

Students' Use of an LLM-powered Virtual Teaching Assistant for Recommending Educational Applications of Games

Mamta Shah^{1,2}[0000-0002-4932-2831] Maciej Pankiewicz¹[0000-0002-6945-0523] Ryan Baker¹[0000-0002-3051-3232] Jiahui Chi¹[0009-0009-3658-3635] Yue Xin³[0000-0002-6172-8316] Hetali Shah⁴[0009-0009-0279-7475] Dangelá Fonseca¹[0009-0007-4976-254X]

¹ University of Pennsylvania, Philadelphia PA 19104, USA

² Elsevier, Philadelphia PA 19103, USA

³ University of Maryland, College Park MD 20742, USA

⁴ Raritan Valley Community College, Branchburg NJ 08876, USA
m.shah@elsevier.com

Abstract. In this paper, we discuss the application of JeepyTA— a virtual teaching assistant (TA) powered by a large language model (LLM)- within a graduate-level course on games and learning in Spring 2024. Specifically, we describe how JeepyTA was integrated in two “play journal” assignments where twenty-two students documented their observations of playing classic and contemporary digital games, shared insights from assigned readings, and proposed educational applications of the respective games through consultation with JeepyTA. We (a) report students’ overall communication patterns with JeepyTA and (b) identify five ways in which students incorporated JeepyTA’s recommendations for Minecraft. We conclude this paper with directions for future research and practice on supporting students in using LLMs for reflecting on their experiences and creatively adapting games for learning.

Keywords: Virtual Teaching Assistant, Large Language Models, Games, Minecraft, Game-Based Learning

1 Introduction

Repurposing commercial entertainment games for education is not new [1, 2]. However, navigating the complex mechanics and vast environments of popular games (e.g., Legend of Zelda Breath of the Wild) can be overwhelming for educators who are new to the study and application of games for education. Researchers have proposed analytical and pedagogical frameworks for making game analysis and integration accessible to educators and customizable to their ecological conditions [3,4]. The genre of ‘Let’s Play’ videos on YouTube have expanded opportunities to learn about a game from novice and expert players [5]. Training teachers and disseminating educational curricula based on popular games has also become common both through community driven efforts (e.g., Common Sense Media) and through major companies recognizing the need for training teachers (e.g., Teach with Minecraft). We argue that the use of

large language models (LLMs) can advance these academic and socio-technical contributions by assisting students and educators in leveraging their knowledge of a particular game for educational use. This provided the impetus for the project described in this paper involving the application of JeepyTA in a course on games and learning.

2 Application of JeepyTA in EDUC5152 in Spring 2024

EDUC5152 Video Games and Virtual Worlds as Sites for Learning and Engagement introduces students to the interdisciplinary scholarship of game studies. Practices in gaming ecologies such as playing, making, and remixing digital and analog games inspire course activities and assignments [See 6 for a detailed description]. JeepyTA was developed at the Penn Center for Learning Analytics [7] to interact with students in conversations on a course discussion forum as one of the forum's users. To generate specific responses in each course, JeepyTA's available context is based on materials provided by an instructor such as course syllabus and examples of feedback from the past. It uses embeddings to store these materials and performs semantic search to generate a precise response. JeepyTA's responses are published with a short delay, to reflect the characteristics of a discussion forum (and allow for server latency).

JeepyTA was deployed in EDUC5152 using OpenAI's GPT-3.5 model (gpt-3.5-turbo-16k-0613) to (a) respond to students' questions about the course, (b) summarize discussion board posts for the instructor, and (c) serve as a discussion partner for two play journal assignments (A1 and A5). For A1, students chose two classic games, preferably released before 1980 (e.g., Donkey Kong, Frogger). For each game, they documented their play experience from first impressions to final thoughts. Almost identical requirements guided A5, the play journal involving Minecraft, except for different assigned readings [8-9 for A1 and 10-11 for A5], and an additional requirement of including how YouTube supported/enhanced their game play experience.

3 Instructions and Prompt for Consulting with JEEPYTA

Three former students (one from Spring 2020, and two from Spring 2023) volunteered to test the prompt for consulting with JeepyTA and provided feedback for modifying it. As a result, the following instructions and prompt were provided to the full class of Spring 2024 students for consulting with JeepyTA (See Fig. 1).

Below we present findings for the following research questions, "How did students consult with JeepyTA?" (RQ1) and "How did students incorporate JeepyTA's recommendations for repurposing Minecraft?" (RQ2).

Hello!
For A5, Dr. Shah has asked you to seek my; that is, JeepyTA's assistance in recommending educational applications of Minecraft. Follow the instructions and tips to engage in a 1:1 dialog with me.

