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Journal of Advanced Research in Social and Behavioural Sciences

Journal homepage:
https://karyailham.com.my/index.php/jarsbs/index
ISSN: 2462-1951



Cognitive Offloading to ADAB-AI: A Framework for Responsible Generative Artificial Intelligence use in Higher Education

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ARTICLE INFO

Article history:
Received 1 October 2026
Received in revised form 6 November 2026
Accepted 10 November 2026
Available online 16 November 2026

Keywords:
Generative artificial intelligence; cognitive offloading; ADAB-AI; higher education

ABSTRACT

The effortless use of generative AI in higher education for immediate feedback and personalised learning support has raised concerns about cognitive offloading. Although parts of the cognitive process have long been offloaded to machines such as calculators and GPS, learners now delegate analysis, evaluation, idea generation and decision-making to AI systems. The argument for cognitive offloading is not inherently detrimental, as the educational consequences depend on the nature and extent of the cognitive processes delegated to AI. Therefore, a distinction is proposed between adaptive offloading, which reduces peripheral cognitive demands while preserving higher-order reasoning. Meanwhile, substitutive offloading occurs when AI replaces most of the cognitive processes essential for learning. The most critical part is the implications of these types of offloading on critical thinking, cognitive autonomy, academic integrity and student well-being. It further integrates the Islamic principles of adab (proper conduct) as ethical foundations for responsible AI use. Accordingly, an Islamic conceptual framework proposes the ADAB-AI Framework, which integrates AI in higher education through principles of Aql, Dalil, Amanah, and Balance. The framework that preserves Islamic concepts offers an ethically grounded approach to preserving cognitive autonomy, human agency, academic integrity and well-being in AI-supported higher education. Last but not least, the primary construct is to position AI as cognitive scaffolding rather than a substitute for human reasoning.

1. Introduction

Recent surveys show how rapidly generative AI (GenAI) has become embedded in students' academic lives. In the United Kingdom (UK), the 2025 Higher Education Policy Institute survey reported that 92% of students used some form of GenAI for academic purposes, compared with just 66% the previous year [1]. A similar trend has been observed across 15 countries, including Malaysia, under the Chegg Global Student Survey 2025. The survey involving 11,706 undergraduate students aged 18 to 21 found that around 80% had used GenAI [2]. The most recent survey in 2026, involving

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more than 8,000 university students in Australia, found that over 80% had used GenAI for study-related activities, and almost half reported regular use [3]. Together, these findings suggest that GenAI is no longer a peripheral tool in higher education; instead, it is becoming part of the everyday learning environment.

Although surveys on the use of AI in education were conducted in different populations and used different questions, a remarkably consistent pattern emerges. Students primarily use GenAI to understand or clarify concepts, improve their writing, summarise and organise information, and support problem-solving or assignments [1-3]. Importantly, many of these activities correspond to cognitive processes that students would traditionally perform themselves.

The educational issue is therefore shifting from whether students should use AI to how to integrate AI in the learning process without impacting its nature. The mechanism of integration is extremely important as GenAI differs from many earlier digital tools, such as search engines, that merely used to retrieve information. Whilst GenAI, due to large language model-based systems, can explain and summarise information, generate ideas, provide immediate feedback, assist with writing, and support problem-solving [4]. Such capabilities provide important educational opportunities, particularly through accessible and personalised support. The concern arises when AI moves from supporting cognition to substituting for cognitive activity that the student is expected to develop. Therefore, GenAI integration should have a pedagogical impact within human-controlled and ethically governed environment rather than being solely dependent on technological efficiency [5].

Understanding this concern requires first considering the normal cognitive process of learning. When learners encounter a problem, they attend to relevant information and retrieve prior knowledge from long-term memory. Later, they manipulate information in working memory, analyse relationships, compare alternatives and generate a judgement or solution. Metacognitive processes subsequently allow them to monitor understanding, identify uncertainty and revise their reasoning. These activities are important not merely because they produce an answer, but the cognitive activity itself contributes to learning.

