Engaging and empowering open and distance learning learners: Open University Malaysia experience in leveraging H5P

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Article Info

ABSTRACT

The COVID-19 pandemic disrupted the world in unimaginable ways. The repercussions of the pandemic continue until today and one of the most impacted sectors was education. Learning institutions were required to be more creative as face-to-face (F2F) learning could not be held. Hence, Open University Malaysia (OUM) has produced digital learning materials using hypertext markup language (HTML), HTML5 package (H5P) as a technology tool. This concept research paper is a continuation from a research article by OUM entitled measuring the impact of COVID-19 pandemic for continuous development of learning materials. The objectives of this paper are to investigate the impact of adding interactivity to learning materials specifically in H5P format and to identify how impactful the integration of H5P learning materials in the open and distance learning (ODL) environment is. This qualitative study used a mixed method approach involving semi-structured interview and purposive sampling. The findings show approximately 82% of participants were motivated to complete all H5P activities, although about 63% felt that these activities were time-consuming. The interactive components of H5P successfully engage learners in assessment tasks, in the long run, it might lead to boredom due to the perceived time demands associated with these activities.

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1. INTRODUCTION

From year end 2019 to 2021 the world went through tough times with the coronavirus disease 2019 (COVID-19) pandemic. Higher education in Malaysia was significantly disrupted and it created challenges for many universities in the country [1]. The prolonged lockdown and closing of borders spelt disaster for the educational institutions in Malaysia, particularly the private higher educational institutions (PHEIs) that depended heavily on foreign students' enrolment. Many premises were closed down during the pandemic including educational institutions. By April 2020, higher educational institutions (HEIs) were forced to shift from traditional face-to-face (F2F) classroom teaching to online classes. Most institutions of higher learning had to change their strategy from conventional F2F teaching to remote teaching; using on-hand technologies, such as learning management system (LMS), extended web conferencing meetings, emails, and even phone calls [2].

Besides domestic lockdown, the country imposed the closing of international borders and only in March 2021, was there a reopening of borders. Some PHEIs took as many as 50% of foreign students in their institutions, depending on the business model and courses they offer [3]. These institutions suffered the most as the number of enrolments dwindled throughout the pandemic period. Most PHEIs in Malaysia were also

ill-prepared to face the pandemic. The rapid pace of digital transformation in the higher education sector has left many PHEIs struggling to adapt. The lack of strategic agility and organisational learning capabilities exacerbates the challenges of implementing capable technology management systems [4]. Open and distance learning (ODL) education providers, such as Open University Malaysia (OUM), had an advantage over other PHEIs, as the university had already carried out online education since its inception in 2001. Nevertheless, the lockdown meant that teaching cannot be done through distance learning, i.e., through F2F interaction at various learning centres throughout the country. Indeed, in the post-pandemic world, it is crucial for PHEIs to adopt innovative business models that prioritize the digital revolution and technology shift [5].

The prolonged lockdown and closing of borders spelt disaster for the educational institutions in Malaysia. As an ODL education provider, OUM, has an advantage over other PHEIs, as the university has already carried out online education since its inception in 2001. In the post-pandemic world, it is crucial for PHEIs to adopt innovative business models that prioritize the digital revolution and technology shift [5]. With the paradigm shift due to COVID-19 in the 21st century education and adoption of active learning strategies, most higher learning institutions including OUM, are now revisiting the integration of H5P into teaching and learning [6]. In this study, we set out to investigate the impact of adding interactivity to learning materials, specifically in H5P format to provide interactive and engaging learning materials to our learners and also to identify how impactful the integration of H5P learning materials in the ODL environment is.

