AI-Generated Virtual Instructors Based on Liked or Admired People Can Improve Motivation and Foster Positive Emotions for Learning

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***Abstract*—This paper presents the results of a study with 134 participants to explore the effects of learning from an AI-generated virtual instructor that resembles a person one likes or admires. Given the important role instructors play in shaping learning experiences, as well as the recent surge in demand for online education, we investigate the potential for AI-generated instructors to motivate learning. Recent advances in generative AI have made it easy to create virtual instructors based on the likeness of a present-day, historical or fictional person, thereby enabling customization of video instructors based on the material, context and student. We found that while greater degrees of liking and admiration do not result in increased test scores, they can significantly improve students' motivation towards learning, foster more positive emotions, and boost their appraisal of the AI-generated instructor as serving as an effective instructor.**

***Index Terms*—learning, motivation, deepfakes, virtual instructor, AI-generated characters**

I. Introduction

In recent years, machine learning (ML) algorithms have become increasingly adept at generating realistic-looking images and videos of people. This technology is being used for generating "deepfakes" or "AI-generated characters" [1], which are synthetic images or videos where faces or bodies are digitally altered in ways that make them difficult to distinguish from real images or video content. While deepfakes have recently been used mostly for nefarious purposes, such as creating fake news stories or spreading misinformation, we believe they have the potential to be used for good.

One potential use case for AI-generated characters is in the field of education. A shift towards remote learning during the COVID-19 pandemic has burdened teachers to transform their content, and has challenged students to keep focused and motivated [2]. AI-generated characters present an opportunity for educational content to be personalized in order to foster interest and engagement. They also hold the potential to assist real-life instructors and perhaps improve access to education.

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Prior research suggests that instructors' identities and student-teacher relationships can impact students' attitudes, motivation and even their academic outcomes [3]. For example, one study found that learning from someone from the same race or gender can increase engagement and learning motivation [4]. Another study found that fictional characters can be used to foster stronger motivation and growth mindsets in learning [5]. These findings suggest that the way a student relates to the instructor can have a significant impact on a student's attitude and motivation levels, even if all other variables are constant. Motivation has in several studies been associated with better overall learning outcomes [6], [7]. Given this, it is intriguing to consider how AI-generated instructors could be used to enhance motivation in online learning. In this paper, we investigate the effects of learning from videos of AI-generated instructors that resemble characters that people like and admire (see overview in Fig. 1). Using an open-source platform for generating synthetic characters [1], we conducted an extensive study with 134 participants to explore the effects of a personalized virtual instructor on students' learning outcomes, as outlined in the following research questions:

- RQ1. How do AI-generated instructors that resemble people students like or admire impact online learning performance?
- RQ2. How do AI-generated instructors that resemble people students like or admire impact students' emotions and their motivation to learn?
- RQ3. How does the degree to which students like or admire the people portrayed by AI-generated instructors impact the instructors' perceived credibility, human-likeness and ability to facilitate learning?

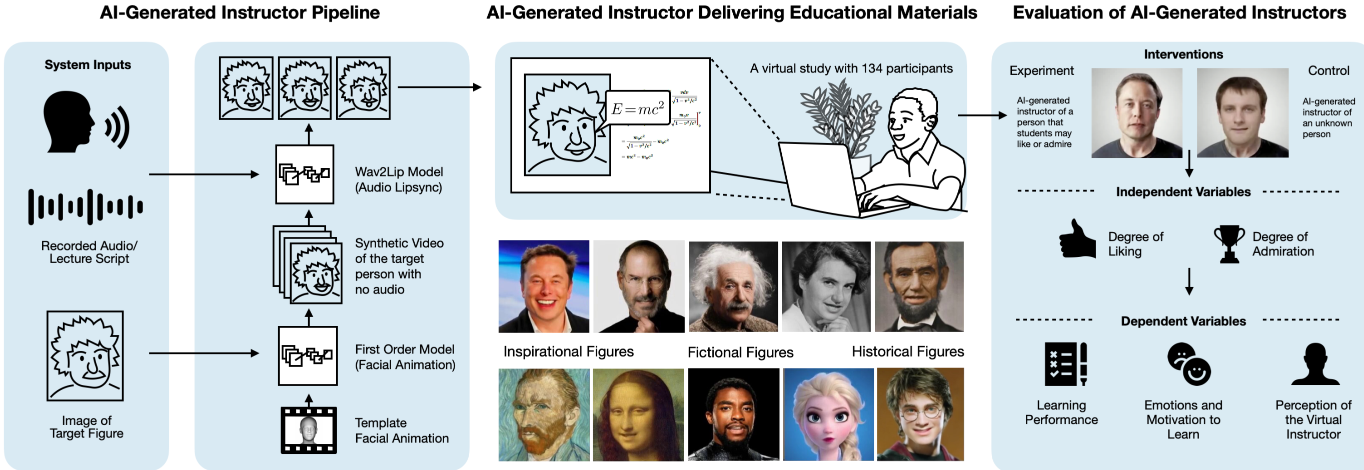

Fig. 1. AI technology presents an opportunity for students to learn from a virtual instructor that resembles a person they like or admire. In this paper, we report on a study with 134 participants to investigate the impact this might have on students' perception of and attitudes towards the learning experience.