You will need the following info ready from your journal:

- A description of the key elements (e.g., story, interface, gameplay, graphics, characters, music, art style, design, genre) affected/influenced/impacted your experience.
- Interesting details/anecdotes that you noticed while playing the game (e.g., character, discussion with a play partner) or learnt about through a secondary source (e.g., fan page, discussion board, YouTube).
- Connections between your play experience with insights gained from the readings (Ito, 2008; Malliet & de Meyer, 2005)

You will also need the following for your dialog with me:

- **Desired Educational Objectives:** A description of your specific educational objectives or areas of interest for how Minecraft can be used. For instance, you may highlight aspects like critical thinking, creativity, collaboration, or subject-specific learning you wish to address through Minecraft.
- **Desired Educational Application:** An articulation of the type of educational application you wish to explore using Minecraft. Let me know if you're interested in inquiry-based learning, narrative creation, skill development, or any other specific educational focus.
- **Begin with this multi-step prompt and use your judgment to insert relevant excerpts from your journal. Give me a few minutes between the steps. Use your time judgment to move to the next prompt.**

JeepyTA, please act like a coach. I will provide you with excerpts from my Minecraft play journal and directions for how I wish to explore the application of Minecraft in education. I would appreciate your suggestions.

- **First, please familiarize with the key elements that influenced my experience.** <insert text from your journal>
- **Now, learn about an interesting detail/anecdote that I noticed/documentated while playing the game.** <insert text>
- **Let me share the connections I made between my experience playing and the readings assigned by [your instructor].** <insert text>
- **I would like to explore the use of Minecraft for fostering** <insert texts related to desired educational objectives and application>
- **JeepyTA, please remember the context I have provided you thus far and provide your suggestions for implementing Minecraft in education.**

Once you arrive at this step, let's engage in a 1:1 dialog. Former students of this class have found it useful to ask follow-up questions and offer clarification until they've reached a point of satisfaction with the outcome. Make sure you use insights from our dialog to recommend (in 500 words) what knowledge, skill(s) or attitude(s) can a particular audience/user learn/practice using Minecraft (as a whole or one of the key elements) in a formal or informal setting? Include that in your journal before you hit submit on Canvas!

Fig. 1. Instructions and prompts provided to the students for consulting with JeepyTA

4 Findings

4.1 Findings for RQ1

A1 required the students to seek JeepyTA's guidance on applying two classic games in education. For the first game, 54.5% (12/22) students followed the prompt and 50% (11/22) of students asked follow-up questions. For the second game, 50% (10/22) students followed the prompt and 45% (9/20) students asked follow-up questions. A5 required students to seek JeepyTA's guidance on applying Minecraft in education. 40.9% (9/22) students followed the prompt and 54.5% (12/22) students asked follow-up questions. 13.6% (3/22) students followed the prompt only for A1 and 9.1% (2/22) followed the prompt only for A5. 27.5% (6/22) students followed the prompt and 31.8% (7/22) did not follow the prompt for both assignments. Of the students who did not follow the prompt, some students omitted a portion of the prompt, while other students chose to modify the prompt. Example of a modification includes: "Hi JeepyTA, have you heard of the game, The Legend of Zelda?. Can you recommend an educational use for this game? What knowledge, skill(s) or attitude(s) can a particular audience/user learn/practice using this game.." For both A1 and A5, elaboration was the most frequently used question type for follow-ups with JeepyTA (e.g., "Can you expand on the first point that you made? Write a more fleshed-out detailed lesson plan on how you think that sort of thing would work"). Other question types included feedback, summary and clarification.

4.2 Findings for RQ2

We identified five patterns in students' play journals for A5 that illustrate how they acknowledged, integrated, rejected or built upon JeepyTA's recommendations for using Minecraft for education.

Thirty-six percent students (8/22) found JeepyTA's recommendation insightful and/or in alignment with their own idea(s). These students intentionally sought JeepyTA's guidance to brainstorm Minecraft's application in a specific domain. Their journals also suggested that students took a collaborative approach with JeepyTA to recommend implementation strategies. For instance, "My passion for math inspired me to ask JeepyTA to recommend how one can use Minecraft as a resource for students to build their knowledge base...I must align all Minecraft activities with the learning objectives and math standards to properly reach the learning goals. To do this, I can integrate explicit math instruction and game-based activities to help students make connections between the game and mathematics. Here are the following implementation strategies that JeepyTA recommends..."