New technologies are needed to support this technology shift, and one example is H5P. This JavaScript-based software was initially released in 2013 and it is already implemented in many massive open online course (MOOC) platforms or LMS such as Moodle and Canvas [7], [8]. Integrating H5P contents in MOOCs among others make the contents easier to understand, more effective, and more helpful in improving students' learning outcomes [9]. In fact, H5P interactive videos were found to be beneficial as a replacement of F2F lectures during the pandemic outbreak and remain as a useful supplement during post-COVID-19 period [10]. These modules played a vital role in all other supplementary learning materials such as video lectures, podcast, and audio books, as they are all sourced from the modules. Subsequently, the modules came in the form of HTML. In late 2020, the University introduced online activities (OA) using H5P for selected weekly e-lessons. By then, the country was already under MCO, and the University went fully online. The shift to H5P was practical as it provides a more interactive approach to learning, a change from the more static HTML-based modules. Two years later, in late 2022, the University began to develop H5P-based modules for the learners. The integration of H5P in OUM learning materials is heavily promoted to enhance the learning process, not only during e-class but now, with learners having access to mobile technology, more so outside of their e-class, it allows two learning styles to be used simultaneously via audio visual, as there are many interactive features in H5P can be integrated in the learning materials. This integration strengthens the communication between learners and peers, learners and lecturers, and learners with their learning environment as well as providing individual learners with the ability to self-pace their own learning.

Figure 1 shows the content in one of OUM's modules in PDF format. In this format, the content is static and not interactive. Learners can download, highlight, and bookmark the content whenever they need to. Flipbook is available in my open education resources (myOER) using attractive infographics. The font type and font size have been carefully chosen by OUM for the open educational resources (OER) as for suitable font for reading. For the OER format, learners are only able to view the content and flip the pages.

Figure 2 illustrates the content available in the H5P version of the OUM module implementing infographic figures, so that the colour scheme and tone will attract learners more. In this format, it is more interactive; learners can participate more. This is in line with findings in [11], where the use of H5P to implement flipped learning in first-year science education, revealed that students responded positively to the technology and engaged effectively with the content. OUM's content also integrates QR codes to stimulate learners, prompting them to explore related resources and take initiative in expanding their knowledge through external websites. This approach further supports active learning and self-directed exploration within the ODL environment.

In H5P interactive elements such as drag-and-drop activities, which actively engage learners in constructing knowledge by encouraging participation and immediate feedback to guide them toward correct answers. These features reinforce learning through practice and improve retention in an online setting. Learners are also equipped with crossword puzzles as among the activities available in OUM's H5P module. These interactive puzzles not only serve as engaging learning tools but also help reinforce key concepts, terminology, and subject-specific vocabulary. By integrating game-based learning elements like crosswords, the module fosters active recall and enhances learner motivation, making the learning experience more dynamic and enjoyable. The novelty of this research paper is that it offers institution-specific insights into OUM's use of H5P to enhance engagement in an ODL environment, uniquely examining the balance between interactivity and learner perception post-pandemic. Using a qualitative and quantitative approach, it highlights H5P's long-term impact and provides strategies for sustainable, scalable interactive learning.
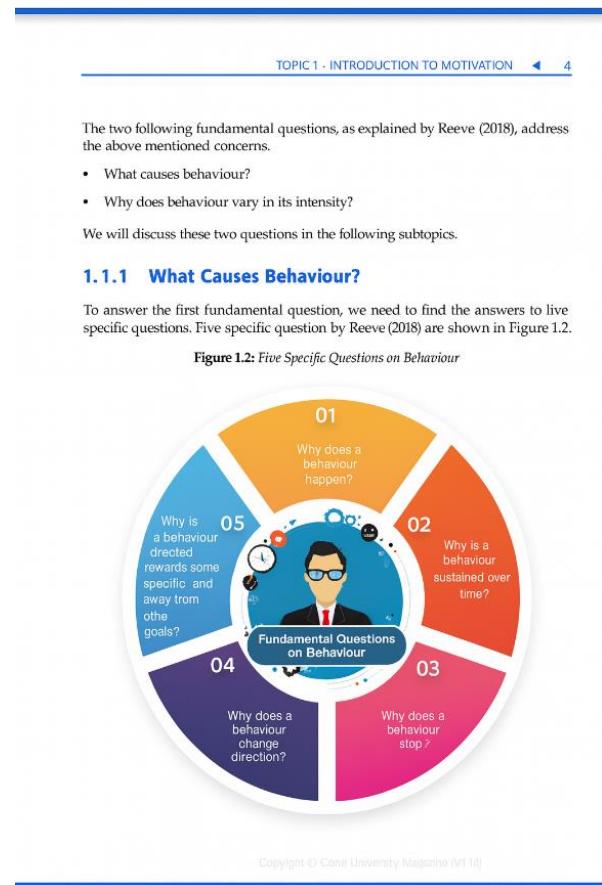
Figure 1. Content from module in PDF format