II. Related Work

Our work on understanding the role of AI-generated instructors is situated within three different contexts of research: (1) research on the learning effects of role models, (2) recent technical advancements in AI-generated characters, and (3) the use of virtual instructors in online learning.

A. Personal Role Models in Online Learning

Role models or personal heroes are important for the personal growth of students. Research has shown that having a role model or a mentor can positively influence the performance and progression of a person's career [8], [9], increase motivation [10], and reduce stereotype threat [11].

Research has also shown that a student's motivation for learning and their academic outcomes are strongly affected by the student-teacher relationship [3]. Studies show that including personal stories in subjects like STEM [12], as well as learning from someone you identify with (e.g. same race and gender) [4] can increase engagement and make students more motivated to learn. Combining online learning with storytelling through characters can humanize the learning process, make it more engaging and make the learning content more relatable and inspirational. Further, it aligns the learning process with the social cognitive processes of one's brain by involving one's emotions in the learning process. This has been shown to lead to better long-term learning effects and engagement [13].

B. Virtual Instructors

With the recent increase in remote learning, researchers have developed "virtual instructors" or "pedagogical agents" to facilitate the instruction and teaching of materials via videos and videoconferencing. These instructors do not necessarily resemble a real person but can be any digitally created character such as a 2D cartoon or 3D character.

A meta-analysis examined the effect of using virtual instructors on learning by reviewing 43 studies involving 3,088 participants [14]. In the analysis, virtual instructors were found to have significant effects on learning outcomes. For example, one study found that learners can pick up emotion from virtual instructors [15], while another study found that virtual instructors with a particular identity (young and attractive) generated more intrinsic motivation to learn than someone with another identity (old and unattractive) [16].

In an empirical study using fNIRS, students were found to have greater brain activity in the social areas of the brain during learning from virtual instructors and performed better on learning tasks than without the virtual instructor [17]. These studies highlight the educational potential of virtual instructors in online classrooms and inspire future directions for research on virtual instructors.

C. AI-Generated Characters

AI-generated characters are realistic digital representations of a person, created by machine learning algorithms, whose speech or movements can be controlled digitally. To generate these characters, researchers have developed numerous high-performing architectures, including generative adversarial networks (GANs) [18]–[20], neural radiance fields [21]–[23], and self-supervised motion transfer networks [24]. These technologies have been leveraged for a variety of use cases, including generating facial animations [18]–[23], protecting people's privacy in documentaries and interviews [25], dubbing of films [26], and reanimating historical images [27], [28].

Given recent progress in AI for generating characters, we can now create highly realistic virtual instructors that resemble current, historical, or fictional figures to come into the virtual classroom to teach and share stories or perspectives [1]. These newly available methods for generating virtual teachers can now be used to personalize the instructor in an online video to adopt the appearance of someone the student likes and admires in an automated way with minimal manual input from the user.

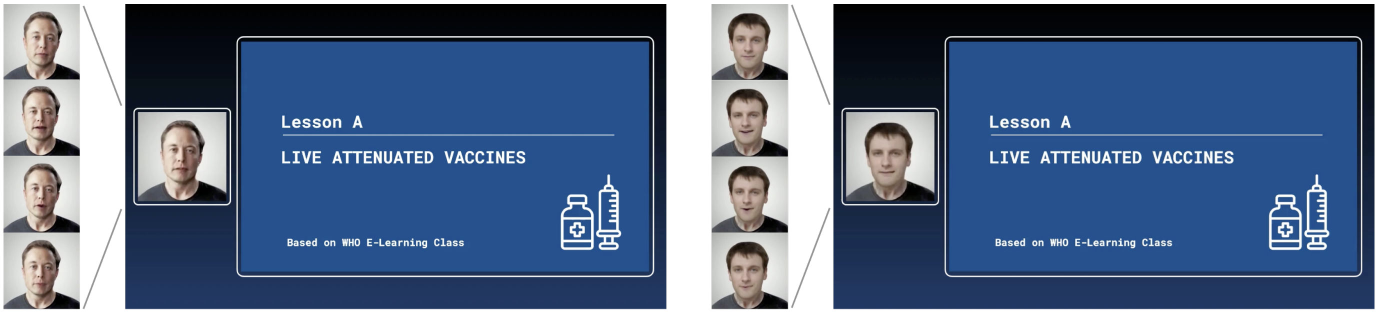

Fig. 2. The *Experimental Group* watched an online lecture given by an AI-generated character that resembled Elon Musk (an innovator and tech entrepreneur). Participants in the *Control Group* watched the same online lecture delivered by an AI-generated character based an unknown person of the same age, race, and gender, whose face was generated using a free online service model.