GenAI can now participate in several stages of this process. A learner can ask AI to retrieve relevant knowledge, organise information, analyse problems, synthesise evidence, generate explanations, evaluate alternatives and recommend a conclusion. This transfer of cognitive work to an external resource can be understood through cognitive offloading. Risko and Gilbert [6] define cognitive offloading as the use of external actions or resources to reduce the information-processing requirements of a task. Human beings have long relied on notebooks, calculators, reminders and digital devices. Therefore, cognitive offloading itself is neither new nor inherently harmful. Emerging research has reported a relationship between frequent AI use, increased cognitive offloading, and lower critical-thinking performance [7]. A systematic review of 67 studies in higher education, in contrast, found that ChatGPT could support critical and creative thinking when embedded in scaffolded and inquiry-oriented activities. Meanwhile, passive or unstructured use was more frequently associated with cognitive offloading and reduced epistemic engagement [8]. Thus, the educational effect appears to depend less on the presence of AI itself than on how human and artificial cognition are distributed within the learning task.

This issue is also relevant to student well-being, as recent evidence distinguishes ordinary AI use from improper AI dependence. A study by Wang *et al*., [9] reported an association between AI dependence and lower self-efficacy as well as academic stress connected to burnout and anxiety. However, the findings do not prove that using AI directly causes poor mental health. Instead, they suggest that high dependence on AI can cause chaos if the students start using it as a cognitive replacement rather than their own thinking and engagement [9].

In an Islamic educational context, these concerns also relate to the preservation and cultivation of the intellect (aql), responsible verification of information (tabayyun) and accountability (amanah). Contemporary scholarship on digital competency and AI in Muslim contexts similarly argues that technological proficiency should be accompanied by ethical responsibility and preservation of human intellectual agency [10,11].

This conceptual paper is not intended to estimate the quantitative effects of GenAI. Instead, it is organised to identify the cognitive processes that normally contribute to learning, determine which of these processes can be transferred to GenAI, and explore how such delegation can be ethically and pedagogically regulated. Subsequently, it examines cognitive offloading in GenAI-assisted higher education and distinguishes adaptive from substitutive cognitive offloading. The aim is to connect these bodies of knowledge to explain when cognitive delegation may support learning and when it may undermine the intellectual processes education seeks to cultivate. Accordingly, it proposes the ADAB-AI Framework as an applied ethical and pedagogical framework for responsible AI-supported learning in higher education.

3. GenAI and Cognitive Offloading in Learning

3.1 From Normal Cognitive Processing to AI-Assisted Cognition

Learning involves interaction among attention, prior knowledge, working memory processing, higher-order reasoning and metacognition. When students solve a problem independently, they are required to activate existing knowledge, identify relationships, analyse competing possibilities, construct an explanation and evaluate whether their conclusion is defensible [12,13]. Current concern is that GenAI may alter this cognitive architecture because learners can now request assistance at almost every stage. The difference is educationally significant. Successful task completion does not necessarily indicate that the cognitive processes underlying competence have occurred. A student may produce a sophisticated output without being able to independently reconstruct, explain or defend the reasoning represented in that output [14]. This is why the central question is not simply how frequently students use AI. Instead, which cognitive processes are being offloaded, and to what extent, and whether the learner retains responsibility for their final judgement [7].

3.2 Adaptive and Substitutive Cognitive Offloading

This paper proposes a distinction between adaptive and substitutive cognitive offloading as summarised in Table 1.

Table 1
Adaptive and substitutive cognitive offloading

Dimension	Adaptive Offloading	Substitutive Offloading
Role of AI	Cognitive scaffold	Cognitive substitute
Purpose	Support learning	Complete the task
Initial learner reasoning	Preserved	Frequently bypassed
Higher-order cognition	Human-led	Increasingly AI-led
Verification	Active	Limited or absent
Final judgement	Learners retains control	AI strongly determines outcome
Likely consequences	Cognitive efficiency	Risk of dependency and reduced autonomy

Adaptive cognitive offloading occurs when AI reduces peripheral, repetitive or supportive cognitive demands while the learner retains the thinking central to the learning objective. Examples

include organising already understood information, language editing, generating practice questions, suggesting alternative examples or providing feedback on a learner-generated explanation. In these circumstances, offloading may enable cognitive resources to be redirected towards higher-order reasoning.

Substitutive cognitive offloading, in contrast, occurs when AI performs the very cognitive processes that the learner is expected to develop. Examples include asking AI to analyse a problem before making an independent attempt or to construct the principal argument of an assignment. The worst part is evaluating evidence on behalf of the learner or generating a conclusion that is subsequently accepted without critical appraisal.