Figure 2. Content in the H5P version of the module

2.   LITERATURE REVIEW

It is possible to create interactive H5P content directly in our own web pages after installation, or also at h5p.org. When creating interactive content, we can choose from 40 diverse types of multimedia tasks such as branching scenario, image hotspot, interactive video and creating timelines [12]. H5P is a versatile tool and it can even use PowerPoint to develop interactive animated videos for students [13]. With seamless e-learning integration, H5P can utilize an interactive book to motivate and immerse learners [14]. From this

information, OUM's developer would be able to conduct a trial-and-error on the suitable diverse types of multimedia tasks to engage with the learners. It was shown that H5P interactive videos had higher views than conventional videos, which subsequently led to higher marks in weekly quizzes. The tutorials were delivered using Zoom meetings, supplemented with pre-recorded videos which supported students who could not attend the tutorial or for their revisions [15]. Thus, it is an additional option for OUM to add additional learning materials using different formats. This also could encourage students to enrol with OUM due to multiple formats of learning materials, besides the conventional module produced in PDF format.

Despite disruptions caused by the COVID-19 global pandemic, it has ironically provided opportunities to reimagine private higher education [5]. Under the new normal, private HEIs can no longer operate based on their traditional business models [16] and there is a need to address curriculum and delivery challenges amid the shift to online learning [17]. Thus, the development of H5P is a good step taken by OUM to engage learners through the latest technologies available online. The developers of OUM's H5P including web developers, instructional designers, editors, and subject matter experts (SMEs) are able to produce and communicate with each other although working from home (WFH) during the pandemic. They have recommended using H5P interactive video content to increase the students' engagement in learning at higher education level on Moodle. Hence, the step taken by OUM to use H5P seems to have a positive impact and jive with the other institutions all over the world which are also looking for a better way to engage learners.

A study in Australia [18] indicated that students are positive about the interactive elements of H5P and look forward to more interactive H5Ps in the future. Due to the interactive nature, H5P tools can enhance academic achievement and motivate students [19], [20], even in subjects like mathematics [21], [22] and basic programming [23]. It was also found that students and teachers showed higher engagement and participation using this tool [24] as it increases student learning independence [25]. This paper highlights H5P's benefits for creating and sharing interactive learning content. With seamless e-learning integration, H5P enhances engagement and accessibility. Meanwhile, in Jordan, H5P had been shown to facilitate instruction and personalized learning [26]. The application of H5P and Moodle in asynchronous distance learning environments is also effective for undergraduate students [27] and even school students [28] as both provide an engaging and interactive learning experience. Student engagement was particularly high prior to assessments like test [29].

Meanwhile, OUM has been producing video lectures for several years and the video is a different learning material for learners. By having multiple choices of learning materials, OUM hopes that it enables learners with plenty of choices for learning to make it more fun, interesting and engaging as well as providing different experiences. Increased learning effort by learners and 90% of students who participated in research, mentioned that H5P videos do not directly increase the activity per se, but influence the corresponding patterns and also have a stimulating effect [30]. However, a combination of H5P and videos can provide the scaffolding required to support collaboration and engage learners [31].