III. Motivation

We believe AI-generated characters can be used to create compelling learning experiences, from delivery of content online, to novel classroom experiences and engagement with content at museums, historical monuments, or even in nature. One potential benefit is that they could be used to personalize and motivate learning experiences by using characters that a student likes or admires. Using state-of the-art generative machine learning models, prominent historical, modern-day, or fictional figures can be brought to life to engage learners with "lived" experiences of scientists making their discoveries, historical figures narrating battles, or painters discussing their inspiration and process. Young children could have their teacher or a classroom guest take the form of a favorite cartoon or movie character. For instance, these students could get excitement from having an AI-generated version of Elsa from the movie Frozen teach them about the formation of snow and ice. Similarly, high school students could experience a realistic recreation of a lecture or a historical event by using AI-generated characters that are part of that narrative. Using AI-generated characters, information that may only have been available in writing or told by a third party can now be delivered by a virtual representation of the real person discussing their work or story, as exemplified in the museum exhibit "Dalí Lives" [27].

IV. Methodology

To evaluate the effects of virtual characters in online learning, we (1) designed educational videos based on information from the World Health Organization [29], (2) used an open-source AI-generated characters pipeline [1] to generate videos of virtual instructors narrating these videos, and (3) performed a human subject study to evaluate the impact of using AI-generated instructors that resemble people that students may like or admire, on students' learning performance, emotions, motivation, and perceptions of the instructor.

A. Educational Videos

Study participants watched the educational video comprising a slideshow and a talking-head video of a virtual instructors (see Fig. 2). Two versions of the lecture were created. In one version, the lecture was delivered by an AI-generated instructor resembling Elon Musk (a well known American innovator and tech entrepreneur). In the other version, the exact same content was taught by an unknown person of the same age, race, and gender, whose appearance was generated using a free online service that generates faces of people that do not exist (https://thispersondoesnotexist.com/). In these videos, only the face was changed, whereas the voice and gestures were identical. Elon Musk was selected since he is a somewhat controversial figure that participants would like, dislike, or admire to various degrees. This variation would help us to study how liking or admiring the portrayed character can impact students' learning outcomes, motivation, emotions, and their perception of the virtual instructor.

B. Generating Lectures with Virtual Instructors

To generate realistic looking virtual instructors that resemble inspirational, historical, or fictional figures, we used an open-source unified pipeline [1]. It takes audio or text input along with a target image in order to output a video of a talking AI-generated character based on the image. The pipeline was selected as it is 1) easy to set up, 2) provides realistic outputs, and 3) requires modest resources. Hence, it can easily be used by educators to generate learning materials.

The pipeline comprises state-of-the-art generative AI models that convert text-to-audio, audio-to-video, and video-to-video to create a variety of audio and video outputs. It uses *WaveNet* [30] for realistic text to speech generation, *Wav2Lip* [31] for automated lip synchronization, and the *First Order Motion Model* [24] for facial animation. The pipeline is hosted on Google Colab, a collaborative cloud-based development platform. To generate a talking-head video, a user of this pipeline must input an image of the target character's face and either a text-based script or a voice recording of the lecture that the virtual instructor should deliver. The process is easy and automated, thereby enabling straightforward customization of virtual teachers in learning videos.

C. Study Design and Procedure

To explore how AI-generated characters might improve online learning outcomes, enhance motivation, and improve the learning experience, we conducted a study with 134 participants ranging in age from 18-35 years old. The participants were recruited from our university's "anonymous" behavioral research participant pool.

The study was a two-part, between-subjects online study conducted using Qualtrics. In part one, participants watched the video lecture and answered questions about their level of motivation, how they felt, and their impressions of the instructor. The latter metrics were based on the paper by Lawson et. al. [15] which explored how students relate to (unknown) animated virtual instructors. A week later, they completed part two which contained a test on the lecture content. Each participant was randomly assigned to learn from one of the two AI-generated instructors. Participants assigned to the *Experimental Group* were taught by an AI-generated instructor resembling "Elon Musk," while those assigned to the *Control Group* were taught by an instructor based on someone who does not exist, named "Allen Mann."

Prior to watching the lecture video, participants were informed that they would be learning from an AI-generated instructor rather than a real person. They were then presented with the name and image of their instructor. Based on this, they were asked to report whether they recognized their virtual instructor "Do you recognize this person?" ("Yes" or "No"). Participants who did not recognize Elon Musk, and those who reported recognizing Allen Mann were removed from the data set. In addition, they were asked to what extent they liked the instructor "Do you like this person?" on a 3-point scale ("I dislike this person", "Neutral", or "I like this person"), and admired them 'How much do you admire this person" on a 5 point Likert-scale (1 = "Not at all" and 5 = "A great deal.").

Both characters delivered the exact same content in a slideshow with the same voice, i.e. only the appearance of the instructor was different (see Fig. 2). After watching the lecture video, participants were then asked to fill out additional survey questions comprising both custom and standardized questions [32]. The questions in the survey were broken down into three groups focusing on: (1) their perceived learning experience, (2) how the instructor made them feel, and (3) their assessment of the instructor's qualities.