3.3 Implication for Cognitive Autonomy and Well-Being

Cognitive autonomy may be understood as the capacity to reason, evaluate and make intellectual judgements independently. Closely related is epistemic agency, which the learner remains responsible for determining what and why the information should be believed, and whether the evidence supports a particular conclusion. Excessive cognitive substitution potentially produces a paradox [15]. Technological intervention might enable students to complete the task efficiently. But the concerns are fewer opportunities for independent problem-solving, uncertainty, error correction and limited successful mastery. Eventually, this could affect healthy self-esteem, a fundamental in developing mental resilience despite facing failure or rejection, which evolves over life experience and personal growth [16]. However, a careful interpretation of AI use and its psychological implications is needed. Although a study found that high dependence on AI correlates with lower self-efficacy and a tendency to experience burnout and anxiety from academic stress, the impact is not about the general use of AI [9]. Thus, it is unfair to assume that all AI use results in psychological harm while neglecting the beneficial assistance that can be gained from a maladaptive reliance on AI.

Islam is known for its comprehensive guide for a muslim. The guidance encompasses routine daily practices up to complex ethical, social, intellectual and professional decisions. This comprehensive orientation reflects the principle that human actions should be guided by appropriate values, responsibilities, and boundaries [17,18]. Since AI has been well integrated into daily life, including education, comparable principles are needed in accordance with the Islamic perspective. This paper, therefore, proposes an appropriate benefit of technological intervention, which defines adaptive cognitive offloading as the ability to preserve cognitive processes in AI use.

4. ADAB-AI Framework from Islamic Ethical Principles

As AI becomes increasingly integrated into human life, particularly learning, guidelines are needed to govern the use and evaluation of the outputs in maintaining human ethical [10,11]. The Islamic ethical principles of aql, dalil, amanah and wasatiyyah provide a relevant foundation for constructing the framework for AI-assisted learning. Accordingly, the ADAB-AI Framework, comprising these four interconnected principles, is proposed.

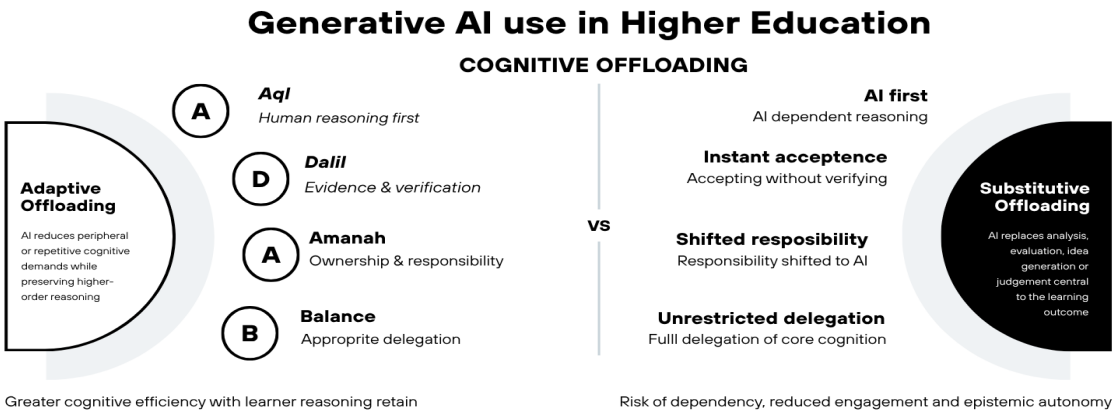

Fig. 1. Conceptual model of the ADAB-AI framework

4.1 Aql: Human Intellectual

Aql refers to human intellectual capacity in evaluating information and directing action. In an education context, aql therefore supports active engagement with knowledge through interpretation, analysis, evaluation and reasoned decision-making. Thus, this principle is particularly relevant to limit the delegation of cognitive functions to AI. Independent reasoning constitutes the learning objective, in which students should activate their own cognition before receiving substantial AI assistance. The proposed approach does not require the exclusion of AI from all initial learning activities. Instead, it protects cognitive initiation when independent reasoning is educationally significant. The simple reflection could be "What do I think before asking AI?" This principle ensures that the transition from human intellectual interpretation prior to AI intervention guided by human reasoning.