Even in OUM, H5P is the future of learning materials that might change or maybe replace PDF format of learning materials such as modules as a way forward. With OUM's instructional designers who all have more than 10 years of experience in instructional design, produce engaging and interesting instructional design elements incorporated in OUM's learning materials. Meanwhile, H5P can be an effective enhancement for more learner engagement in a self-directed environment [7]. For OUM, as an ODL institution, H5P will be explored further as to reach all learners and to engage new learners to study at OUM. A study [32] on the use of H5P interactive tools via Moodle LMS mentioned that it provides a major procedural benefit by allowing the adjustment of pre-existing video material into suitable online content. Adding flipbook in H5P learning materials, with attractive visuals and aesthetic application will also have a positive effect on the way learners build their understanding of particular subjects [33]. This also has been done by OUM by using the modules for instance as content in the H5P and OER. Then, further enhancement was done by the instructional designer and multimedia programmers to enhance the instructional design elements to be more interactive and engaging in the H5P format for the benefit of learners.

The use of AI can further enhance the H5P learning experience. A study on H5P-based e-learning content for AI lectures in Indonesian language and literature has shown that over 89% expert validation that interactive media can enhance students' engagement [34]. The integration of AI and H5P is also useful to encourage students to create their own assessment, thereby AI be more involved in their own learning. For instance, in one study, students generate code statements for AI-created exercises, with plans to integrate it into an H5P-based, gamified LMS workflow for broader adoption [35].

3.   METHOD

This study used a mixed method approach. A qualitative study involving semi-structured interviews and purposive sampling was used in selecting the participants with relevant expertise and experience. In order to answer the research questions, data was collected through F2F interviews with the developers

(instructional designers and multimedia programmers), who were directly involved in the H5P development. These interviews aimed to explore the processes, challenges, and insights from the developers' perspectives. To complement the qualitative data, a quantitative approach was employed through a satisfaction survey targeting undergraduate learners.

A seven-item satisfaction survey questionnaire was carefully designed to capture key aspects of user satisfaction. These questionnaires were distributed to 6,000 undergraduate learners enrolled in eight pilot courses that incorporated H5P activities. The courses represented a diverse range of disciplines, ensuring a robust dataset. The survey responses provided quantitative insights into the learners' satisfaction levels, engagement, and perceived value of the H5P-enhanced learning experiences.

4. RESULTS AND DISCUSSION

To answer the research questions, data was collected through F2F interviews with the developers comprising instructional designers and multimedia programmer. The following is the outcome of the interview in Table 1. Feedback from instructional designers and multimedia programmers reveals challenges and enablers of using H5P in ODL. Designers struggle to translate static module content into engaging H5P materials and highlight the need for improved graphical elements. Programmers face limitations in customization, such as restricted fonts and alignment, and the need for better content alignment. Enablers include H5P's free, user-friendly design and features like FlipBook, which enhance engagement. Barriers include reliance on stable internet, lack of offline access, and limited compatibility with module content, particularly challenging in low-resource settings. Recommendations include providing training, enhancing customization, exploring offline solutions, and improving internet infrastructure to maximize H5P's potential.

Table 1. Feedback on H5P learning materials

No.	Questions	Instructional designer	Multimedia programmer
1	What are the challenges in developing the H5P content/features in enhancing student engagement?	Visualising the content from module to H5P and adding more graphical elements.	Have to understand the content type. There are some limitations. Only work on what is available in H5P such as types of fonts and also to justify alignment.
2	What are the enablers and barriers in using H5P learning materials in teaching and learning?	Not everything from the module can be converted into H5P. In addition, developing the H5P requires stable internet connection. But a useful enabler is FlipBook for the benefit of learners. And the graphic elements are more dynamic allowing animation.	Among the enablers include free software and are easy to use. Even non-IT programmers can develop the learning material. H5P can only be accessed online and cannot be downloaded.

4.1. Positive features/benefits of H5P

OUM has produced H5P as a new way to engage with learners following the COVID-19 pandemic which changes us forever. Table 2 shows the features of H5P [36] used in OUM's H5P modules. Figure 3 lists the benefits of H5P as shared by our Multimedia Programmer. Among the benefits are as follows.