To assess the participants' motivation while learning from the AI-generated instructor, they were asked to rate the following questions: "I was motivated to pay attention to the lesson I just watched," "I put in a lot of effort to understand the information in the lesson," "I would like more lessons like this one," and "I would like to learn more advanced material from this instructor,", on a 5-point Likert-scale (1 = "Strongly disagree", and 5 = "Strongly agree"). Participants were also asked to indicate how the instructor influenced their emotions: "The instructor made me feel...(happy/content/frustrated/bored)" on a 5-point Likert-scale (1 = "Strongly disagree", and 5 = "Strongly agree"). To assess the students' perception of the qualities of the lecturer, participants also answered questions as outlined by the Agent Persona Instrument [32], which correspond to their perceived credibility and human-likeness, as well as their ability to be engaging and to facilitate learning.

One week after watching the lecture, the participants were prompted to take a test on the lecture content, comprising 20 multiple choice questions. Participants were informed that incorrect answers would reduce their score to discourage random guesses. A test score was automatically computed after each participant completed the test.

V. Results

The likeability and admiration ratings for the virtual instructors were used as the independent variables for the learning experience. The group sample sizes for the independent variables were as follows:

- Liking: the *Control Group* = 67 and the *Experimental Group* (Dislike = 13, Neutral = 36, Like = 18)
- Admiration: the *Control Group* = 67, and the *Experimental group* (*1 - Not at all* = 11, *2 - Not very much* = 14, *3 - A moderate amount* = 16, *4 - A lot* = 11, *5 - A great deal* = 12)

The responses of each group were analyzed along the dimensions outlined in the research questions. We first assessed if the normality assumption was met for each distribution using the Shapiro-Wilk test due to the relatively small group sample sizes. If the normality assumption was not met, we performed a Kruskal-Wallis test followed by a post-hoc Dunn test using the Bonferroni error correction. If the normality assumption was met, we then conducted a homogeneity test using a Levene test to assess whether the samples were from populations with equal variances. If the samples were not homogeneous, we ran a Welch analysis of variance (ANOVA) and a Tukey post-hoc test. If the samples were homogeneous, we ran a basic ANOVA test. Statistics from this analysis are available online [33].

A. Learning Performance

We investigated the impact of the degree to which participants liked or admired the virtual instructor on their test scores. The scores for each group followed normal distributions and were statistically homogeneous (refer to [33]). We found no statistically significant differences in the scores across the groups based on liking, as determined by a one-way ANOVA ($F(3,130) = 0.22$, $p = 0.89$). Regarding degrees of admiration (from 1-5), we found a statistically significant difference between groups as determined by a one-way ANOVA ($F(3,130) = 2.36$, $p = 0.044$). A pairwise post-hoc Tukey test found a significant difference between *Experimental Groups* 3 ($M = 17.4$, $SD = 5.78$) and 5 ($M = 10.5$, $SD = 5.73$) ($p = 0.045$). However, no significant differences were found between the *Control* and *Experimental Groups* (see Fig. 3).

B. Emotions and Motivation to Learn

1) Motivation: Students' attitudes towards learning were measured through self-report Likert questions (see Fig. 4.) For degree of liking, we first compared the *Experimental Group* against the *Control Group*. The participants who reported liking the instructor character ($M = 4.28$, $SD = 1.02$) were significantly more inclined to want to learn more advanced material from the instructor compared to the *Control Group*

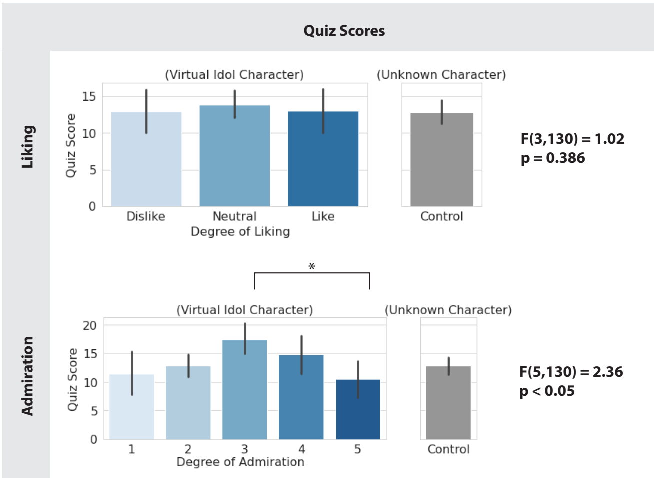

Fig. 3. Participants' quiz scores based on liking and admiration.

(M = 3.27, SD = 1.39) (p = 0.035). Those who disliked the instructor (M = 1.77, SD = 0.93) were significantly less inclined to want to learn more advanced material than the *Control Group* (p = 0.0034).

Within the *Experimental* populations, we found that those who liked the instructor were significantly more motivated to pay attention to the lesson (p = 0.0085), would like more lessons similar to the one given (p = 0.0061), and would like to learn more advanced material from this instructor (p = 6.4E-6) than those who disliked the instructor.