4.2 Dalil: Verification or Evidence

Dalil generally refers to evidence used to support a claim, judgment or conclusion. Its precise meaning varies across disciplines such as usul al-fiqh, theology and Qur'anic interpretation. The common principle is that a claim should not be accepted without an established evidentiary basis. Dalil is significant as AI-generated information may be plausible, fluent and persuasive without necessarily being accurate or adequately supported [19]. AI-generated content, therefore, should be treated as information to be critically evaluated rather than as an authoritative final answer [20]. AI claims should be verified against disciplinary sources, checking whether cited evidence genuinely exists, comparing alternative explanations and recognising uncertainty. The operational query is "Does the AI response scientifically precise?" This principle transforms the individual from a passive recipient of AI output into an active evaluator of knowledge.

4.3 Amanah: Human Responsibility

Amanah refers to trust, responsibility and the obligation to fulfil what has been entrusted to an individual with integrity and care. Amanah encompasses moral responsibilities for one's actions, decisions, knowledge and consequences arising from their use [21]. While in education context, it is closely associated with intellectual honesty, responsible conduct, and personal ownership of learning [22]. Amanah is relevant because the use of AI does not transfer the responsibility from learners to technology. The responsibilities include accuracy, academic integrity, appropriate disclosure,

confidentiality and the ability to explain the submitted work independently. A simple yet useful query is “Can I understand, explain and take responsibility for this final output?” Therefore, the central principle is that cognitive assistance may be delegated, but responsibility remains exclusively human.

4.4 Balance: Appropriate Cognitive Delegation

The principle of Balance is derived from the Islamic concept of wasatiyyah. The concept has been well adapted mainly in Islamic education, which emphasises moderation and proportionality [23,24]. This principle supports the deliberate regulation of cognitive delegation, where not every task requires the same level of AI involvement. AI may be highly appropriate for generating practice questions or language feedback, while independent analysis may be essential when reasoning itself constitutes the intended learning outcome. Balance should therefore depend on the learner's level, disciplinary context, assessment purpose and cognitive skill being developed. The operational question is “What task should I delegate to AI, and what thinking should remain mine?” This principle also preserves productive struggle. Uncertainty, retrieval effort, mistakes and revision can be educationally valuable. Responsible AI integration should therefore not aim to remove all difficulty from learning.

Overall, the four principles of the ADAB-AI framework are particularly relevant to learners in higher education, who are expected to develop greater intellectual independence, self-awareness, decision-making capabilities, and responsibility for their learning. These capacities provide an appropriate foundation for engaging with the principles of aql, dalil, amanah and appropriate balance in the use of AI. A structured ethical framework, therefore, supports the development of responsible judgment, critical evaluation of AI-generated information, ownership of academic work, and appropriate regulation of cognitive delegation to AI.

5. Implementation in Higher Education

The practical value of ADAB-AI lies in its ability to guide not only students but also educators. The educator has a central role in designing, facilitating, regulating and evaluating the learning process. The role is not limited to transmitting knowledge, but also to structuring learning experiences that enable learners to develop knowledge, skills, reasoning, judgement and ethical responsibility [25]. These established educators’ responsibilities remain essential in AI-assisted learning, but have acquired additional amendments. The role includes designing tasks that identify which cognitive processes must remain student-led and guiding appropriate interaction with AI. Subsequently, supporting validation where students lack sufficient disciplinary expertise, and encouraging reflection on how AI altered the original reasoning. This approach aligns with broader evidence that reflective, inquiry-oriented AI use is more likely to scaffold higher-order thinking rather than unregulated AI use.

The implementation of the framework also has implications for assessment, as instead of focusing on detecting AI use, educators may require students to reflect on the cognitive process behind their final output. The assessment can be based on initial reasoning, source verification, oral defence, comparison between pre- and post-AI responses or reflective AI-use statements. The aim is to make human cognition evolve when AI is integrated into the learning environment. Thus, ADAB-AI should not be interpreted as a framework for restricting technology usage. The purpose is to provide guidelines based on Islamic principles for the preservation of human intellect through cognitive delegation, thereby ensuring that advances in technological capability is accompanied by ethical compliance.

5.1 Descriptive Clinical Application: Working Length Determination in Endodontic Education

In dental education, the topic of working length determination in Endodontics can illustrate a clinical application of the ADAB-AI framework. This topic is not only about obtaining a measurement. Dental students need to learn to take the radiograph, interpret the radiograph, know the estimated working length, identify the nature of root canal anatomy, consider the electronic apex locator reading and then decide whether all the information obtained is reasonable, clinically acceptable or not. For this matter, electronic apex locators are usually used together with radiographic assessment, and students need adequate pre-clinical exposure before using them during the clinical year [25,26].