Table 2. Among the features of H5P

Features	Description
Crossword puzzle	Learners will be able to give one-word answers for a number of short questions
Find the word	Learners are required to search certain words from a number of letters
Flash card	Flip card to reveal answer
Fill-in-the-blanks	Learners need to fill in the blanks with the correct answer

Based on Table 2, the features of H5P activities offer diverse, interactive learning opportunities tailored to various learner needs. The "crossword puzzle" enhances vocabulary and recall by requiring one-word answers to short questions, while "find the word" promotes word recognition and attention to detail through word searches. "Flash cards" support memorization and self-assessment by allowing learners to flip cards to reveal answers. The "fill-in-the-blanks" feature improves comprehension and grammar by having learners' complete sentences with the correct words. Finally, the "drag and drop" activity fosters critical thinking and understanding as learners match answers to corresponding boxes. Together, these features create an engaging and inclusive learning environment ideal for instruction and assessment.

The features highlighted in the Figure 3 emphasize H5P's advantages as an educational tool in ODL environments. Its free access and user-friendly interface cater to both developers and learners, making it a cost-effective and widely accessible solution. The interactive and engaging features enhance student participation and make learning more dynamic. H5P is particularly effective for assessment purposes, offering tools like quizzes, fill-in-the-blanks, and drag-and-drop activities, which support diverse evaluation methods. Additionally, its minimal data usage ensures usability in low-resource settings, promoting equitable access to learning materials. These strengths position H5P as a valuable tool for fostering interactive and efficient learning experiences.
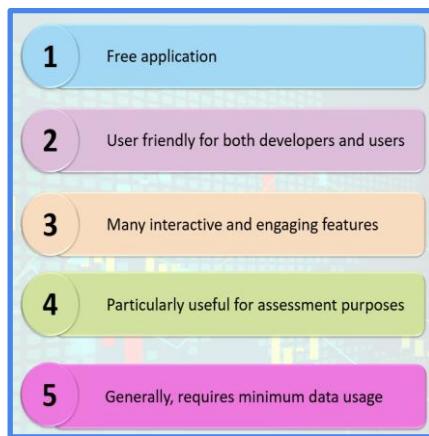
Figure 3. Among the benefits of H5P

4.2. Quantitative study through purposive sampling

OUM has conducted a study recently on the H5P assessment activities for e-lessons. Among the important questions include user experience based on the observation of the number of views on the course page. There is a total of 571 responses from eight pilot courses with OA whereby 6000 were sent out. Respondents are 20.07% male and 70.93% female of undergraduate learners and the results are as shown in Table 3.

Table 3. Responses on OA

OA	Agree/strongly agree	Disagree/strongly disagree	Neutral
The online interactive activities were relevant	80.39	3.85	15.76
The online interactive activities were helpful in my learning	80.74	3.5	15.76
The online interactive activities were time consuming	63.75	7.53	28.72
The number of activities given were sufficient	78.98	3.5	17.51
I completed all the activities given	82.49	3.5	13.84
I was able to complete the activities within the time frame given	79.51	5.08	15.06
I would like to see more interactive activities in my online courses	67.78	7.36	24.69

Based on the findings in Table 3, the most important aspect of the activities is that the learners are motivated to complete all the activities given (82.49%). These are followed by the interactive activities being both relevant and helpful to the learners. The varied array of activities provided to learners as mentioned in Table 2, maybe the reason why they find the activities engaging. The instructional designer elements also help to ensure the activities are relevant to the subject. However, about 63% of the learners felt that the activities were time-consuming, and more than a quarter were neutral; meaning to say that more than half perceive the activities as relatively difficult to complete within a short time. If the learners continuously feel that the activities take time to complete, overtime they may feel bored and may not want to attempt the activities in the future. The interactiveness of content is also vital to make the activities engaging as 67.78% of the respondents wanted to see more interactive activities in the online courses.

