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ENHANCING STUDENT ENGAGEMENT AND LEARNING OUTCOMES IN HIGHER EDUCATION USING H5P INTERACTIVE LEARNING TOOLS: A SYSTEMATIC LITERATURE REVIEW

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Abstract:

The growing emphasis on innovative teaching methods in higher education underscores the significance of interactive tools like H5P in promoting student engagement and enhancing academic outcomes. However, its pedagogical potential remains insufficiently examined, warranting a systematic investigation of its effects. This study undertakes a comprehensive review of existing research on using H5P in higher education, focusing on its contribution to active learning and improved academic performance. Guided by the PRISMA methodology, the researcher systematically reviewed 30 peer-reviewed articles from Scopus, ScienceDirect, and ERIC. The analysis identified three key themes, including H5P Tools and Interactive Content for Student Engagement, Impact of H5P on Learning Outcomes, and Innovative Pedagogical Approaches Using H5P. The findings demonstrate that H5P facilitates enhanced student engagement through dynamic content, self-paced learning, and interactive assessments, improving academic results. Nevertheless, gaps persist in areas such as longitudinal studies and cross-cultural applications, indicating the need for further research. The study concludes that H5P has transformative potential for higher education but emphasizes the importance of aligning its use with pedagogical objectives and ensuring adequate technical support. These insights provide educators and policymakers practical guidance for integrating H5P to foster engaging, inclusive, and effective learning environments.

Keywords:

Higher Education, H5P, Interactive, Learning Outcomes, Pedagogy, Student Engagement

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Introduction

The ever-evolving nature of higher education necessitates innovative teaching strategies to meet the varied needs of today's learners (Chigbu et al., 2023; Frazier, 2023). As the focus of education transitions from traditional, lecture-driven models to more interactive, student-centred approaches, technology emerges as a key catalyst for change. Among the many digital tools available, H5P, a flexible, open-source platform for creating interactive and engaging educational content, has attracted growing interest from both educators and researchers (A'dawiah Jamaluddin et al., 2023; Rekhari & Sinnayah, 2018). Offering features such as interactive videos, quizzes, timelines, and branching scenarios, H5P presents significant potential to transform teaching practices and facilitate active learning (Bui & Brooks, 2023; Singleton & Charlton, 2019).

Interactive platforms like H5P align well with modern pedagogical theories emphasizing constructivist and experiential learning. These tools prioritize student engagement, fostering deeper cognitive interaction, enhancing knowledge retention, and enabling learners to apply concepts practically and meaningfully (Clarkin et al., 2023; Llerena-Izquierdo & Zamora-Galindo, 2021). Furthermore, H5P's intuitive interface and compatibility with widely adopted Learning Management Systems (LMS) make it accessible to educators across various disciplines (Kamran Mir et al., 2022; Utari et al., 2022). Despite its popularity, there is a lack of comprehensive studies evaluating H5P's influence on student engagement and academic outcomes, underscoring the need for a detailed exploration of its pedagogical impact.

The emphasis on student engagement as a fundamental element of academic achievement underscores the importance of this review. Engaged learners demonstrate increased motivation, participation, and critical thinking, which are crucial for attaining educational objectives in higher education (Anuyahong & Pucharoen, 2023; Zhao et al., 2023). However, bridging the gap between strategies for engagement and measurable academic success remains a challenge. H5P offers promising solutions by enabling educators to design tailored, interactive content that appeals to diverse learning preferences. However, its success depends not only on the quality of its design but also on its thoughtful integration into teaching practices, necessitating evidence-based guidance for its effective use (Kartimi et al., 2023; Susanto et al., 2022).

This systematic review aims to address this gap by synthesizing existing literature on H5P's role in fostering student engagement and improving learning outcomes in higher education. A systematic literature review on the role of H5P interactive learning tools in higher education addresses the research gap by synthesizing existing studies to understand their impact on student engagement and learning outcomes comprehensively. While prior research highlights the potential benefits of H5P, findings remain scattered across various disciplines, lacking a unified perspective on its effectiveness. This review consolidates empirical evidence, identifies key pedagogical strategies, and evaluates assessment metrics used in H5P-based learning environments. By mapping current research trends and theoretical frameworks, the study offers valuable insights into best practices and areas requiring further investigation, ultimately guiding educators and researchers in optimizing H5P’s application in higher education.

Literature Review

Incorporating technology in education has revolutionized teaching and learning, particularly in higher education. Among the many tools available, the HTML5-based H5P platform stands out for its ability to create interactive content. Asynchronous learning environments have

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significantly benefited from H5P, as demonstrated by Mutawa et al. (2023), who highlighted its capacity to boost student engagement and motivation through features like interactive videos, quizzes, and games. Supporting this, Rossetti-López et al. (2023) reported high levels of student satisfaction with H5P activities, citing their effectiveness in capturing attention and fostering engagement. Unsworth and Posner (2022) also emphasized H5P's adaptability in online education, showcasing its use in interactive laboratory sessions to maintain instructional quality. Collectively, these findings highlight H5P's potential to elevate the digital learning experience.

