

# The Role of Students' Help-seeking Profiles in the AI-assisted Game-based Learning

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**Abstract:** This study aims to investigate the impact of students' help-seeking profiles on their seeking help from AI in a digital game-based learning environment. The study involved 102 middle school students who played online game and sought help from ChatGPT while solving physics problems. The results revealed that students' help-seeking profiles such as instrumental help-seeking were related to their help-seeking behavior in the game. The findings highlight the importance of considering individual differences, such as help-seeking profiles in designing AI-assisted learning environments to better support students' learning and help-seeking behavior.

**Keywords:** Help-seeking, AI, game-based learning, ChatGPT

## 1. Introduction

Digital game-based learning (DGBL) has gained popularity in recent years as a way to engage students in learning activities. With the advent of Artificial Intelligence (AI), DGBL has become more sophisticated, providing personalized learning experiences that cater to individual learners' needs. One important aspect of learning through DGBL is the role of help-seeking, which can greatly enhance students' learning experiences. Help-seeking is a critical process that enables learners to overcome challenges and achieve their learning goals. The concept of help-seeking has been extensively explored to date in the classroom setting or online learning environment, there remains a paucity of evidence on its impact in DGBL.

DGBL provides a unique environment for help-seeking, as there are a myriad of help sources and channels that can be different from those in traditional classroom settings or online learning. In a DGBL environment, learners may have access to various forms of help, such as in-game tutorials, hints, and feedback, as well as external resources like chatbots or intelligent agents. For instance, it was found that students with efficient help-seeking strategies were highly interactive with virtual characters and posters in DGBL (Xu et al., 2022). While students in traditional classrooms tend to seek informal help predominantly from their peers (Karabenick & Knapp, 1991), those engaged in DGBL exhibit varying preferences (Jimenez et al., 2014). The objective of this study was to investigate the underlying factors that drive GBL learners to seek assistance from AI, considering learners' approach to seeking help, including their attitudes, tendencies, and objectives. The results of this research could enhance our comprehension of GBL learners' AI help-seeking behaviors and suggest ways to promote the use of AI for seeking help in GBL environments.

## 2. Literature review

Help seeking is a critical component of effective learning and has been studied in the traditional classroom setting and online learning such as MOOC, Blackboard, or Forum (Kizilcec et al., 2017; Koc & Liu, 2016). Research on help seeking within digital game-based learning is still in its early stages of development. The environment of digital game-based

learning offers a distinctive opportunity for seeking assistance, as it presents a diverse range of help sources and channels that may not be present in traditional classroom or online learning settings. Therefore, it is valuable to investigate help-seeking in the context of digital game-based learning. In light of the existing research gaps in this field, the purpose of this study was to explore the connection between students' help-seeking profiles and their behaviors when seeking help in the context of digital game-based learning.

### **3. Method**

#### **3.1 Participants**

A total of 102 7th grade students (49 females and 53 males) in two different middle schools took part in this study. The students were recruited from 6 classes, and showed no statistically significant difference in their previous experience in using games to learn content knowledge.

#### **3.2 AI-assisted game-based learning**

A digital game-based learning platform called *Summon of Magicrystal* designed to teach physics concepts was used. In the game, students take on the role of legendary warriors fighting against a dragon invasion. *Summon of Magicrystal* is also AI-assisted in that it incorporates machine learning algorithms that adapt to individual student needs. It uses ChatGPT, a state-of-the-art language processing algorithm, to provide real-time feedback and assistance during gameplay.

#### **3.3 Instruments**

To measure students' help-seeking profiles, a 13-item questionnaire was adapted from Karabenick (2003). The measurement included four subscales: help-seeking threat, avoidance of help seeking, instrumental help-seeking goal, and formal versus informal help seeking. The questionnaire was modified to refer to the AI-help instead of the class, and students rated their agreement on a 5-point scale. In addition to students' help-seeking profiles, game performance and ChatGPT behaviors were also retrieved from the system. Game performance included game score, gameplay time, and attempts. The game score refers to the points the player gains based on their performance in the game. Game points or score is accumulated by successfully completing levels, with advanced levels with higher point reward compared to basic levels. Gameplay time refers to the amount of time a player spends in playing the game. Attempts refers to the number of times a player tries to complete the game. ChatGPT behaviors included the numbers of questions asked and the time spent on the ChatGPT forum.

### **4. Results**

Before discussing the relationships among the help-seeking profiles, we observed that the help-seeking profiles could be a little bit different from those in similar studies (e.g., Pajares, Cheong, & Oberman, 2004; Ryan & Pintrich, 1997). Even though in general, students' threat and avoidance help-seeking tendencies were lower than the middle point of the scale as the literature indicated, the mean of threat and avoidance help-seeking were 2.36 and 2.30 on a 5-point scale. In other words, they were not very reluctant to seek help compared to the students in other studies where the mean threat and avoidance scores 2.25 on a 8-point scale (Pajares et al, 2004) or 1.44 on a 5-point scale (Huang & Law, 2022). Their instrumental help-seeking was also stronger. These tendencies might be due to the fact that they were in a DGBL environment as students might not think too much about learning, but focus on playing the games. Our results showed that threats and avoidance are positively related. Students who viewed help-seeking as a threat also avoided help-seeking. One

interesting finding is that threats and avoidance are positively correlated to instrumental help-seeking instead of negatively correlated as found in previous studies (e.g., Pajares et al., 2004; Ryan & Pintrich, 1997). This difference may be due to the nature of instrumental help that students would ask AI for help. In other words, asking AI for help probably is interpreted differently than asking people (either teachers or peers) for help. In addition, our study results found that formal/informal help-seeking is positively correlated with instrumental help-seeking. This misalignment can be due to the definition of the constructs.

## 5. Discussion and conclusions

This study attempts to examine the relationship between students' help-seeking profiles and their involvements in seeking help from AI in the context of digital game-based learning environment. Future research can explore students' self-efficacy regarding their impact on seeking help from AI, and their potential moderating role in the relationship between help-seeking profiles and behaviors. The results of the study help advances our understanding of help seeking from AI as an informal source of help that has a positive impact in digital game-based learning.

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