Recent studies have explored the use of AI in working length determination and radiographic feedback for endodontic training [27-29]. From the view of Aql, the student should at least first attempt to understand the case or scenario before using AI. For example, the students may review the pre-operative radiograph, identify the likely canal anatomy and estimate the working length based on it. Meanwhile, AI can be introduced after this stage to provide additional support, such as highlighting a possible anatomical feature, identifying a discrepancy, or even giving a suggestion for the radiographic interpretation. The purpose is not for AI to provide the working length directly, but to support the students' own reasoning on the chosen landmark. This is also consistent with the exposure during the pre-clinical training using electronic apex locators, where students need to learn how to interpret the information provided by the device rather than depend on the radiographic reading only [26].

The principle of dalil is particularly crucial when AI provides a suggestion. Even though when AI-generated working length appears convincing, the student should still need to verify and even double check whether it agrees with the radiographic findings, including the landmarks of cuspal references and radiographic apex. In other words, the AI output should be treated as supporting information rather than the final answer. This is relevant because evidence on AI-assisted working length determination is still emerging, and much of the available research has been carried out actively in laboratory, retrospective or internally validated settings [28,29].

Amanah relates to the responsibility for the final decision. AI may assist students with interpretation, but the corrected working length still needs to be decided by students under clinical supervision. The students should also be able to explain to their supervisor how the decision was reached and how the landmarks were considered during the radiographic assessment. In clinical practice, responsibility extends beyond the measurement itself, and it includes patient safety, appropriate use of clinical findings and identifying uncertainty.

The principle of Balance helps to determine how much assistance from AI is appropriate and sufficient. AI may be useful as a source of formative feedback and a second opinion, especially during training. Yet, if AI provides the answer before the student has attempted the task, an important part of learning may be lost. One possible learning sequence is to interpret, estimate, and AI delegation based on aql principle, verify through dalil, decide and defend through amanah and baance principles. Tentatively, in this manner, AI supports the reasoning process, but does not replace the learner's questioning and judgment.

6. Conclusions

The issue of AI use in higher education is not merely about whether students can use AI or not, or expanding access to information. The key issue is how to integrate AI effectively to preserve human cognition. Cognitive offloading is not inherently detrimental, as adaptive offloading can improve efficiency by transferring peripheral cognitive demands while preserving reasoning. The greater

concern is substitutive offloading, in which AI performs the analysis, evaluation and judgment that learners themselves need to develop.

The proposed ADAB-AI Framework, Aql, Dalil, Amanah, and Balance, integrates cognitive considerations with Islamic ethical principles to guide responsible AI-supported learning. Determining working length in dental education is one example of how ADAB-AI can be implemented. Its underlying proposition is straightforward. AI should scaffold human cognition without replacing the reasoning, judgement and responsibility that education seeks to develop. The goal of higher education in the AI era should therefore not be to minimise human cognitive effort, but to enable learners to use increasingly powerful technologies while preserving critical thinking, cognitive autonomy, human agency, academic integrity and well-being.

Acknowledgement
This article proposed a framework that was not funded by any grant. During the preparation of this work, the authors used ChatGPT (OpenAI) solely for language refinement and improvement of manuscript readability. The authors reviewed and edited all generated content and take full responsibility for the content of this publication.