H5P, an open-source HTML5 framework, is increasingly acknowledged for transforming conventional learning spaces into dynamic and interactive environments. By enabling educators to develop, share, and repurpose digital content, H5P supports a transition from passive to active learning approaches. Studies by Utari et al. (2022) and Ramliyana and Ramdhan (2020) illustrate its versatility in language education, which has been used to create quizzes, games, and multimedia content for English and Indonesian language instruction. Similarly, Pinoa (2021) reported enhanced user engagement and ease of content reuse when integrating H5P with e-learning platforms like Moodle.

Despite these benefits, challenges remain regarding H5P's impact on learning outcomes. Jacob and Centofanti (2024) found no significant improvement in assessment scores among students using H5P interactive videos, although learners reported positive experiences. Similarly, Gil-García et al. (2023) noted increased motivation but minimal differences in grades between traditional methods and H5P-enhanced activities. These findings suggest that while H5P boosts engagement and motivation, its direct effect on academic performance requires further investigation. Kamran Mir et al. (2022) indicated that the effectiveness of H5P relies heavily on the degree of interactivity, emphasizing the need for improved instructional design to maximize its impact.

H5P's adaptability across disciplines benefits both educators and learners. Kiryakova (2022) explored its use in creating interactive books to enhance engagement and accessibility on multiple devices. Kartimi et al. (2023) noted that H5P interactive videos in science education led to variations in students' understanding of stereoisomers based on learning styles. Furthermore, Kosmaca and Siiman (2023) demonstrated how H5P's branching features support collaboration and scaffolding in online laboratory settings. These examples highlight the platform's ability to address diverse subject-specific needs and provide tailored learning experiences.

The role of H5P in mitigating learning loss and enhancing performance skills has also been examined. Susanti et al. (2023) reported significant improvements in students' outcomes when using H5P STEM-based videos for electrical measurement topics. This finding aligns with Kamran Mir et al. (2022), who observed higher satisfaction among students engaging with H5P content in e-learning contexts. Similarly, Unsworth and Posner (2022) noted an increase in first-class grades among students using H5P for laboratory exercises, demonstrating its effectiveness in supplementing traditional teaching methods.

Integrating H5P tools into online and blended learning environments has improved student engagement. Kosmaca and Siiman (2023) reported that H5P-enabled interactive experiments in physics classes encouraged collaborative learning and provided essential scaffolding.

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Likewise, Unsworth and Posner (2022) showed that H5P alternatives for laboratory tasks preserved high academic performance while enabling self-paced learning. Wicaksono et al. (2021) found that incorporating H5P in English language teaching increased motivation and interactivity, breaking the monotony of traditional methods.

Beyond engagement, H5P fosters more profound learning and skill development. Research by Susanti et al. (2023) demonstrated that H5P STEM videos significantly enhanced performance skills in electrical measurement topics, effectively addressing learning gaps. Similar advancements have been reported in language and mathematics education (Utari et al., 2022; Haqq et al., 2022), where H5P's interactive features offered accessible and contextually relevant learning experiences. Content development using frameworks like ADDIE and Design Sprint further ensures alignment with instructional design principles (Pinoa, 2021; Susanti et al., 2023).

Despite its merits, H5P faces challenges. Kamran et al. (2022) stressed that the success of H5P content hinges on interactivity and user feedback mechanisms. Haqq et al. (2022) highlighted the importance of tailored scaffolding and contextual vocabulary to address diverse learner needs. These findings underscore the necessity of thoughtful content design and ongoing evaluation to enhance H5P's effectiveness.

H5P represents a significant advancement in educational technology, with applications spanning various disciplines and learning environments. Its impact ranges from fostering engagement and collaboration to enhancing academic outcomes. However, as Kamran et al. (2022) and Kosmaca and Siiman (2023) suggest, future implementations must address design challenges and incorporate robust feedback mechanisms to sustain their effectiveness. Continued research into H5P's potential across different educational contexts will further establish its role in modern pedagogy.

In summary, the existing literature underscores H5P's effectiveness in enhancing student engagement, motivation, and interactivity in higher education. However, despite these advantages, studies indicate that its direct impact on academic performance remains inconclusive. While some research highlights improved learning experiences, others suggest minimal or no significant differences in student assessment outcomes. This gap indicates that while H5P fosters engagement, its role in enhancing learning outcomes requires further exploration, particularly concerning instructional design quality and interactivity levels. By addressing this, the present study systematically examines existing research to determine how H5P's interactive features influence engagement and learning outcomes, thereby offering insights into optimizing its pedagogical effectiveness in higher education settings.

Research Questions Based on the research gaps that the study aims to address and guided by the PICo (Population, Interest, and Context) framework, the following two research questions are proposed:

Research Question 1: How do H5P tools and interactive content impact student engagement in higher education settings?

Population: Higher education students
Interest: The effectiveness of H5P tools in creating interactive content for enhancing student

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engagement
Context: Higher education settings

Research Question 2: What are the effects of H5P-based innovative pedagogical approaches on learning outcomes in higher education classrooms?

Population: Higher education students and instructors
Interest: The integration of H5P tools in innovative pedagogical approaches and their effect on learning outcomes
Context: Higher education classrooms utilizing H5P

These two questions align with the identified themes, aiming to address the research gaps.