Overall, we saw the trend that the more a person liked the instructor, the more they were motivated to pay attention to the lesson, would like more lessons like the one given, would like to learn more advanced material from the instructor, and put more effort into learning the material. According to the independent variable for admiration, we see a similar trend that the more they admire the person, the more they are motivated along these dependent axes.

For degree of admiration, although there were no statistically significant differences between the *Experimental* and *Control* groups regarding motivation (see Fig. 4, bottom), we observe a statistically significant pairwise difference between the *Experimental Groups* 1 (M = 2.73, SD = 1.42) and 5 (M = 4.33, SD = 1.07) for desiring more lessons like the one given (p = 0.046). Additionally, we see a statistically significant pairwise difference between the *Experimental Groups* 1 (M = 1.91, SD = 1.04) and 5 (M = 4.33, SD = 0.98) (p = 6.1E-4), and 2 (M = 2.36, SD = 1.35) and 5 (p = 0.0054) for the desire to learn more advanced material from the instructor. There is a subtle trend for increasing degrees of admiration to correspond with more motivation to learn, with greater admiration levels corresponding most strongly with the desire to learn more advanced material from the instructor.

2) Emotions: We also asked participants to report the degree to which the instructor made them feel happy, content, frustrated, and bored. Those who liked the instructor reported that the instructor made them feel significantly more happy (p = 6.5E-5) and content (p = 0.0023), and significantly less bored (p = 0.022) than those in the *Control Group*. Those who reportedly disliked the instructor felt significantly more frustrated than those in the *Control Group* (p = 0.0078).

Within the *Experimental Group*, those who liked the instructor reported feeling significantly happier (M = 4.33, SD = 0.91) than those who disliked (M = 2.08, SD = 0.86) (p = 6.1E-6) or felt neutral (M = 2.69, SD = 0.95) towards the instructor (p = 5.9E-5). They also reported feeling significantly more content (M = 4.22, SD = 0.81) than those who disliked the instructor (M = 2.38, SD = 0.87) (p = 0.00014). We also found that those who liked the instructor reported being made to feel significantly less frustrated (M = 1.67, SD = 0.97) and bored (M = 2.00, SD = 1.28) by the instructor than those who disliked the instructor (Frustrated: M = 3.15, SD = 0.90, p = 0.0018) (Bored: M = 4.00, SD = 0.82, p = 7.1E-4).

Overall, we observe a trend that the more the instructor is liked, the more they reported the instructor as making them feel positive emotions and the less they reported the instructor making them feel negative emotions (see Fig. 5).

Regarding admiration, those who strongly admired the instructor were significantly happier compared to the *Control Group* (5:M = 4.50, SD = 0.67, Ctrl: M = 2.81, SD = 1.28, p = 4.1E-4) and more content (5: M = 4.33, SD = 0.78, Ctrl: M = 3.06, SD = 1.25, p = 0.014).

Within the *Experimental Group*, those who reported strongly admiring the instructor were significantly happier than those who felt neutral (3: M = 2.75, SD = 0.774, p = 0.0044) or did not admire the instructor (1: M = 2.36, SD = 0.92, p = 8.6E-4, 2: M = 2.07, SD = 0.83, p = 1.2E-5). We also observed that strong admirers felt significantly more content than those who did not admire the instructor (1: M = 2.27, SD = 0.91, p = 6.6E-4, 2: M = 2.57, SD = 1.09, p = 0.0037), felt significantly less frustrated than those who did not admire the instructor (2: M = 2.86, SD = 0.95, 5: M = 1.50, SD = 0.91, p = 0.020), and felt significantly less bored than those who did not admire the instructor (2: M = 4.00, SD = 0.88, 5: M = 2.00, SD = 1.35, p = 0.0055).

C. Perception of the AI-Generated Virtual Instructor

We analyzed participants' responses for each factor in the Agent Persona Instrument by Baylor and Ryu [32] based on the degree to which the participants liked and admired the virtual instructor. For each factor, at least one group violated the assumption of normality according to a Shapiro-Wilk test. Therefore, Kruskal-Wallis tests were used, followed by post-hoc Dunn tests with Bonferroni corrections to determine if there were significant differences between groups. The results are plotted in Fig. 6. All means, standard deviations and p-values can be found in our supplementary material [33]. We observed a general trend that the more a student liked or admired the virtual instructor, the more they perceived the instructor as someone who helps facilitate their learning, is credible, is human-like and is engaging.

