

Conceptualizing the Influence of Artificial Intelligence on Students' Academic Integrity

Joshua Abah ABAH¹, Ubagu David Terungwa², Taurayi Willard Chinaka³

^{1,3}Department of Mathematics, Science and Technology Education, University of Zululand, South Africa

² Department of Computer Science Education, Joseph Sarwuan Tarka University, Makurdi, Nigeria

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ABSTRACT

Artificial Intelligence (AI) has evolved into an indispensable tool in education. AI usage in education permeates tutoring systems, automated essay scoring, plagiarism detection, virtual reality simulations, and chatbot-based learning support. This ubiquity has threatened the tenets of academic integrity upon which the entire education system hinges. This present conceptualization focuses on demystifying the concepts and conversations at the nexus of AI adoption and academic integrity. The conceptualization deeply explored the development of AI and the motivation for its deployment in education. A broad overview of academic integrity highlights the core values of honesty, trust, fairness, respect, responsibility, and courage. This was followed by a detailed exploration of the techniques used by students to avoid detection of AI-generated work. A focal discussion was then provided on the impact of AI-generated writing tasks on students' academic integrity, highlighting both opportunities and challenges. Next, the technical, procedural, educational, and collaborative strategies for detecting and minimizing the rate of AI-generated work among students were discussed. The Technology Acceptance Model and Academic Integrity Framework were discussed as conceptualizations' theoretical foundations. The conceptualization closes with a summary of recent empirical research emphasizing the need for further studies to explore all ramifications of the influence of AI on academic integrity. It is hoped that the conceptual clarity provided in this work will support the emerging scholarship on AI's influence on society.

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Corresponding Author:

Joshua Abah ABAH

Department of Mathematics, Science and Technology Education, University of Zululand, South Africa

Email: AbahJ@unizulu.ac.za ; abahjoshua@outlook.com

1. INTRODUCTION

The evolution and integration of Artificial Intelligence (AI) in teaching and learning have transformed education and assessment practices, offering new opportunities and challenges. AI technologies, ranging from intelligent tutoring systems, machine

learning, and natural language processing, have been increasingly adopted across educational settings worldwide.

Siemens and Gašević [1] and Gašević, Siemens, and Sadiq [2] noted that the evolution of AI in education dates back to early efforts in the 1950s and 1960s when scholars/researchers explored the potential of computers to support learning through programmed instruction and computer-assisted instruction (CAI). These early AI systems laid the foundation for more sophisticated applications of AI in education in subsequent decades.

One significant milestone in integrating AI into education is the design and deployment of intelligent tutoring systems (ITS). ITSs leverage AI techniques to provide personalized and adaptive instruction to learners, allowing for individualized learning experiences tailored to students' needs and unique preferences [3]. For example, systems like Carnegie Learning's Cognitive Tutor and the Assignment system have effectively improved student learning outcomes in mathematics [4], [5].

Moreover, AI-driven educational technologies have expanded beyond traditional tutoring systems to encompass multiple utilities, including automated essay scoring, plagiarism detection, virtual reality simulations, and chatbot-based learning support [6], [7], [8]. These technologies offer educators and learners valuable tools for enhancing engagement, facilitating learning, and improving educational outcomes. However, integrating AI into education raises ethical, social, and pedagogical concerns. Critics argue that AI-driven technologies may exacerbate educational inequalities, reinforce biases, and compromise student privacy and autonomy [9], [10]. Additionally, there is a need for careful consideration of the ethical implications of AI in educational assessment, particularly regarding issues of fairness, validity, and transparency [11].

The main concerns and criticism of AI usage in education surround the authenticity of student work. Student academic work is any written or submitted materials used to evaluate a student's knowledge, skills, or abilities in a course or subject area, including essays, reports, lab reports, presentations, and exams. Academic Integrity entails the ethical principles, norms, and values that underlay scholarly and other academic work, including honesty, fairness, trust, and responsibility. It involves upholding standards of honesty and ethical conduct in academic activities such as research, writing, teaching, and assessment.