Material and Methods

The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework is widely recognized as a benchmark for conducting systematic literature reviews to ensure transparency, thoroughness, and consistency throughout the review process. By following PRISMA guidelines, researchers can enhance the precision and reliability of their analyses through structured procedures for identifying, screening, and including relevant studies. The framework also underscores the importance of randomized research studies, emphasizing their role in minimizing bias and offering robust evidence for systematic reviews. This study utilized three major databases- Scopus, ERIC, and ScienceDirect owing to their extensive coverage and reliability. Scopus is a widely recognized multidisciplinary database that indexes high-impact, peer-reviewed journals, ensuring access to diverse and authoritative studies. ERIC is a specialized database focused on education, providing a wealth of research on teaching strategies, learning technologies, and student engagement. ScienceDirect, managed by Elsevier, is a well-established source for scholarly articles, particularly in education and technology. By utilizing these databases, the study ensures a robust selection of credible, high-quality, and peer-reviewed literature essential for a comprehensive and systematic review.

The PRISMA framework comprises four essential stages: identification, screening, eligibility, and data extraction. During the identification phase, relevant studies are located through a thorough search of academic databases. Subsequently, the screening phase involves comparing these studies against predefined criteria to eliminate irrelevant or poor quality. The remaining studies are carefully evaluated in the eligibility phase to ensure they meet the inclusion requirements. Finally, data extraction entails gathering and synthesizing information from the selected studies to generate reliable and meaningful conclusions. This systematic approach upholds a high standard of rigour, ensuring the review produces dependable insights that can inform future research and practical applications.

Identification

This research adopted a systematic review methodology to compile a substantial body of pertinent literature. The process began with identifying keywords, which were then expanded upon through dictionaries, thesauri, encyclopaedias, and prior studies to determine related terms. These terms were consolidated to construct search strings in the Scopus, ERIC, and Science Direct databases (refer to Table 1). As a result of this preliminary step, 211 publications aligned with the study's focus were retrieved from these three databases.

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Table 1: The Search String.

Scopus	TITLE-ABS-KEY (("H5P") AND ("students" OR "learners" OR "engagement" OR "involvement" OR "participation" OR "interactive" OR "learning" OR "outcomes" OR "objectives" OR "pedagogy" OR "tools" OR "higher education" OR "tertiary education")) AND PUBYEAR > 2017 AND PUBYEAR < 2025 AND (LIMIT-TO (SRCTYPE , "j")) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (LANGUAGE , "English")) **Date of Access: 21 Dec 2024**
ERIC	("H5P") AND ("students" OR "learners" OR "engagement" OR "involvement" OR "participation" OR "interactive" OR "learning" OR "outcomes" OR "objectives" OR "pedagogy" OR "tools" OR "higher education" OR "tertiary education" **Date of Access: 21 Dec 2024**
Science Direct	("H5P") AND ("students" OR "engagement" OR "interactive" OR "learning outcomes" OR "pedagogy" OR "higher education")) **Date of Access: 21 Dec 2024**

Screening

In the screening phase, research items were assessed to ensure their relevance to the established research question(s). This step focused on selecting studies addressing H5P interactive learning tools to enhance higher education student engagement and learning outcomes. During this stage, the researcher removed duplicate entries, excluding 149 publications. This process left 62 papers for further evaluation based on specific inclusion and exclusion criteria (see Table 2). The first criterion pertained to the type of literature, with only journal articles in their final publication stage considered. Other sources, such as reviews, meta-syntheses, meta-analyses, books, book chapters, and conference proceedings, were excluded. The researcher restricted the review to English-language studies published between 2018 and 2024. Additionally, she eliminated six publications due to duplication.

Table 2: The Selection Criterion is Searching

Criterion	Inclusion	Exclusion
Language	English	Non-English
Timeline	2018 – 2024	< 2018
Literature type	Journal (Article)	Conference, Book, Review
Publication Stage	Final	In Press

Eligibility

In the third stage, the eligibility phase, 56 articles were initially considered for review. At this point, the researcher meticulously assessed each article's titles and main content to ensure they

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satisfied the inclusion criteria and were relevant to the study's objectives. As a result, 26 articles were excluded for various reasons, such as being outside the scope of the field, having titles that lacked relevance, abstracts that did not align with the study's goals, or not being accessible in full text for empirical analysis. This process left a total of 30 articles for the subsequent review process.

Data Abstraction and Analysis

This study employed an integrative analysis as a key assessment strategy to examine and consolidate various research designs. The primary aim of this thorough investigation was to identify relevant topics and subtopics. The data collection phase was the initial step in the theme development process. As illustrated in Figure 2, the authors systematically reviewed 30 publications to extract assertions or content pertinent to the topics addressed in the current study. Following this, the authors assessed significant studies focusing on using H5P as an interactive tool, carefully analysing the methodologies and outcomes of these studies. Subsequently, the author worked alongside a colleague to create themes grounded in the evidence from this study. Throughout the data analysis, a log was maintained to document any analyses, perspectives, questions, or other insights relevant to interpreting the data. In the final stage, the author and colleague compared their findings to check for discrepancies in the theme development process. Notably, in cases of differing views on the concepts, the author and colleague engaged in discussions to resolve any disagreements.

The researchers refined the finalized themes to maintain consistency throughout the analysis. The selection process was conducted by two experts, both seasoned educators with over 20 years of experience in higher education, to assess the validity of the identified issues. During the expert review phase, the experts carefully evaluated each subtheme's clarity, relevance, and appropriateness to ensure domain validity. The author and co-worker made revisions based on the insights and suggestions provided by the experts, as well as their own judgment.