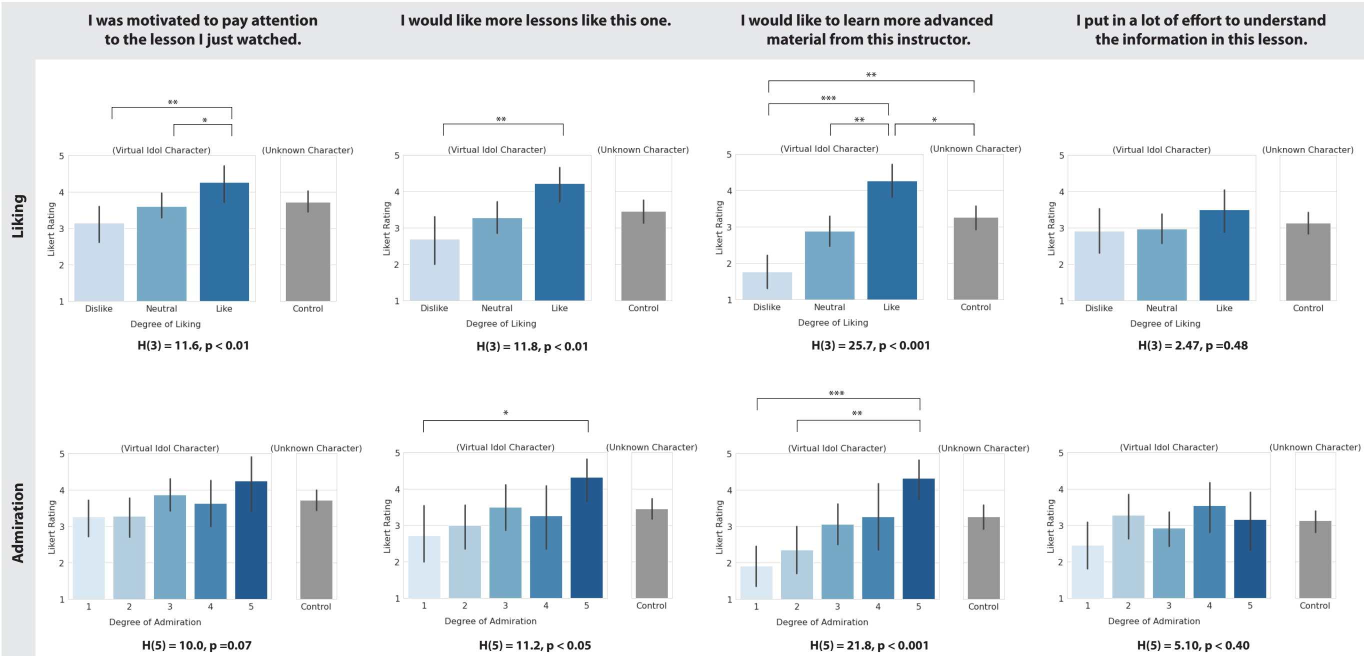

Fig. 4. Participants' responses to questions pertaining to learning motivation, based on their degree of liking (top row) and admiring (bottom row) the instructor. The H-statistics and p-values for the conducted Kruskal-Wallis tests are reported beneath each chart. Significant pairwise Dunn test results are indicated by the brackets above each chart. Note that * = p<0.05, ** = p<0.01, and *** = p<0.001.

