

H5P + AI: A Powerful Combination for Engaging Learning in Open, Distance, and Digital Education

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Abstract

In this paper, we investigate the potential of integrating artificial intelligence (AI) with the HyperText Mark-Up Language (HTML) 5 Package or H5P open-source content creation tool to address the challenge of disengagement and low comprehension in traditional higher education lectures. The purpose of this study is to examine how the synergy between H5P and AI can be harnessed to create more engaging and personalised learning experiences. The problem statement focuses on the need for innovative educational tools that can adapt to diverse learning styles and improve student engagement and outcomes. The key research questions addressed are: (1) How can AI be effectively integrated with H5P to improve interactivity and engagement in higher education? (2) What are the specific benefits and challenges associated with using AI-enhanced H5P content in higher education settings? (3) How do students perceive and respond to AI-powered H5P content compared to traditional learning methods? Through a mixed-methods pilot study, we aim to answer if AI-powered H5P activities (e.g., adaptive branching, personalised feedback) can outperform traditional methods in terms of student engagement and learning outcomes. This research delves into the underexplored territory of AI-H5P integration for education, proposing a novel approach to create personalised and engaging learning experiences. This innovative approach has demonstrated compelling findings, including significant improvements in student engagement, retention, and academic performance. Interactiveness is also rated highly with 69% students strongly agree that graphics and illustrations of H5P materials are interactive. Students reported higher satisfaction with 96% of respondents either satisfied or very satisfied with AI-powered H5P content, highlighting the potential for AI to transform educational experiences. This research can inform future H5P functionalities by highlighting areas where AI integration can be most beneficial. Furthermore, it lays the groundwork for exploring AI-powered H5P's effectiveness across different disciplines and contexts, while prompting future research to consider the ethical implications of AI in ODDE or open, distance, and digital education setting.

1. Introduction

Open University Malaysia (OUM) is the pioneer of the open and distance learning (ODL) university in Malaysia. This private university has 35 learning centres throughout Malaysia with 55 programmes offered and 103,000 graduates. Students are able to learn through face-to-face tutorial, online forums, self-managed study, and fully online learning. Students of OUM are provided with learning materials for their studies, comprises modules, study guides, learning kit, video lectures, and others.

The first stable version of HyperText Mark-Up Language (HTML) 5 Package (H5P) for Moodle was released on 14 March 2017 and a year later, thousands of organisations including universities and schools joined the bandwagon of H5P websites for students [1]. Artificial intelligence (AI) on the other hand had a much longer history but this educational technology grew in leaps in bounds after the introduction of ChatGPT in late November 2022 [2] during the coronavirus disease 2019 (COVID-19) pandemic. OUM started with producing printed modules, followed by PDF modules (see Figure 1). Then, since 2022, a prototype of H5P module had been introduced and available to be assessed by students and tutors since 2023 (see Figure 2). We can the difference whereby the H5P version of module is more representable and engaging, as well as interactive.

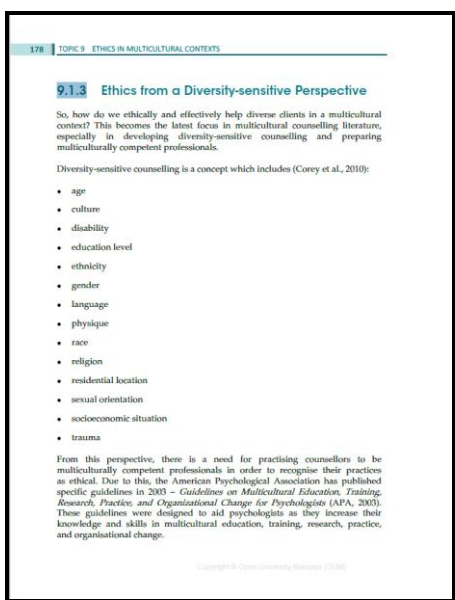


Fig. 1 PDF module



Fig. 2 H5P module

This paper will explore the possibility of addressing the issue of low comprehension and disengagement in traditional higher education lectures by implementing open, distance, and digital education setting (ODDE), followed by integrating AI with H5P, an open-source content creation tool.