Quality of Appraisal

Following the guidelines set forth by Kitchenham and Charters (Kitchenham, 2007), it is essential to evaluate the quality of the research they present and conduct a quantitative comparison after selecting the articles. This study adopted the quality assessment framework from Anas Abouzahra et al. (Abouzahra et al., 2020), which includes five assessment questions. The evaluation process involves assigning one of three possible ratings for each criterion: "Yes" (Y) with a score of 1 if the criterion is fully met, "Partly" (P) with a score of 0.5 if the criterion is partially met but has some gaps, and "No" (N) with a score of 0 if the criterion is not met at all.

Table 3: Quality Assessment Table

Quality Assessment	Co-Worker	Expert 1	Expert 2	Total Mark
Is the purpose of the study clearly stated?	Y	Y	Y	3
Is the interest and the usefulness of the work clearly presented?	Y	Y	Y	3
Is the study methodology clearly established?	Y	Y	Y	3

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Are the concepts of the approach clearly defined? Is the work compared and measured with other similar work?	Y	Y	Y	3

The table presents a quality assessment (QA) process designed to evaluate a study according to specific criteria. Three experts assess the study based on these criteria, assigning scores of "Yes" (Y), "Partly" (P), or "No" (N) to each. Below is a detailed explanation:

1. **Is the purpose of the study clearly stated?**
    - This criterion examines whether the study clearly states and defines its objectives. A well-articulated purpose provides direction and scope for the research.
2. **Is the interest and usefulness of the work clearly presented?**
    - This criterion assesses how clearly the study explains its significance and potential contributions, measuring the relevance and impact of the research.
3. **Is the study methodology clearly established?**
    - This criterion evaluates whether the research methodology is clearly defined and suits the study's objectives. A transparent methodology ensures the study's validity and replicability.
4. **Are the concepts of the approach clearly defined?**
    - This criterion considers whether the study clearly outlines the theoretical framework and key concepts. Clear definitions are vital for understanding the study's approach.
5. **Is the work compared and measured with other similar work?**
    - This criterion looks at whether the study compares itself with existing research. Benchmarking against other studies helps contextualize the work within the broader academic field and emphasizes its contributions.

The co-worker and experts evaluate the study independently based on these criteria, with their scores then being summed to calculate the overall rating. To move on to the next phase, the total score, obtained by adding the ratings from all three assessors, must exceed 3.0. This threshold guarantees that only studies meeting a specific quality standard advance to the next stage.

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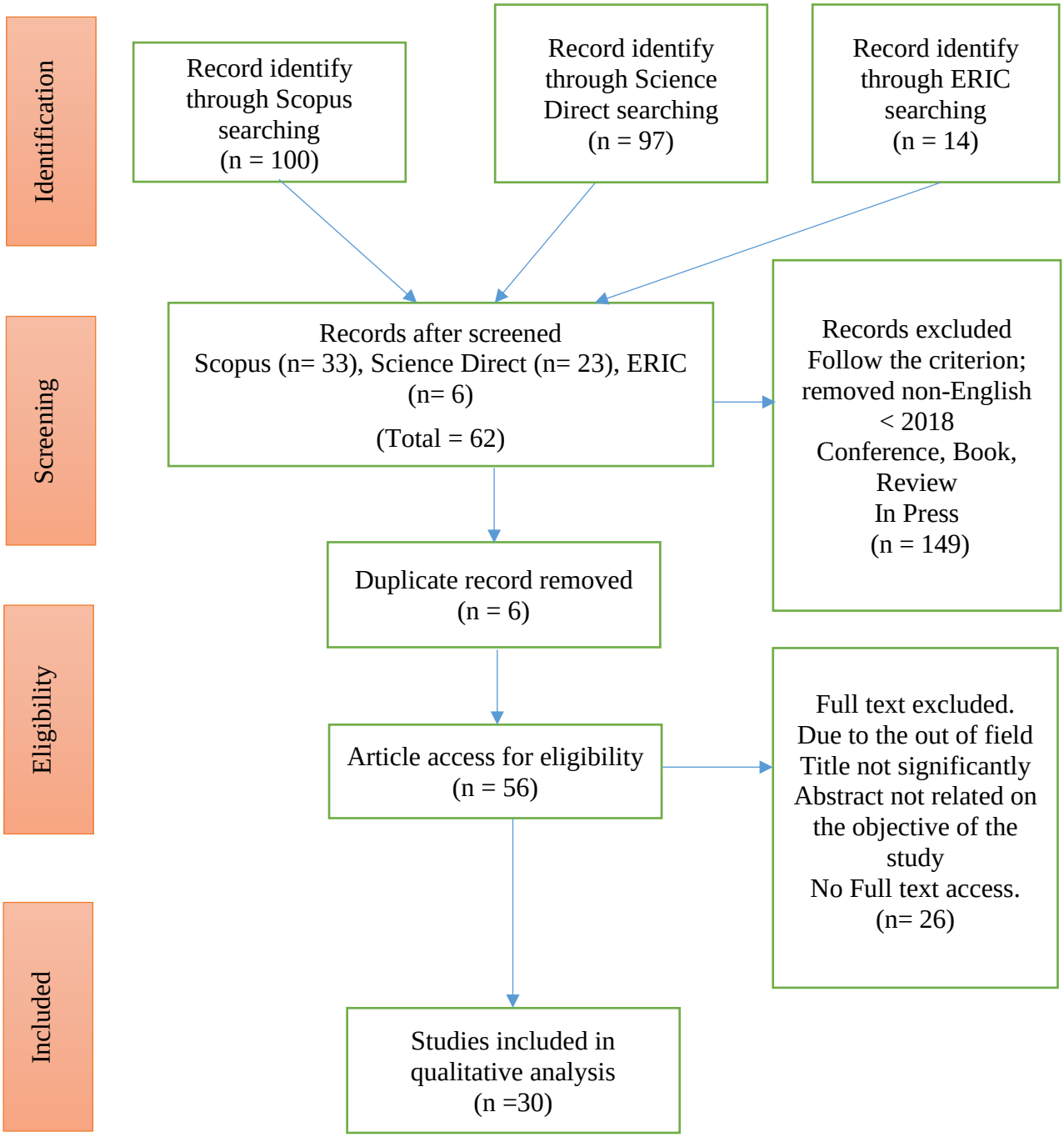