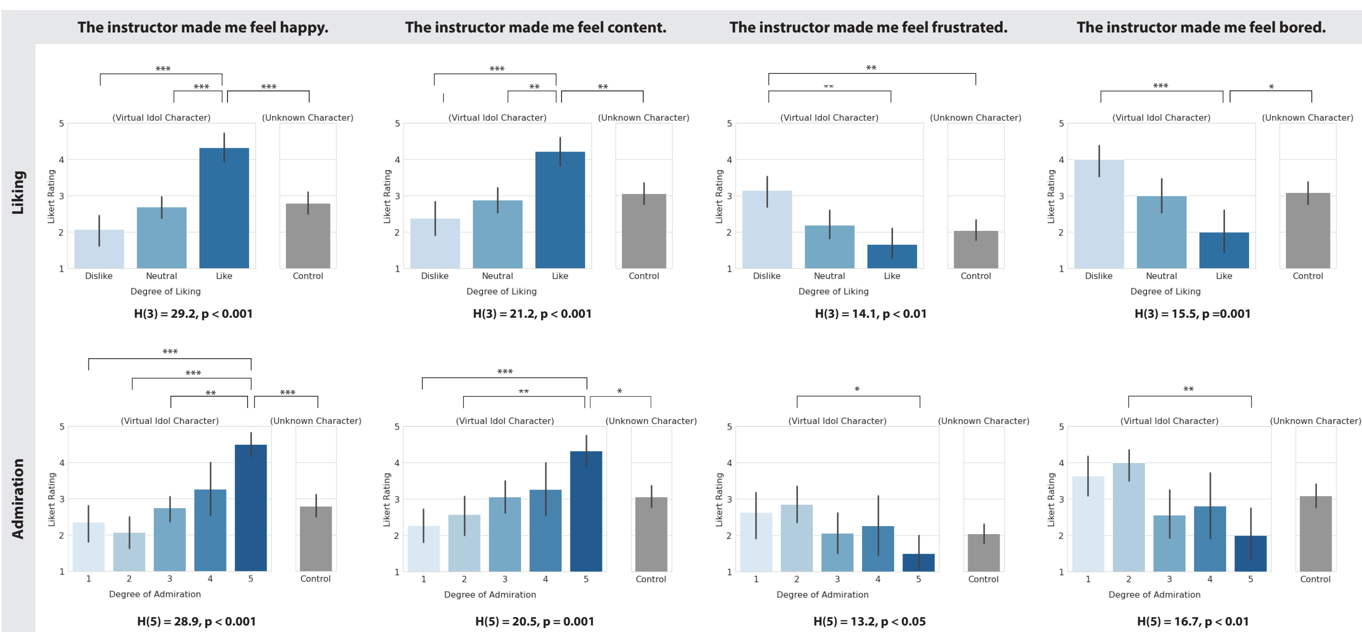

Fig. 5. Participants' self-reports on how the AI-generated instructors made them feel, based on the degree to which they liked (top row) and admired (bottom row) the instructor. The H-statistics and p-values for the conducted Kruskal-Wallis tests are reported beneath each chart. Significant pairwise Dunn test results are indicated by the brackets above each chart. Note that * = p<0.05, ** = p<0.01, and *** = p<0.001.

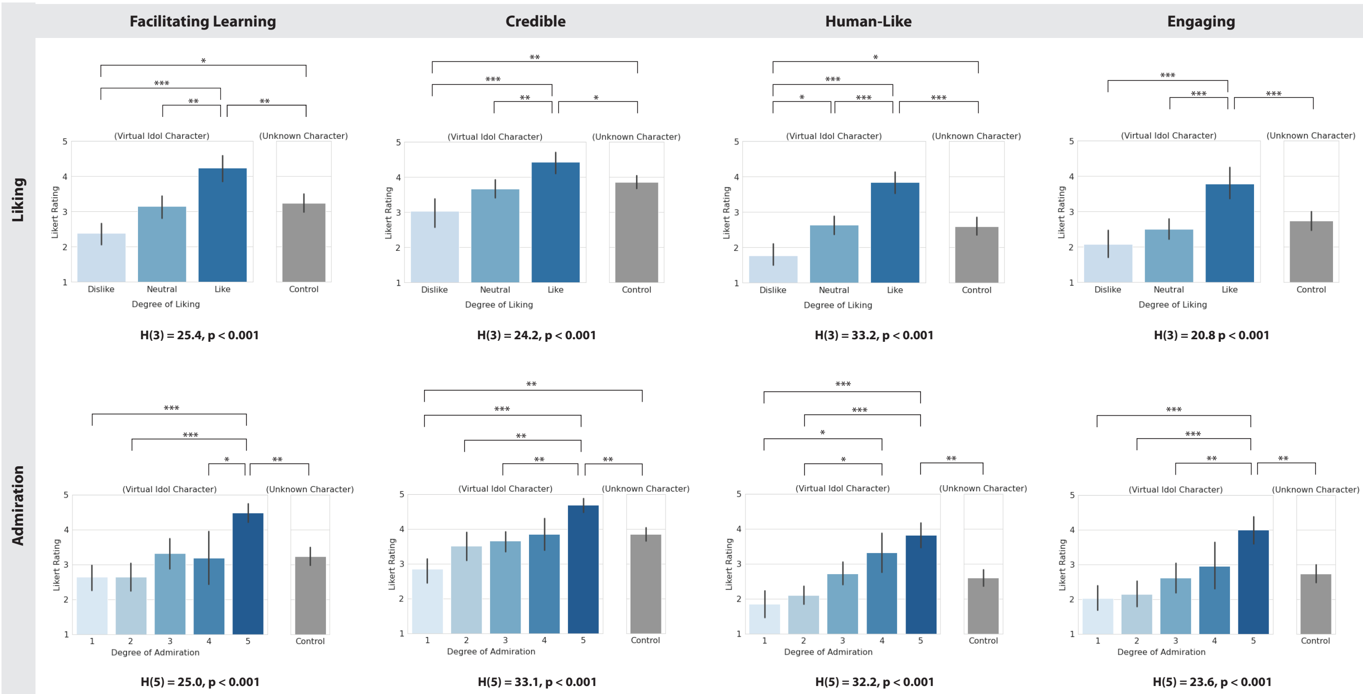

Fig. 6. Participants' perceptions of the AI-generated instructor along the four factors in the Agent Persona Instrument [32], based on the degree to which they liked (top row) and admired (bottom row) the instructor. The H-statistics and p-values for the Kruskal-Wallis tests are indicated beneath each chart. Significant pairwise Dunn test results are indicated by the brackets above each chart. Note that * = p<0.05, ** = p<0.01, and *** = p< 0.001.

VI. Discussion

While the degree to which participants liked or admired the instructor did not result in a significant difference in test scores between the *Experimental* and the *Control group*, students who were neutral towards the AI-generated instructor scored slightly higher than the others. It is possible that this is due to being distracted, but more investigation would be needed. However, their degree of liking or admiration notably impacted their feelings and attitudes towards learning and their perception of the character as an instructor. This suggests that enabling students to learn from virtual characters modeled after people they like or admire may have the potential to boost students' positive emotions, increase their motivation to learn, and enhance their perception of their instructor.