References

[1] Freeman, Josh. 2025. "Student generative AI survey 2025." Higher Education Policy Institute: London, UK 2.
[2] Chegg. 2025. "Global student survey."
[3] Chung, Jennifer, Michael Henderson, Christine Slade, Yifei Liang, Nicole Pepperell, Thomas Corbin, Jack Walton et al. "The use and usefulness of GenAI in higher education: Student experience and perspectives." *Computers and Education Open* (2026): 100347. https://doi.org/https://doi.org/10.1016/j.caeo.2026.100347
[4] Su, Jiahong, and Weipeng Yang. "Unlocking the power of ChatGPT: A framework for applying generative AI in education." *ECNU Review of Education* 6, no. 3 (2023): 355-366. https://doi.org/10.1177/20965311231168423
[5] Unesco. 2022. Recommendation on the ethics of artificial intelligence. United Nations Educational, Scientific and Cultural Organization.
[6] Risko, Evan F., and Sam J. Gilbert. "Cognitive offloading." *Trends in cognitive sciences* 20, no. 9 (2016): 676-688. https://doi.org/10.1016/j.tics.2016.07.002
[7] Gerlich, Michael. "AI tools in society: Impacts on cognitive offloading and the future of critical thinking." *Societies* 15, no. 1 (2025): 6. https://doi.org/10.3390/soc15010006
[8] Li, Changyue, Hang Cui, and Linda Serra Hagedorn. "The cognitive impact of ChatGPT in higher education: A systematic review of critical and creative thinking outcomes." *Computers and Education: Artificial Intelligence* (2026): 100571. https://doi.org/10.1016/j.caeai.2026.100571
[9] Wang, Wenlong, Yuhang Wu, Jie Fang, Chong Yang, and Langyi Wen. "When cognitive offloading becomes dependence: how AI dependence mediates the pathway from academic stress to burnout and anxiety." *BMC psychology* 14, no. 1 (2026): 1125. https://doi.org/10.1186/s40359-026-04911-w
[10] Ahmad, Noorlila, Mohammad Karimi Ma, Siti Fatimah Abd Rahman, Syarifah Rohaniah Syed Mahmood, Nor Asiah Muhamad, and Syamsul Nor Azlan Mohamad. "The Islamic ethical principles and Maqasid al-Shariah to enhance digital competency among adolescents." *UMRAN-Journal of Islamic and Civilizational Studies* 12, no. 3 (2025): 101-117. https://doi.org/10.11113/umran2025.12n3.833
[11] Johari, Mohd Effino. "Overreliance on Artificial Intelligence in Malaysian Education: Ethical Implications and a Maqasid Shariah-Based Hybrid Intelligence Framework." *Jurnal Evolusi* 7, no. 1 (2026): 77-98. https://doi.org/10.61688/jev.v7i1.569
[12] Widodo, Estu, Yudhi Arifani, Muhammad Rafiek, and Jihan Nawal Aini. "ASD Learners' Cognitive Processes in PIRLS Reading: A Case Study on Varying English Background and IQ Levels." *The Journal of AsiaTEFL* 22, no. 2 (2025): 432-440. https://doi.org/10.18823/asiatefl.2025.22.2.16.432
[13] Groome, David, and Michael Eysenck. *An introduction to applied cognitive psychology*. Taylor & Francis, 2025. https://doi.org/10.4324/9781003396758
[14] Zhu, Qiuhan, Xiangnan Li, Yiang Dong, Pengcheng Chang, and Mengmeng Fan. "Not all cognitive offloading is equal: distinguishing dependent and autonomous offloading to generative AI." *Frontiers in Psychology* 17 (2026): 1878629. https://doi.org/10.3389/fpsyg.2026.1878629

[15] Gill, Ayesha Asghar, Fouzia Janjua, Mehwish Zahoor, and Adnan Afzal. "Cognitive Offloading to Cognitive Atrophy: A Neuropsychological Framework of AI Dependency, Automation Bias, and the Erosion of Critical Thinking." In *Psychological and Neurological Consequences of AI: Dependency, Laziness, and Reduced Critical Thinking*, pp. 211-236. IGI Global Scientific Publishing, 2027. https://doi.org/10.4018/979-8-3373-9484-8.ch008

[16] Al Ghraibeh, Bahaa. "Self-Esteem Development and Emotional and Behavioral Disorders." *Archives of Assessment Psychology* 15, no. 1 (2026): 12.

[17] Habibullah, Siti Noraida Mohamad. "Islamic Ethics: Guiding the Spiritual Development of Children." In *Children, Religion and Development*, pp. 36-50. Routledge. https://doi.org/10.4324/9781003608509-4

[18] Kurbiyanto, Aji, Desfa Yusmaliana, Fifin Fitriana, Eka Altiarika, and Fadillah Sabri. "Environmental ethics in Islamic teachings: Discussing ethical principles in Islamic teachings that emphasize environmental protection and preservation." In *Navigating Peace and Sustainability in an Increasingly Complex World*, pp. 15-34. Singapore: Springer Nature Singapore, 2024. https://doi.org/10.1007/978-981-97-8772-2_2