Figure 1: Flow Diagram of the Proposed Searching Study

(Moher et al., 2009)

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Results and Findings

Table 4: Studies Included in Qualitative Analysis

	Authors	Title	Year	Source title	Scopus	Science Direct	ERIC
1	Sharmin N.; Pandya J.; Stevenson T.R.; Chow A.K.	Interactive H5P content for increased student engagement in a dental hygiene program	2024	Canadian Journal of Dental Hygiene	√		
2	Rahmi U.; Fajri B.R.; Azrul A.	Effectiveness of Interactive Content with H5P for Moodle-Learning Management System in Blended Learning	2024	Journal of Learning for Development	√		√
3	Priyakanth R.; Abburi R.; Praveena M.	Design and impact of interactive video content for the improvement of student engagement and learning	2021	Journal of Engineering Education Transformations	√		
4	Vdovinskiene S.	Using flipped classroom as an active teaching method for teaching engineering graphics	2023	Baltic Journal of Modern Computing	√		
5	Abusalim N.; Rayyan M.; Alshanmy S.; Alghazo S.; Al Salem M.N.	Revolutionizing Pedagogy: The Influence of H5P (HTML5 Package) Tools on Student Academic Achievement and Self-Efficacy	2024	International Journal of Information and Education Technology	√		
6	Wehling J.; Volkenstein S.; Dazert S.; Wrobel C.; van Ackeren K.; Johannsen K.; Dombrowski T.	Fast-track flipping: flipped classroom framework development with open-source H5P interactive tools	2021	BMC Medical Education	√		
7	Eisenmann M.; Rauschenberger V.; Maschmann J.; König S.; Krone M.	Interactive hygiene training using free open source software	2024	BMJ open quality	√		

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8	Al Aufi A.; Naqvi S.; Naidu V.R.; Al Homani Y.	INTEGRATING HTML5-BASED SPEECH RECOGNITION WITH LEARNING MANAGEMENT SYSTEM TO ENHANCE EFL LEARNERS' PRONUNCIATION SKILLS	2023	Journal of Teaching English for Specific and Academic Purposes	√	
9	Gil-García I.C.; Fernández-Guillamón A.; García-Cascales M.S.; Molina-García Á.	Virtual campus environments: A comparison between interactive H5P and traditional online activities in master teaching	2023	Computer Applications in Engineering Education	√	
10	Kartimi K.; Chandra E.; Riyanto O.R.	THE INFLUENCE OF H5P INTERACTIVE VIDEO ON STEREOISOMER UNDERSTANDING IN TERMS OF LEARNING STYLE	2023	Jurnal Pendidikan IPA Indonesia	√	
11	Brega O.N.; Kruglyakova G.V.	Video podcast technology for distant ESP teaching in team work	2021	Perspektivy Nauki i Obrazovania	√	
12	Sinnayah P.; Salcedo A.; Rekhari S.	Reimagining physiology education with interactive content developed in H5P	2021	Advances in Physiology Education	√	√
13	Rahadiani P.; Kekalih A.; Soemantri D.; Krisnamurti D.G.B.	Exploring HTML5 Package Interactive Content in Supporting Learning Through Self-Paced Massive Open Online Courses on Healthy Aging: Mixed Methods Study	2024	JMIR Medical Education	√	
14	Mutawa A.M.; Al Muttawa J.A.K.; Sruthi S.	The Effectiveness of Using H5P for Undergraduate	2023	Applied Sciences (Switzerland)	√	

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		Students in the Asynchronous Distance Learning Environment				
15	Kosmaca J.; Siiman L.A.	Collaboration and feeling of flow with an online interactive H5P video experiment on viscosity	2023	Physics Education	√	√
16	Muangbangyung S.; Srisawasdi N.	Design and Development of Interactive Moodle-Based E-Learning Platform for Competency Training †	2023	Engineering Proceedings	√	
17	De Santos-Berbel C.; Hernando García J.I.; Vázquez-Greciano A.	H5P-Based Matching Game for Training Graphs of Internal Forces in Structural Analysis	2024	Education Sciences	√	
18	Unsworth A.J.; Posner M.G.	Case Study: Using H5P to design and deliver interactive laboratory practicals	2022	Essays in Biochemistry	√	
19	Pierce Farrier K.; Dowd A.; Van Der Volgen J.	Interactive Images in Library Instruction: A Case Study	2024	Medical Reference Services Quarterly	√	
20	Moreno G.; Meneses-Monroy A.; Mohamedi-Abdelkader S.; Curcio F.; Domínguez-Capilla R.; Martínez-Rincón C.; Pacheco Del Cerro E.; Mayor-Silva L.I.	Virtual Active Learning to Maximize Knowledge Acquisition in Nursing Students: A Comparative Study	2024	Nursing Reports	√	
21	Woods K.	The Development and Design of an Interactive Digital	2020	Frontiers in Education	√	

