fields and not just epigenetics. However, if these results hold up, the suggestion is that AI has enormous application through its ability to produce content that is effective as well as quick and cheap to produce.

Even though AI-generated video did not produce better learning than did human-generated video (although in a separate study, we did show that students who learned from Chat GPT-generated text scored higher on a post-test than those who learned through teacher-generated text, Namilae

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and Leddo, 2024), the educational community could recognize enormous cost savings by switching to AI-generated videos. As stated by Caryn Neumann, a teaching professor at Miami University, "The Education Data Initiative said the average cost for textbooks in 2023 was between $339 and $600 per year." (Neumann, 2023). This shows how expensive educational materials can be. AI-generated content can bring these costs down dramatically.

AI can also help with another area: student-specific content. Currently, human-generated educational content is not only expensive to produce, but it is uniform: each student receives the same material. However, different students have different learning needs and learning styles. By adapting to students' needs, learning can be improved. This is shown in the work of Chunmei She and her colleagues who found that students retained more information when instruction is adapted to the needs of the student (She et al., 2023). This can also reduce teacher workload as the AI can student-specific content for them.

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