The findings in Figure 4 reveal that learners highly valued the online interactive activities, with 82.49% completing all tasks, reflecting strong engagement. The activities were deemed relevant (80.39%) and helpful (80.74%), indicating their alignment with learning objectives and positive impact on educational outcomes. Most respondents (78.98%) agreed that the number of activities was sufficient, and 79.51% felt

they could complete them within the given timeframe. However, 63.75% found the activities time-consuming, suggesting a need to balance task complexity with time demands. Notably, 67.78% expressed a desire for more interactive activities, highlighting their appreciation for these elements in enhancing engagement. Overall, the activities were seen as effective and engaging, with room for improvement in balancing time demands and expanding interactivity to further enrich the learning experience.
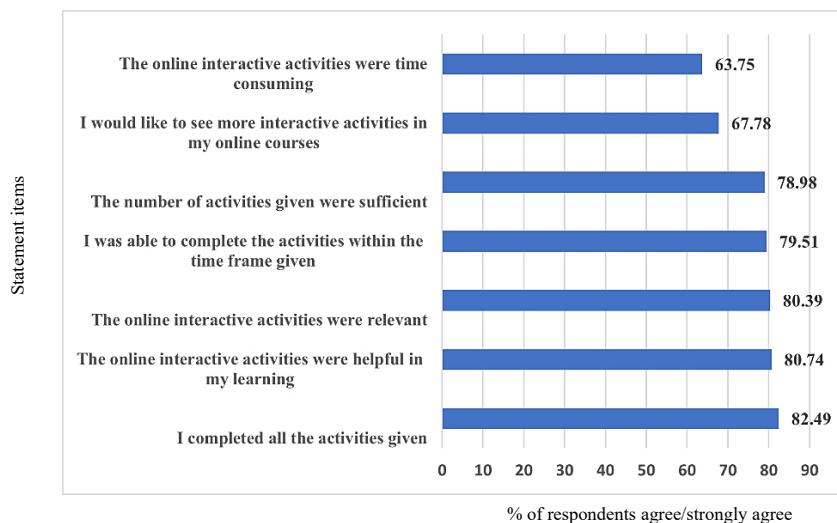

Figure 4. Responses with agree/strongly agree from lowest to highest in percentage

As summary of all the results and findings, they reveal that H5P activities are effective and well-received, with 82.49% of learners completing all tasks, demonstrating high engagement. The activities were considered relevant (80.39%) and helpful (80.74%) in supporting learning objectives, and the variety of features, such as crossword puzzles and flashcards, contributed to their interactive and engaging nature. While 78.98% of respondents agreed that the number of activities was sufficient and 79.51% completed them within the timeframe, 63.75% found them time-consuming, indicating a need for improved balance between task complexity and time demands. Notably, 67.78% of learners expressed a desire for more interactive activities, emphasizing the importance of maintaining and enhancing the interactivity of content to sustain engagement. Challenges such as limited customization, reliance on stable internet, and difficulty converting static content into H5P materials were noted by developers, but the tool's free access, user-friendly interface, and dynamic features positioned it as an effective and equitable educational resource. Overall, the findings of our research suggest that H5P has strong potential to enhance online learning, with opportunities to improve customization, interactivity, and accessibility.

5. CONCLUSION

Leveraging the use of H5P in teaching and learning is part of the OUM initiative to initiate innovation in the learning path for learners. A system can be used as a learning tool that uses technology to maximize the learning achievements of learners. The H5P also offers diverse resources and activities to support a more interactive teaching and learning process. Like its development, interactive multimedia content and activities integrated with H5P, give large opportunities to learners to understand better in their learning. Based on the survey done, it indicates the H5P-based OA are found to be both relevant and helpful to our learners. Thus, it can also enhance the learner's accomplishments by encouraging them to complete the activities given and make them actively engage in learning. Several steps need to be taken to shorten the activities to ensure that the activities given are not too time-consuming.

AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

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C : **C**onceptualization	I : **I**nvestigation	Vi : **Vi**sualization
M : **M**ethodology	R : **R**esources	Su : **Su**pervision
So : **So**ftware	D : **D**ata Curation	P : **P**roject administration
Va : **Va**lidation	O : Writing - **O**riginal Draft	Fu : **Fu**nding acquisition
Fo : **Fo**rmal analysis	E : Writing - Review & **E**diting	

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author, [SAB], upon reasonable request.

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