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		Training Resource for Personal Tutors					
22	Kiryakova G.	Engaging Learning Content for Digital Learners	2022	TEM Journal	√		
23	Killam L.A.; Luctkar-Flude M.	Virtual Simulations to Replace Clinical Hours in a Family Assessment Course: Development Using H5P, Gamification, and Student Co-Creation	2021	Clinical Simulation in Nursing	√	√	
24	Keedle H.; Young K.; Arundell F.; Burns E.	Midwifery student engagement with digital interactive books: A cross sectional survey	2024	Women and Birth	√	√	
25	Jacob T.; Centofanti S.	Effectiveness of H5P in improving student learning outcomes in an online tertiary education setting	2024	Journal of Computing in Higher Education	√		√
26	Park Y.; Kim Y.	A design and development of micro-learning content in e-learning system	2018	International Journal on Advanced Science, Engineering and Information Technology	√		
27	Rahadiani P.; Kekalih A.; Krisnamurti D.G.B.	Use of H5P interactive learning content in a self-paced MOOC for learning activity preferences and acceptance in an Indonesian medical elective module	2023	African Journal of Science, Technology, Innovation and Development	√		
28	Paul D. Miller; Michael A. Mills	Supporting Open Education through a Coordinated Network of Support	2022	Teaching and Learning Excellence through Scholarship			√
29	Girmay S.; Yliniemi K.; Nieminen M.;	Enhancing 360° virtual laboratory safety training with linear learning	2024	Education for Chemical Engineers		√	

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	Linnera J.; Karttunen A. J.	pathway design: Insights from student experiences				
30	Viitaharju P.; Nieminen M.; Linnera J.; Yliniemi K.; Karttunen A. J.	Student experiences from virtual reality-based chemistry laboratory exercises	2023	Education for Chemical Engineers		√

Discussion

The researcher identified and analysed 30 articles using the employed search strategy and grouped these articles into three primary themes: H5P tools and interactive content for student engagement (12 articles), the impact of H5P on learning outcomes (12 articles), and innovative pedagogical approaches using H5P (6 articles).

H5P Tools and Interactive Content for Student Engagement

These articles focus on how H5P enhances interaction, engagement, and creating active learning environments.

The integration of H5P tools in education has gained notable traction, particularly for their role in fostering student engagement and improving learning outcomes. Examining various studies underscores their efficacy across different academic fields, including health sciences and engineering. These tools enable the creation of interactive content, such as quizzes, videos, and simulations, which are crucial in promoting active learning environments. This review consolidates insights from 12 studies, emphasizing the significant benefits of incorporating H5P tools in higher education contexts.

In a dental hygiene program at a Canadian university, Sharmin et al. (2024) highlighted the effectiveness of H5P's interactive resources in enhancing students' academic performance in an oral biology course. Learners who utilized H5P supplemental materials achieved higher scores on exam questions related to the content, underscoring the role of interactive tools in fostering active learning and improving knowledge retention. Similarly, Priyakanth et al. (2021) demonstrated that interactive videos, enriched with embedded questions and case studies, enhanced student engagement and critical thinking skills in an engineering education context. Specifically, using interactive video content in MATLAB courses significantly deepened students' understanding of complex topics, emphasizing the broader educational value of such tools. These findings collectively emphasize the transformative impact of H5P on cognitive development and academic success.

Miller and Mills (2022) explored how H5P facilitates active participation and collaborative learning by creating Reusable Learning Objects (RLOs). In their study of Spanish 101 and 102 courses, integrating H5P enabled students to engage interactively, increasing comprehension and involvement. Students expressed high levels of satisfaction, with an average rating of 4.54 out of 5, and 89% reported that H5P-based materials significantly contributed to their academic progress. These results demonstrate the practicality and positive influence of H5P on learning experiences.

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In language learning, Abusalim et al. (2024) observed that students using H5P tools to study German achieved better academic outcomes and exhibited greater self-confidence than those relying on traditional methods. This study underscores the ability of H5P to support self-directed learning and boost learners' self-efficacy. Similarly, Eisenmann et al. (2024) documented the use of H5P in a healthcare training program, where participants praised the interactivity and relevance of the materials, leading to high satisfaction and retention of knowledge. These studies highlight the versatility of H5P, demonstrating its capacity to enhance academic and professional training by promoting practical and engaging learning experiences.

Within Massive Open Online Courses (MOOCs), Rahadiani et al. (2024) found that H5P's interactive content improved student engagement and satisfaction, especially in self-paced courses. Learners reported that H5P materials were more effective than traditional formats, with computer literacy playing a key role in optimizing their experience. Kosmaca and Siiman (2023) echoed these findings in a physics course, where interactive video experiments enabled students to simulate real-world laboratory activities, fostering collaboration and engagement. Such evidence illustrates H5P's adaptability across diverse educational contexts, meeting varied learning demands.

