"Help RobAI Fix Its System Bug": An Escape Game Assisting Teaching AI Literacy

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Abstract. Games in learning enhance student engagement and autonomy, while immersive learning fosters focused, distraction-free experiences. Educational escape rooms support collaborative, student-centered learning. With Generative AI (GenAI) increasingly integrated into higher education, a thoughtful approach is essential to ensure ethical, creative, and critical use. This study explored AI literacy through digital game-based learning (DGBL), using ChatGPT exercises and a digital escape game to improve student awareness of its capabilities and limitations. Conducted in Lisbon (N = 13) and Warsaw (N = 13) from November 2024 to January 2025, the study employed Genially software to develop six exercises and a linear escape game. Students engaged in interactive tasks to critically assess ChatGPT's functions, recognizing issues such as misinformation and the importance of precise prompts. The escape game, designed as a mission to fix the robot RobAI, reinforced independent learning. Findings highlight the potential of DGBL in fostering meaningful AI education.

Keywords: AI literacy · Artificial intelligence · Escape game · Immersive learning · İnformation literacy · Polish students · Portuguese students

1 Introduction and Aim of the Study

Nowadays, Generative AI (GenAI) has entered higher education, and it is essential to seek a collective approach for its integration of teaching and learning. As mentioned internationally, this technology can increase efficiency and expand education and information accessibility in several ways, but it is far from a neutral tool [1]. Therefore, it is important to face the challenges of training educators and students, facilitating meaningful and authentic learning experiences, and ensuring human supervision, which guarantees consideration, ethics, creativity, critical thinking and empathy.

Games in learning encourage students to be more engaged and more autonomous in their learning process. Immersive learning allows students to focus entirely on a topic

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or activity, free from distractions. Educational escape rooms are increasingly used as collaborative and interactive learning experiences, where participants solve puzzles and embrace a sense of autonomy, fostering a transition to student-centered and self-directed learning [2].

This study aimed to explore how digital game-based learning (DGBL) strategies, including a digital escape game and ChatGPT-based exercises, can support the development of AI literacy in higher education contexts. Specifically, it aimed to investigate how these activities foster critical awareness of the capabilities and limitations of generative AI among students.

2 Generative Artificial Intelligence and AI Literacy

Artificial Intelligence (AI) integration in higher education introduces significant challenges, including the risk of misinformation, biases embedded in algorithmic decision-making, and concerns about intellectual autonomy. While AI can enhance learning experiences through personalized educational pathways and data-driven insights, its use must be critically examined. The presence of human oversight remains essential in mitigating biases and ensuring that AI tools align with pedagogical objectives rather than replacing fundamental cognitive and analytical skills [3]. Thus, AI literacy must include the capacity to assess AI-generated content critically, recognize its limitations, and apply human judgment in interpreting its outputs.

AI literacy extends beyond technical proficiency to encompass ethical considerations, critical thinking, and the responsible use of AI-driven tools, particularly within the academic environment [4]. Integrating tools like ChatGPT into the higher education environment represents a significant opportunity to enhance student learning and support. However, this integration must be approached with caution, considering potential ethical challenges and the need for robust policies against misuse [5]. Information professionals play a crucial role in this process, helping to develop curricula and content that foster skills and working closely with educators to ensure these technologies are used effectively and ethically. Librarians and information professionals, in general, have the function of identifying fundamental ideas in the field of knowledge and facilitating student learning with several tools, and ChatGPT is no exception [6–10]. However, with all their functions regarding academic support to find sources of information, select information, and work on it, librarians may feel their role is threatened since ChatGPT is a strong competitor in these matters [11].

Moreover, the ethical dimensions of AI in education cannot be overlooked. Issues such as data privacy, academic honesty, and the transparency of AI-driven recommendations require explicit consideration. As AI tools proliferate, academic institutions must implement robust policies to safeguard ethical standards while fostering innovation. The "Living Guidelines on the Responsible Use of Generative AI in Research" [12] further emphasizes the importance of maintaining research integrity while leveraging the advantages of AI, such as increased efficiency and accelerated discovery.

Sabzalieva & Valentini [13] advocate an enlightened use of generative artificial intelligence, arguing that it is necessary to know the models to make appropriate use of them, in supporting the academic work of teachers and students. And this is only possible with

critical involvement, which goes beyond a superficial or inaccurate passive acceptance of this tool. Some library institutions have already spoken out on AI, as the profession learns more about how to make use of it and support users to interact productively and safely with it. CILIP [14] issued several recommendations, highlighting the important role of libraries in promoting artificial intelligence literacy and the relevance placed on values and ethics for this new context. The Association of Research Libraries [15] has developed guidelines to help research libraries integrate AI, emphasizing the importance of ethical considerations in this technology's use.