1.1 Objective

This study aims to investigate how learning experiences can be made more individualised and engaging by utilising the synergy between H5P and AI. Specifically, as the research was conducted at OUM, the study is limited to an ODDE setting.

1.2 Problem Statement

The problem statement focuses on the need for innovative educational tools that can adapt to diverse learning styles and improve student engagement and outcomes. The key research questions addressed are: (1) How can AI be effectively integrated with H5P to improve interactivity and engagement in higher education? (2) What are the specific benefits and challenges associated with using AI-enhanced H5P content in higher education settings? (3) How do students perceive and respond to AI-powered H5P content compared to traditional learning methods?

2. Methodology

Through a mixed-methods pilot study, we aim to answer if AI-powered H5P activities (e.g., adaptive branching, personalised feedback) can outperform traditional methods in terms of student engagement and learning outcomes. This method comprised survey questionnaire with 182 respondents consisting of OUM learners, and interviews with instructional designers and programmers. The survey questions consist of 15 items with 11 close ended questions, one open ended question and two items combining both closed and open-ended questions. The study will focus on two questions: a close ended question "The graphics/illustration were interactive in enhancing the learning experience" and an open ended question asking whether the learning material is engaging and giving examples. This research delves into the underexplored territory of AI-H5P integration for education, proposing a novel approach to create personalised and engaging learning experiences.

3. Findings

The following are several findings from the pilot study conducted:

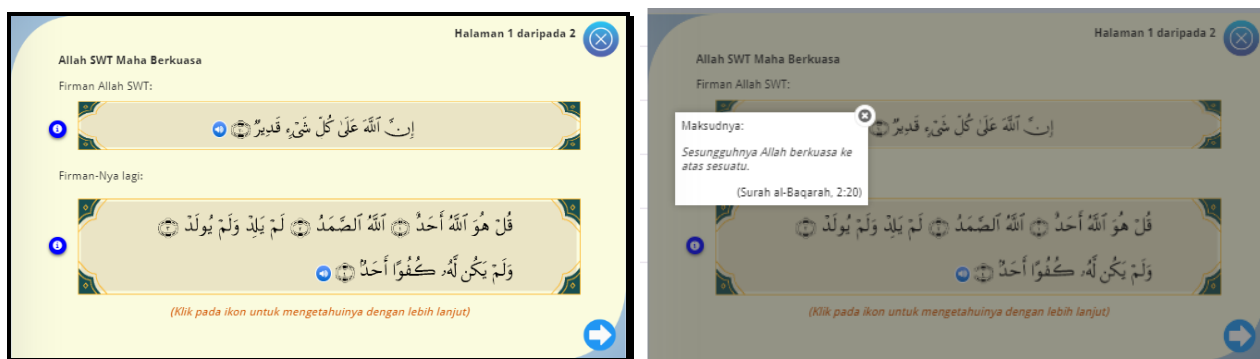
3.1 Effective Integration of AI with H5P to Improve Interactivity and Engagement

In terms of interactivity of the graphics and illustrations of H5P learning materials, 69% strongly agreed with the statement and another 29% agreed with it. AI can enhance H5P learning materials by enabling adaptive learning paths, interactive assessments, and natural language processing [3], [4]. Additionally, AI can analyse student progress and performance to personalise content, generate dynamic quizzes and simulations [5], [6], [7] and incorporate chatbots and virtual tutors to provide immediate feedback and explanations [8], [9]. These methods ensure personalised learning experiences for each learner. Overall learners were either very satisfied (67%) or satisfied (29%) with the AI and H5P learning materials.

3.2 Benefits and Challenges of Integrating AI-enhanced H5P Content

In terms of benefits, the clear benefit according to [10] is in terms of providing personalisation as AI can tailor content to individual learning styles and preferences, enhancing the overall learning experience. AI can also provide lecturers with real-time analytics on student engagement and performance, enabling timely interventions and support [11]. However, the main barrier or challenge is in integrating the significant technical expertise and resources required.

Figure 3 shows the H5P implemented with AI of audio of recital al-Qur'an verses. When students click the speaker button, a voice pre-recorded audio will play the embedded al-Quran verse on demand. Thus, students are able to hear the recital as well as read the Qur'an at the same time. For the meaning of the Qur'an verse, student could click the information icon.