Moreno et al. (2024) compared in-person teaching with virtual environments supported by H5P tools in nursing education. While both approaches yielded similar knowledge outcomes, virtual learning provided greater flexibility and engagement. Pierce Farrier et al. (2024) highlighted using H5P interactive image hotspots in library instruction, allowing students to explore virtual spaces and enhancing their learning experience. Additionally, Killam and Luctkar-Flude (2021) demonstrated how gamified virtual simulations powered by H5P in family assessment courses encouraged student creativity and active participation.

Keedle et al. (2024) showcased the benefits of H5P interactive books in midwifery education, emphasizing their aesthetic appeal and usability in promoting engagement. These findings are consistent with research by Gil-García et al. (2023), which showed that H5P activities in wind energy courses motivated students and increased participation compared to traditional online methods. Together, these studies underline the importance of well-designed and user-friendly interactive tools in maximizing the educational impact of H5P.

In conclusion, integrating H5P's interactive features across various disciplines has consistently improved student engagement, learning outcomes, and satisfaction. From healthcare training to engineering and language learning, H5P tools—through interactive videos, quizzes, and simulations—foster active learning, enhance academic performance, and bolster students' confidence. As H5P continues to evolve, its potential to revolutionize educational practices and enrich the learning experience across diverse fields remains evident.

Impact of H5P on Learning Outcomes

These studies evaluate the direct impact of H5P on academic performance, understanding of concepts, and other measurable outcomes based on 12 articles.

Adopting H5P-based interactive tools in educational environments has emerged as a promising approach to improving learning outcomes, especially within blended and online learning contexts. Numerous studies highlight the ability of H5P-enabled content hosted on platforms

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like Moodle to foster engaging and impactful learning experiences. For instance, Rahmi et al. (2024) demonstrated how integrating H5P into a rotation-style blended learning model led to notable gains in student knowledge, skills, and satisfaction. Similarly, research by Wehling et al. (2021) underscored the adaptability of H5P tools within a flipped classroom framework, enhancing accessibility and instructional efficiency in medical education. In another study, Al Aufi et al. (2023) illustrated that incorporating H5P-based pronunciation exercises into EFL (English as a Foreign Language) courses improved speaking proficiency, facilitated by immediate feedback that promoted self-directed learning.

The versatility of H5P in accommodating diverse learning preferences and content areas further reinforces its value in educational settings. For example, Kartimi et al. (2023) reported that using H5P interactive videos in biology classes improved students' grasp of challenging topics, such as stereoisomers. This study aligns with the findings by Brega and Kruglyakova (2021), who employed interactive video podcasts to strengthen linguistic, pragmatic, and sociolinguistic competencies, observing marked skill enhancements among learners. Moreover, integrating H5P into Moodle's Learning Management System (LMS) has mitigated feelings of isolation in asynchronous learning scenarios. Mutawa et al. (2023) found that the interactivity of H5P content maintained students' motivation and engagement, even in remote learning conditions.

Nevertheless, the effectiveness of H5P tools on learning outcomes has not been universally consistent. Jacob and Centofanti (2024) observed that while H5P increased engagement in a psychology course, it did not significantly outperform traditional methods in terms of academic achievement. Likewise, Unsworth and Posner (2022) found no substantial differences in assessment outcomes between students using H5P-enhanced laboratory sessions and those in conventional "wet" labs. These results suggest that the success of H5P tools hinges on factors like the nature of the content and the level of student interaction. Despite this, students engaging with H5P content frequently expressed positive attitudes and preferences for interactive elements in future courses, highlighting its potential to complement traditional teaching strategies effectively.

Despite these challenges, many studies emphasize the broader pedagogical advantages of H5P. For instance, De Santos-Berbel et al. (2024) explored using H5P-based matching games in structural analysis courses. They found them instrumental in motivating students and clarifying complex engineering concepts. Similarly, research by Muangbangyung and Srisawasdi (2023) demonstrated that integrating H5P elements into Moodle platforms effectively supported competency development in online education settings. These examples underscore how combining robust instructional design with H5P's interactivity can enhance student engagement and learning outcomes.

Furthermore, integrating H5P tools aligns with evolving trends in e-learning, such as micro-learning strategies. Park and Kim (2018) highlighted the efficacy of short, focused learning modules, which are well-suited to H5P's rapid content development capabilities. Viitaharju et al. (2023) explored the synergy between virtual reality (VR) technologies and H5P interactivity, showing that virtual labs incorporating H5P quizzes and videos received positive student feedback despite not entirely replacing traditional learning methods.

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In summary, H5P's integration into diverse educational frameworks has demonstrated its potential to enrich student engagement and improve learning outcomes. Its interactive videos, quizzes, and other tools enhance motivation and facilitate personalized learning experiences. However, optimizing its application requires addressing challenges related to student engagement, content accessibility, and pedagogical design. Future research should focus on refining H5P's use, particularly in educational contexts where interactive content is less prevalent.

Innovative Pedagogical Approaches Using H5P

This theme groups 6 articles emphasizing creative instructional methods or specific course designs integrating H5P.