3 Gamification in Modern Library Learning: Engagement and Innovation

The reviewed literature emphasizes the potential of gamification and escape rooms as tools for modernizing education and enhancing user engagement. Crucial to their effectiveness is the meticulous design that considers educational objectives, the needs of the target group, and an appropriate balance between entertainment and learning. Furthermore, ongoing research is essential to gain a deeper understanding of these methods' effectiveness and to identify best practices. Gamification, which incorporates game design elements into non-game contexts, has emerged as a promising strategy for libraries to enhance engagement by making learning both enjoyable and intrinsically motivating while seamlessly embedding educational content [16].

Several authors, such as Kwong, Falzon, and Feighery [17], explored the use of escape rooms in libraries as a means to engage students with course material in Information Literacy and promote teamwork. The researchers employed Breakout EDU kits to design games that require students to apply Information Literacy skills to solve puzzles. Kroski [18] described the development of an Alexander Hamilton-themed escape room designed to leverage history and library collections. The primary objective was to highlight library resources related to this historical figure. Also, Maršálek, Trčková, and Václavíková [19] presented a chemistry-themed escape game that forms part of a year-long virtual educational game hosted on the Moodle e-learning platform. The game covers high school-level chemistry topics and consists of ten escape rooms, each functioning as a standalone unit connected through an overarching narrative. Its primary aim is to provide a distance-learning tool that can be utilized during prolonged student absences. The game incorporates practical tasks based on Inquiry-Based Science Education (IBSE), encouraging students to ask questions, formulate hypotheses, design experiments, and analyze data. Additionally, Guo and Goh [20] describe the design process of the educational game *Library Escape*, aimed at developing Information Literacy (IL) skills among students. The game incorporates elements from popular genres, such as role-playing adventure games, to enhance player engagement and participation. The storyline centers on the main character, Tom, who becomes trapped in a library and can only escape by correctly solving IL-related puzzles. The game is structured into six missions, aligned with the Information Seeking Process (ISP) model.

4 The Use of AI During Studies – A Comparative Exploratory Study Among Polish and Portuguese Students

This study aimed to combine teaching AI literacy with the concept of digital game-based learning (DGBL), more precisely, digital escape games. Our exploratory, qualitative study consisted of two parts: 1) exercises utilising ChatGPT and 2) a digital escape game to enhance students' awareness of ChatGPT's performance. As the literature review explained, interactive learning modules can potentially convert traditional instruction into highly engaging experiences [16]. The respondents were students in Lisbon (N = 13) and in Warsaw (N = 13). The study was run from November 2024 to January 2025.

The Portuguese sample consisted of students enrolled in a Master's program in School Libraries, offered by a public higher education institution. The majority of participants are practicing teacher-librarians with professional experience in school settings. Their age ranged from 26 to 42 years, representing a group of early to mid-career adults, which may imply varying levels of professional experience and academic maturity. The Polish sample consisted of students enrolled in the Architecture of Information Spaces BA program offered by the University of Warsaw. Their age ranged from 19 to 23; they had little or no professional experience.

4.1 Creating the ChatGPT Exercises and the Escape Game

According to Kim et al. [2], designing an escape room activity typically requires more time and effort than other activities, which is a key reason educators are reluctant to implement it. We used software with ready-to-use templates to develop six exercises and a digital, linear escape game.

For the visual part of the study, a tool called Genially was used. It is a web-based platform that enables users to create interactive, engaging content quickly and easily. It offers an extensive library of customizable templates, allowing the design of diverse professional materials such as presentations, infographics, quizzes, and games. In the study, we used the pre-made templates to create two parts of the task: a quiz requiring participants to perform six exercises using ChatGPT, as well as an escape game with GenAI-related puzzles. The quiz requires participants to provide GPT-generated answers to all of the questions, as well as rate the performance of the Chat in each exercise. The escape game can be accessed only after completing the quiz. It consists of three missions, each including three puzzles. The goal is to acquire a three-digit code that will help a friendly robot called RobAI fix a bug in his system. After completing each mission, the user receives a digit. Once all the missions are finished, the player enters the three digits obtained as the code, which fixes the bug in RobAI, who thanks the user for their help.

4.1.1 Exercises with ChatGPT

The exercises aimed to show the students how to use ChatGPT critically and when this tool can be useful for academic purposes. This part enabled students to reflect on the experience. Thoughtfully crafted reflection activities offer numerous benefits for student learning. For instance, they encourage students to deeply consider their learning experiences and help them stay aware of what they are doing and experiencing [21]. The

exercises with ChatGPT, as presented in Table 1, concern various uses of this tool in an academic context.