(a)

(b)

Fig. 3 H5P implemented with AI (a) al-Qur'an verses and (b) translated al-Qur'an verses

As for Figure 4 is an example of H5P integrated with AI video. Avatar of Krikey AI animate was used to use the function of audio video.

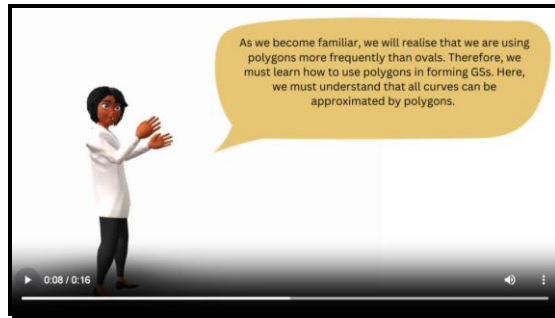


Fig. 4 H5P implemented with AI using avatar

Table 1 lists among the benefits and challenges of implementing H5P with AI-powered content as collected from the interviews and open-ended questions in the surveys. Integrating H5P with AI can significantly enhance educational practices but requires careful consideration of the associated challenges to ensure a successful and equitable implementation.

Table 1 Benefits and challenges of implementing H5P with AI-powered content

Benefits	Challenges
<ul style="list-style-type: none"> • Enhanced interactivity • Engaging • Personalised learning • Enhanced accessibility 	<ul style="list-style-type: none"> • Technical complexity • Data security and privacy • Costly • Training and support

Generally, learners praised the H5P for enhancing interactivity and providing an engaging mode of learning. Among the engaging features include the video and animation, especially generated by AI. A number suggested the inclusion of gamification. Besides enhanced interactivity, learners found the learning materials as very accessible through multiple devices and commended the initiative as user-friendly. From the institution perspective, the staff discussed more on technical complexity, emphasizing issues on the high cost of maintenance, and acquiring the relevant apps for AI features. Training and support were also considered a challenge as AI is a relatively new field in Malaysia.

3.3 Students Perception of AI-enhanced H5P Content

Overall, students reported higher satisfaction and motivation when interacting with AI-powered H5P content, highlighting the potential for AI to transform educational experiences.

4. Implications

These findings can significantly impact teaching practices by demonstrating the effectiveness of AI-powered H5P in creating engaging and personalised learning experiences. Table 2 list the key implications of the findings.

Table 2 Key implications of the findings

Key Implications	Description
Personalized learning	<ul style="list-style-type: none"> • Tailored content: AI can analyse student data to identify individual learning styles, strengths, and weaknesses. This allows educators to create content that is specifically tailored to each student’s needs.
Enhanced engagement	<ul style="list-style-type: none"> • Increase learner engagement: Unlike H5P, where learners are required to assess his or her own performance through various self-check activities, AI allows the lecturers to interact with each and every learners, thereby increasing learner engagement. • Interactive content: H5P’s interactive elements, such as games, and quizzes, can make learning more fun and engaging. • Multimedia integration: AI can help educators integrate various media types (e.g., videos, audio, images) into their lessons, making them more appealing to students.

Improved learning outcomes	<ul style="list-style-type: none"> Increased retention: Interactive and personalized learning experiences can lead to better retention of knowledge. Enhanced critical thinking: AI-powered H5P can encourage students to think critically and problem-solve.
Accessibility	<ul style="list-style-type: none"> Inclusive learning: AI can help create more inclusive learning environments by accommodating students with different learning styles and abilities.
Require technical expertise and resources	<ul style="list-style-type: none"> Nevertheless, the one factor that makes this project less feasible is in terms of technical expertise and resources, especially in terms of cost in hiring the skilled personnel and testing the AI system.

5. Conclusion

This pilot study can inform future H5P functionalities by highlighting areas where AI integration can be most beneficial. Furthermore, It sets the stage for future research to examine the ethical implications of AI in ODDE settings, as well as to investigate the efficacy of AI-powered H5P in various disciplines and contexts. Further studies need to be conducted to overcome the main challenge of acquiring the technical expertise and resources required.

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Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

The authors confirm contribution to the paper as follows: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation. All authors reviewed the results and approved the final version of the manuscript.

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