Incorporating H5P's interactive functionalities into educational practices has garnered considerable interest for its capacity to improve student engagement and enhance learning outcomes. Various studies have assessed H5P's effectiveness in diverse educational settings, particularly highlighting its contributions to active and self-directed learning. For instance, Vdovinskiene (2023) investigated integrating H5P tools alongside the flipped classroom (FC) approach within engineering graphics instruction. The findings revealed that H5P effectively facilitated self-paced learning and supported classroom activities, fostering deeper learning and heightened student involvement. By offering interactive learning opportunities, H5P helps address the constraints of conventional teaching methods, enhancing comprehension and retention of intricate subjects such as engineering graphics.

In a related study, Kiryakova (2022) explored how H5P can engage digital learners by creating interactive educational content. The study demonstrated that H5P enables the development of dynamic and accessible materials that stimulate motivation and participation. This approach was particularly impactful in computer graphics courses, where interactive resources like e-books and instant feedback mechanisms enriched the learning process and allowed students to progress independently. The alignment between Kiryakova's and Vdovinskiene's findings underscores H5P's ability to support active learning and accommodate diverse learning styles, ultimately contributing to improved academic outcomes.

The role of H5P in blended learning environments has also been evaluated, particularly in health education contexts. Sinnayah et al. (2021) integrated H5P into a first-year physiology course, employing interactive modules to promote self-directed learning. Students engaged with the material at their own pace, benefiting from scaffolded activities closely tied to learning objectives. This approach enhanced students' grasp of complex physiological concepts and cultivated critical thinking skills. Moreover, the activities encouraged learners to take ownership of their education by enabling reflection and progress tracking. These outcomes emphasize H5P's potential to create engaging, student-centred learning environments that support academic success.

Similarly, Rahadiani et al. (2023) examined the application of H5P in a self-paced MOOC designed for Indonesian medical students. Their research revealed that learners preferred activities featuring H5P elements, such as documents, videos, and interactive modules. The study demonstrated H5P's effectiveness in fostering active participation in online learning by allowing students to interact with content at their convenience while benefiting from tools like quizzes and simulations. Additionally, the findings highlighted the significance of H5P's user-friendliness and perceived utility in driving its adoption among learners. This research

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contributes to the growing evidence supporting H5P's role in improving engagement and learning outcomes across various educational contexts.

Woods (2020) highlighted the utility of H5P in professional development, specifically in training personal tutors within an arts faculty. Creating an interactive training resource using H5P allowed tutors to engage dynamically with the material, reflect on their practice, and advance through the training effectively. Incorporating interactive features such as quizzes and reflective tasks ensured the content was informative and stimulating, leading to deeper understanding. This case underscores H5P's ability to enhance teaching and learning experiences in professional settings by fostering a more engaging educational atmosphere.

Finally, the work of Girmay et al. (2024) showcased the pedagogical benefits of structured learning pathways in a web-based 360° virtual laboratory safety training module. Over 900 students provided feedback, indicating they found a linear progression model more effective and motivating than a non-linear format. This approach improved the learning experience and catered to diverse learner preferences by aligning pathways with educational goals. These findings resonate with broader trends emphasizing using interactive tools like H5P to develop structured, engaging, and goal-oriented educational solutions in higher education.

H5P has proven to be a versatile and impactful tool across various educational domains, including engineering, health sciences, medical education, and professional training. By offering interactive, adaptable, and personalized learning experiences, H5P facilitates student engagement and academic success. As evidenced by research from Vdovinskiene (2023), Sinnayah et al. (2021), Kiryakova (2022), Rahadiani et al. (2023), Woods (2020), and Girmay et al. (2024), the integration of H5P holds significant promise for advancing modern educational practices and outcomes in higher education.

Conclusion

Adopting H5P tools in education has emerged as a significant innovation, offering transformative benefits in enhancing student engagement, encouraging active participation, and improving academic achievement. An analysis of various studies highlights their efficacy across multiple disciplines, including health sciences, engineering, languages, and professional training. By incorporating features such as interactive videos, quizzes, and simulations, H5P tools create dynamic and immersive learning environments tailored to diverse educational contexts.

In academic settings, these tools have yielded notable outcomes. For instance, interactive resources in oral biology courses led to measurable improvements in student performance, while engineering courses utilizing interactive videos facilitated better comprehension of complex concepts. Similarly, language learning has benefitted from H5P modules, which elevated academic success and enhanced learners' confidence and autonomy. In MOOCs and blended learning environments, H5P supported self-directed learning, sustained engagement, and deepened understanding of course material.

H5P has also demonstrated significant value in professional training. For example, its application in healthcare education improved knowledge retention and learner satisfaction. At the same time, its integration into library instruction and nursing programs showcased its flexibility in delivering engaging, hands-on content. Across various fields, such as midwifery

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and environmental sciences, H5P's interactive design has been linked to increased motivation and ease of use, highlighting its adaptability to different learning styles and subject areas.

While providing valuable insights into the role of H5P interactive learning tools in higher education, this study has certain limitations. The reliance on existing literature may introduce biases related to the selection and availability of studies, potentially limiting the generalizability of findings across different educational contexts. Additionally, variations in research methodologies, sample sizes, and assessment criteria across the reviewed studies may affect the conclusions' consistency. Future research could address these limitations by conducting empirical studies across diverse institutions and disciplines to assess H5P's long-term impact on student engagement and learning outcomes. Moreover, exploring the integration of H5P with emerging technologies such as artificial intelligence and adaptive learning systems could provide deeper insights into its effectiveness in personalized education.

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