Overall, the results suggest that AI-generated instructors could be useful in multiple ways in education. They could be used to completely stand-in for a teacher in an online lecture, but they could also be leveraged as guest lecturers to complement existing lesson plans. For example, a teacher could either invite a virtual Einstein to teach about the theory of relativity or deliver the lecture while puppeteering the likeness of Einstein. The approach could also be used to create personalized learning experiences.

Furthermore, specific characters could be generated to suit the lecture content and add a special touch based on their unique backstories (e.g., Einstein for physics, Picasso for painting). These virtual teachers could also be used by students in active learning scenarios, where the students can drive the virtual characters through acting or puppeteering and could craft reenactments of important events. AI-generated characters can spark imagination and creativity by blending fiction with reality. There's also the possibility for such technology to increase the representation of minorities in teaching videos by modeling virtual teachers based on generic characters or popular role models. Recent studies have shown that students more positively appraise teachers [4], score higher on tests [34], and enter more gifted programs [35] when their teachers are of a similar ethnicity to their own. This factor could likely be replicated in the use of virtual instructors.

VII. Limitations and Future Work

Although our work shows promising potential for AI-generated instructors to boost learning motivation, a number of technical and experimental limitations still remain with regards to creating highly emotionally expressive and interactive AI-generated virtual instructors. Furthermore, user studies could be expanded to investigate both novelty and long-term effects.

A. Character Expression of Nuanced Emotion

Currently, the open-source pipeline used in this study allows the character to show some emotional expression, but it is often somewhat impaired. For instance, while the pipeline can make characters smile if the person in the driving video smiles, we observed that it cannot easily pick up behavioral emotions such as frowning. Hence, adding models for generating facial expression such as [36] in the pipeline could help the character engage better with students in the future.

B. Interactive Dialogue

At present, the pipeline requires that the virtual instructor be produced, curated, or driven by someone. However, a potential future AI-generated teacher could be designed much like a chatbot to answer questions and engage with learners in an independently interactive way. This could be accomplished using conversational language models [37], [38] trained on frequent Q&A datasets or a knowledge corpus of the topic. Thus, the interactive AI-generated character could potentially serve as an individual's personal tutor and learning coach [39]–[41].

C. Expanded User Study

The current setup for the experiment only utilizes a single video and one post-lecture evaluation. As a next step, it would be helpful to conduct a longitudinal study comprising a series of video lectures, as would be typical of an online lecture series. This would help reveal whether the benefits would be sustained over a longer period of time, as well as clarify if the observed effects are attributable to novelty. Moreover, the analysis did not account for the influences of participants' prior knowledge and perceived expertise of the AI-generated instructor. Future work should understand the influences of such factors on learning and motivation.

VIII. Ethical Considerations

The ethics issues of AI-generated media go beyond the educational setting and are the subject of an ongoing, expansive conversation happening across different scales from personal usage to national policies [1], [42]. Here, we focus on ethics around AI-generated characters in education.

A. Misportrayal and Disinformation

AI-generated characters can be used to deliberately spread inaccurate information. For example, a deepfaked scientist could be made to say things that are not supported by scientific evidence. Students could be lead to believe false information or could be confused when the supposed authority on a topic provides conflicting information.

B. Privacy and Consent

It is important to respect a person's privacy and seek the consent of the person to be portrayed. Deepfakes can easily be used to publicly misportray people and their beliefs, which can inflict profound harm (e.g., defamation, emotional distress). The potential for wide distribution can compound these negative effects. One open question is how to handle consent when the person is deceased.

C. Replacement

While AI-generated characters for teaching may have economic benefits and increase access to education in low-resource areas, they should primarily be used to augment or supplement human teachers rather than replace them. Research has shown the student-teacher relationship to be a key factor for fostering positive student attitudes, behaviors and development [3], [43]. Moreover, research indicates that a lack of emotional attachment, as experienced in video-conferencing-based classes, decreases learning effectiveness [2], and that a reduction in social relationships adversely affects mental health, physical health, and mortality risk [44], [45]. Hence, substituting real teachers with virtual instructors could pose a threat to student learning and well-being.

IX. Conclusion

In this paper, we investigated the learning effects of AI-generated instructors that resemble a person the learner likes or admires. We found that while liking or admiring the instructor is not reflected in higher test scores, high likability and admiration of the AI-generated instructor significantly improves students' motivation towards learning and fosters more positive emotions than in case of a virtual instructor they are unfamiliar with. Conversely, we also found that low likability and admiration of an AI-generated instructor significantly decreased students' motivation towards learning, as well as fostered more negative emotions than an unfamiliar virtual instructor. These results demonstrate a potential use case of AI-generated characters in online learning to increase learning motivation among students.

We expect future work on AI-generated characters for learning to result in more realistic, memorable and motivating characters with higher degrees of interaction between student and teacher. AI-generative techniques can further be leveraged in the education space to enable students to role play and learn in a more embodied and situated way about an event such as the Battle of Gettysburg or what it is like to be a scientist in a bio-engineering lab. Students today are no longer limited to acquiring knowledge at a fixed place and time, and with the rapid technological advancements of AI-generated characters, we believe online learning can be personalized to generate a more engaging and motivating experience.

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