[19] Giray, Louie, Md Emdadul Islam, and John Arvin Glo. "AI hallucinations in academic writing: implications for research integrity." *Naunyn-Schmiedeberg's Archives of Pharmacology* (2026): 1-13. https://doi.org/10.1007/s00210-026-05494-4

[20] Slutskiy, Pavel. "AI, post-truth realities, and Thai students' information-seeking behavior." *Manusya: Journal of Humanities* 28, no. 1 (2025): 1-19. https://doi.org/10.1163/26659077-20252811

[21] Shuhari, Mohd Hasrul, Mohd Fauzi Hamat, Muhammad Nasri Hassan Basri, Wan Mohd Khairul Firdaus Khairuldin, Muhammad Rashidi Wahab, Engku Ahmad Zaki Engku Alwi, and Akila Mamat. "Concept of al-amanah (trustworthiness) and al-mas' uliyyah (responsibility) for human's character from ethical Islamic perspective." *J. Legal Ethical & Regul. Isses* 22 (2019): 1.

[22] Akhter, Naseem. "Equity, Responsibility, and Innovation: Integrating Islamic Values Into the Intersection of Media and Technology." In *Examining the Intersection of Technology, Media, and Social Innovation*, pp. 149-172. IGI Global Scientific Publishing, 2026. https://doi.org/10.4018/979-8-3373-5307-4.ch006

[23] Muis, Abdul. "Incorporating religious moderation values into the Islamic religious education curriculum in secondary education: a systematic review of goals, experiences, methods, and evaluation." *British Journal of Religious Education* 48, no. 2 (2026): 248-262. https://doi.org/10.1080/01416200.2025.2598619

[24] Alabdulhadi, Maali Mohammed Jassim, and Kalthoum Mohammed Alkandari. "Practices of Islamic education teachers in promoting moderation (wasatiyyah) values among high school students in Kuwait: challenges and obstacles." *Cogent Education* 11, no. 1 (2024): 2365577. https://doi.org/10.1080/2331186X.2024.2365577

[25] Subagia, I. W. "Roles model of teachers in facilitating students learning viewed from constructivist theories of learning." In *Journal of Physics: Conference Series*, vol. 1503, no. 1, p. 012051. IOP Publishing, 2020. https://doi.org/10.1088/1742-6596/1503/1/012051

[26] Berhanuddin, Muhamad Asyraf, Nurul Fasiha Mohamad, Afzan Adilah Ayoub, Marlena Kamaruzaman, Izyan Hazwani Baharuddin, and Ikmal Hisham Ismail. "Model to aid teaching of electronic apex locator use for endodontics in dental pre-clinical training–a uitm experience pilot study." *Compendium of Oral Science (CORALS)* 8, no. 1 (2021): 55-68. https://doi.org/10.24191/cos.v8i0.17483.

[27] Pisano, Massimo, Giuseppe Sangiovanni, Eugenio Frucci, Michela Scorziello, Giuseppina De Benedetto, and Alfredo Iandolo. "Evaluation of the accuracy of electronic apex locators in modern endodontics: An umbrella review." *Medicina* 60, no. 10 (2024): 1709. https://doi.org/10.3390/medicina60101709

[28] Bansal, Rajinder Kumar, Saurabh Gupta, Saru Dhir Gupta, Sangam Mittal, Gagandeep Kaur, Manish Sharma, and Seema Gupta. "Artificial Intelligence for Working Length Determination in Endodontics: A Systematic Review and Meta-Analysis." *Australian Endodontic Journal* (2026). https://doi.org/10.1111/aej.70081

[29] Khanagar, Sanjeev B., Majed Alharthi, Adel Asery, Muhammad Alalweet, Abdullah Aldobiyan, Meshal Alhayf, and Ahmed Binobaid. "Performance of artificial intelligence models designed as adjuncts for determining working length and apical landmark assessment in endodontic procedures: a systematic review." *Frontiers in Dental Medicine* 7 (2026): 1783828.https://doi.org/10.3389/fdmed.2026.1783828

[30] Aljamani, Sanaa, Iman AlMomani, Walid El-Shafai, Mousa Al-Akhras, AbdulAziz AlHaddad, and Rawan Abu Zaghlan. "Developing an AI-powered tool for radiographic feedback on working length determination in pre-clinical endodontic training." *Frontiers in Dental Medicine* 7 (2026): 1730454. https://doi.org/10.3389/fdmed.2026.1730454