Table 1. ChatGPT Exercises

Exercise no.	Content of the exercise
Ex. 1.	Ask ChatGPT to define the concept of information literacy in English and to provide two scholarly articles on the topic
Ex. 2.	Ask ChatGPT for information about the course instructor, with the response being around 120 words long
Ex. 3.	Instruct ChatGPT to write a short introduction on the topic of enhancing creativity, critically evaluate this piece in terms of academic writing standards, and identify missing elements
Ex. 4.	Shorten a text and translate it into Polish/Portuguese
Ex. 5.	Ask ChatGPT to write a summary of a text in English (up to 140 words) and provide three keywords
Ex. 6.	Ask ChatGPT to convert a bibliography prepared in Chicago style into APA style

Thus, these tasks are designed to familiarize users with ChatGPT's capabilities in information retrieval, text creation, translation, summarization, and bibliography formatting in an academic context, followed by a critical evaluation of ChatGPT's output.

4.1.2 Tasks for the Escape Game

The escape game is conceptualized as fixing the robot named RobAI within three missions. These missions aim to independently learn about more aspects of ChatGPT usage, different from those suggested in the first stage. This part, inspired by the DGBL, included explorations, challenges, and failures.

The first mission focuses on understanding what influences ChatGPT's responses and how it can support academic tasks, with special attention to the issue of plagiarism. The tasks in this mission involve distinguishing which elements of prompts and questions affect ChatGPT's answers and which do not, in what aspects of academic writing ChatGPT can be helpful and cannot, and what is considered plagiarism versus what is acceptable in scholarly work.

The second mission concentrates on evaluating the truthfulness of various statements about generative artificial intelligence. The tasks involve choosing whether statements are correct or incorrect concerning modifying prompts, the safety of sharing private information, teachers' knowledge about AI, the impact of overreliance on AI on skill development, the university's responsibility regarding AI use, AI's limitations, its ability to draw conclusions, understand word meanings, consider cultural context, and the accuracy of generated information.

The third mission involves determining which statements about ChatGPT's capabilities and limitations are true and which are false. The tasks address its ability to process

languages, access the internet, remember previous conversations, make ethical decisions, generate images, access personal data, perform complex calculations, understand emotions, execute code, and create creative content. For completing each mission, the participant receives a number needed for the final code. Sample screenshots from the escape game are presented in Fig. 1.

Fig. 1. Selected screenshots from the escape game.

4.2 Analysis of the ChatGPT Performance According to the Respondents' Opinions

The overall sentiment towards ChatGPT's performance in the given exercises appears to differ between the Polish and Portuguese students. Polish students expressed a more nuanced view, acknowledging the benefits for certain tasks but strongly emphasizing the need for critical verification due to potential inaccuracies. The overall tone suggests a mix of neutral to cautiously positive experiences with a strong caution regarding reliability. Portuguese students show a higher percentage of positive ratings, but also a significant percentage of negative ratings. This suggests a more polarized view, with some exercises being perceived very favorably and others quite unfavorably. Figures 2 and 3 present the detailed evaluations of each exercise, as described in Table 1.