Eighteen percent students (4/22) acknowledged the role of 1:1 communication with JeepyTA in their recommendations. In these journals, students embraced a cooperative stance. They demonstrated some level of personalization but refrained from commenting about whether JeepyTA's guidance was helpful/not helpful. For instance, "After consulting JeepyTA, I have gained insights into two possible educational adaptations for Minecraft. First, to foster creative thinking with Minecraft, teachers could formulate a class for students to create their virtual worlds or build structures in Minecraft that encourage them to use their imaginations...Plus, with the abundance of online MODs for Minecraft, students may also be asked to create their MODs featuring adventures in Minecraft by engaging in creative-writing or storytelling to strengthen and practice their creativity."

Eighteen percent students (4/22) referred to JeepyTA but seemed detached or did not express ownership of the idea(s) proposed. Phrases such as 'All above info provided by JeepyTA', 'JeepyTA provided some educational use for this game' and 'Educational Use for Minecraft Recommended by JeepyTA' were used in their journals. In this category, students' proposals for applying Minecraft were mostly generic and copy-pasted from the interaction logs without much modification. For instance: "Problem-solving and Critical Thinking: In the vast, open-world environment of Minecraft, players are required to engage in continuous decision-making. From gathering resources to building structures, the game compels players to think critically and solve problems creatively..." This aspect of gameplay nurtures an analytical mindset, encouraging players to assess situations, anticipate outcomes, and devise innovative solutions."

Eighteen percent students (4/22) made no reference to JeepyTA in their journal. These students foregrounded their knowledge/experiences of the game and insights from the readings in describing their proposal. The following is an illustration: "Minecraft offers a unique environment for students interested in interior design, mirroring the challenges faced by professionals like those at IKEA...Through connected gaming, students not only learn about design but also become creators of

their virtual spaces, actively applying and reflecting on the design principles they learn, which deepens their engagement and understanding of interior design concepts (Kafai, 2017). Educators can introduce concepts of modern design, such as minimalism or sustainability, and ask students to incorporate these ideas into their Minecraft projects.” The only way to know if JeepyTA contributed to the recommendations was to refer to the interaction logs.

Thirteen percent students (3/22) were critical of JeepyTA's recommendations. These students described JeepyTA's proposed idea, critiqued it, and offered an alternative or built upon it in their journals. For instance, “JeepyTA's suggestions also include the idea of incorporating storytelling in Minecraft. Storyline is something that I think Minecraft missed in its design. But a completely blank storyline gives students the opportunity to write their own story. What I think about this idea is that students can brainstorm a storyline, build different scenes in Minecraft, and tell their own story.”

5 Discussion, Conclusions, and Implications

The use of LLMs for game-based learning is gaining traction [12]. In this paper, we illustrated the application of an LLM-based teaching assistant in a course on games and learning. Specifically, we reported findings for students' use of JeepyTA as part of two play journal assignments to recommend educational applications of classic and contemporary games.

Interaction logs examined in RQ1 illustrated that students are not likely to exactly follow the recommended prompt, omitting portions or modifying the prompt. Students' follow-up questions (i.e., elaboration, clarification, summary, feedback) were reflective of three types of intentions that guide users in human-AI collaborative conversations: describing information need, understanding received information, and maintaining conversation [13]. In this study, no feedback was provided to students between A1 and A5 to observe naturally occurring shifts in student-JeepyTA communication patterns. In future courses, we may consider providing feedback between the play journal assignments and assess its impact on student-JeepyTA interactions. We may also introduce in-class activities where students can practice questioning and messaging JeepyTA using the categories and examples provided by Wei and colleagues [13]. This may benefit both students that prefer the structure of a pre-written prompt and those who prefer freedom to lead their communication with the virtual TA.

Across the five patterns described for answering RQ2, students' recommendations of applying Minecraft were most novel when they were intentional about integrating insights from readings, experience of the game and/or their domain expertise. This corroborates with reports of when teachers and students have used their deep knowledge of a game along with their understanding of instructional goals for a targeted user group to innovatively repurpose games such as RollerCoasterTycoon3 and Animal Crossing New Horizons [e.g., 14]. Future studies warrant a deeper examination of these patterns using approaches such as thematic analysis [15].

Findings from RQ2 also illustrate that student-JeepyTA interaction resulted in a variety of potential educational applications for Minecraft. Specifically, sixty-eight

percent students proposed more than one educational application for Minecraft in their play journals for A5. This finding is promising in relation to the intent of our study; that is, to examine the use of LLMs for assisting individuals (students and educators alike) in leveraging their knowledge of a particular game for educational use. As next steps, we will examine similarities and differences in the number and the kinds of educational applications students of Spring 2024 proposed for Minecraft as compared to students from previous cohorts of EDUC5152.

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