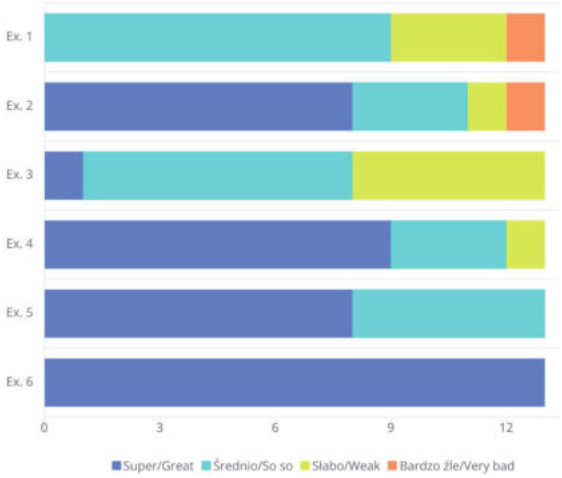

Fig. 2. Polish Students' valuations of each of the ChatGPT exercises

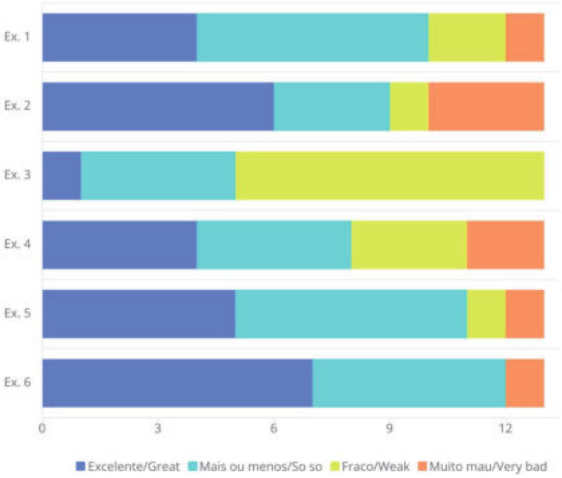

Fig. 3. Portuguese students' evaluations of each of the ChatGPT exercises

4.3 Analysis of the Respondents' Comments

Both Polish and Portuguese respondents acknowledged ChatGPT's usefulness for specific, task-oriented applications in academic settings. These include translating texts, summarizing large volumes of information, formatting bibliographies, generating abstracts, and producing introductory content or keywords. In both groups, students noted that the tool could assist in note-taking and support the educational process, with some having prior experience using ChatGPT academically, while others encountered it for the first time. Respondents consistently emphasized that the effectiveness of ChatGPT is closely tied to the clarity and precision of the user's input, and many recognized its potential as a supplemental aid in academic writing and teaching.

Despite the overall positive outlook, significant concerns were raised, particularly regarding the accuracy and reliability of ChatGPT's output. Polish and Portuguese students alike warned about the tool's tendency to fabricate sources, provide inaccurate bibliographic entries, or generate content that lacks academic rigor. Both groups stressed the importance of critically verifying generated information and highlighted the risk of so-called "hallucinations," where the tool produces plausible-sounding but false data. Portuguese users noted the impersonal and automated tone of some responses, while Polish students were especially vocal about the dangers of relying on AI-generated content without proper oversight. Across the board, the shared sentiment was clear: while ChatGPT can be a valuable academic support tool, its outputs must always be approached with critical thinking and human judgment.

5 Discussion and Conclusions

This study demonstrated the potential of combining digital game-based learning (DGBL) with AI literacy education to create engaging and reflective learning environments. The use of an escape game scenario alongside structured ChatGPT exercises enabled students to actively explore the strengths and weaknesses of generative AI tools in an academic context. Both Polish and Portuguese students recognized ChatGPT's utility in tasks such as summarizing, translating, and formatting bibliographies. However, their feedback also revealed shared concerns, particularly about the credibility of AI-generated content and the risk of fabricated information. The escape game effectively reinforced concepts related to prompt precision, ethical considerations, and the necessity of critical thinking when engaging with AI. The varied reactions between the two student groups also underscore the importance of cultural and pedagogical context when implementing AI literacy tools.

The study's findings align with broader calls in the literature for responsible, critically engaged approaches to AI in higher education (see, for example, [22]). As AI continues to evolve, so too must educational strategies. The insights gathered here suggest that immersive, interactive formats, such as escape games, not only support active learning but also encourage critical evaluation of technology. Educators and librarians play a vital role in facilitating this process, helping students navigate the complexities of AI while promoting ethical and informed usage. Future research should investigate the long-term impacts of such interventions and explore how similar models can be adapted across disciplines and diverse learning environments. Ultimately, cultivating AI literacy through innovative, student-centered methods can empower learners to use AI tools thoughtfully, creatively, and responsibly.

This study highlights the promise of integrating digital game-based learning (DGBL) with AI literacy education to foster engaging, reflective, and critically informed learning environments. By combining structured ChatGPT exercises with a digital escape room game, students were able to actively explore both the capabilities and limitations of generative artificial intelligence (GenAI) within an academic context. Participants—Polish and Portuguese students alike—found ChatGPT helpful for specific tasks such as translating, summarizing, generating abstracts, and formatting bibliographies. Yet, a consistent and important theme across responses was the need for critical verification

of AI-generated content. Students expressed concerns about inaccuracies, fabricated sources, and "hallucinated" information, emphasizing that AI literacy must include the ability to critically assess outputs and apply human judgment.

The escape game component proved particularly effective in reinforcing key concepts, including prompt precision, ethical use, and the role of human oversight. While reactions varied slightly across cultural and educational contexts, the shared insights underline the importance of designing AI literacy activities that are interactive, immersive, and context-sensitive. As GenAI becomes increasingly embedded in educational practices, thoughtful integration is essential. While these tools offer efficiency and broaden access to information, over-reliance could undermine the development of core academic skills such as critical thinking and scholarly writing.

Therefore, pedagogical strategies must not only introduce students to AI tools but also cultivate their analytical and evaluative capacities. Initiatives such as APA's guidelines on documenting ChatGPT use represent an important move toward transparency and responsible AI use in academia. Future research should investigate the long-term impacts of such educational interventions and contribute to the development of clear guidelines and best practices for AI integration across disciplines. Continuous adaptation to technological advancements will be key to maximizing the benefits of GenAI while minimizing its risks and ensuring that students are empowered to use these tools creatively, ethically, and effectively.

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