This present discussion intends to conceptualize the underlying meaning and concerns in the usage of AI in education and how such usage influences academic integrity. The seeming dearth of understanding of the core issues at the heart of ongoing conversation on AI usage in education necessitates this conceptualization. First, the concept of artificial intelligence was explored in detail, and the motivation for AI deployment in education was discussed. An overview of academic integrity was then provided to underscore educationists' commitment to honesty, trust, fairness, respect, responsibility, and courage. The conceptualization of academic integrity duly considered behaviours that support academic integrity on the one hand and behaviours that undermine academic integrity on the other, along with the consequences of breaching academic integrity. This was followed by an exploration of techniques used by students to avoid detection of AI-generated work. The focal discussion was then provided on the impact of

AI-generated work on students' academic integrity, equally highlighting both opportunities and challenges. Next, the strategies for detecting and minimizing the rate of AI-generated work among students were discussed. The theoretical foundations for the conceptualization were then discussed with a detailed focus on the Technology Acceptance Model and Academic Integrity Framework. The conceptualization closes with a summary of recent empirical research emphasizing the need for further studies to explore all ramifications of the influence of AI on academic integrity.

2. OVERVIEW OF ARTIFICIAL INTELLIGENCE (AI)

The history of AI dates back to classical philosophical thinkers who began to describe human reasoning as a symbolic system. However, the field and concept of artificial intelligence (AI) as we know it today dates back to the mid-20th century, with its origins often attributed to the Dartmouth Conference hosted by John McCarthy, Nathaniel Rochester, Marvin Minsky, and Claude Shannon in 1956. The term "artificial intelligence" itself was first used by John McCarthy, a prominent computer scientist, at this conference, and this was widely accepted as the birth of AI scholarship [12]. McCarthy and his colleagues envisioned AI as the development of computer systems capable of carrying out tasks that would typically require human intelligence, such as reasoning, decision-making, visual perception, speech recognition, language translation, problem-solving, and learning [13]. The field of AI research was founded on the premise that human intelligence "can be so precisely described that a machine can be made to simulate it" [13]. Following this conference, AI research flourished in the 1950s and 1960s. Early successes included Allen Newell, Herbert Simon's General Problem Solver, and Joseph Weizenbaum's ELIZA program. However, the field experienced setbacks in the 1970s, a period known as the "AI winter," due to reduced funding and interest caused by unmet expectations [14], [15]. AI research rebounded in the 1980s with the development of expert systems and the increased adoption of the back-propagation algorithm for training neural networks [12], [16]. The 21st century has seen exponential growth in AI capabilities, driven by increases in computational power, the availability of big data, and advancements in machine learning algorithms.

According to Duggal [17], Artificial Intelligence (AI) is the simulation of human intelligence in computing machines designed to reason like humans and mimic their actions. Artificial intelligence also refers to the feigning of human reasoning processes by machines, typically through computer systems. The term may also be applied to any machine that exhibits features associated with the human mind, such as critical thinking, problem-solving, and learning. AI utilizes huge amounts of data with swift, iterative, and procedural processing and intelligent algorithms, allowing the system to learn automatically from patterns or features in the data.

AI can be grouped into two broad types: narrow AI and general AI. Narrow AI, sometimes called weak AI, is designed to carry out unique tasks. Examples include voice assistants like Siri or Alexa and image recognition software. General AI, or strong AI, refers to hypothetical AI that can carry out any intellectual job that a human can do. As of now, general AI remains a theoretical concept [18]. Over the years, AI technologies have

advanced rapidly, enabling machines to perform tasks that previously required human intelligence. From natural language processing and image recognition to autonomous decision-making, AI has found targeted usages in various fields, including transportation, healthcare, finance, and education [19].

Since its inception, AI has progressed appreciably, with improvements in machine learning, natural language processing, and robotics contributing to its development. Machine Learning (ML), a subset of AI, focuses on designing and developing algorithms and statistical models that computer systems use to execute jobs without explicit instructions. Instead, they rely on patterns and inference. Deep Learning, a subset of ML, uses artificial neural networks with multiple layers to analyze various data factors [20]. Natural Language Processing (NLP), another significant area of AI research and application, enables computers to understand, interpret, and generate human language. This technology powers machine translation services, chatbots, and voice assistants. Recent advancements in NLP, such as the development of large language models like GPT-3, have shown remarkable capacities to generate human-like text [21].

In modern times, AI has gained increased attention and adoption across various domains, including education. AI technologies hold promise in education through their diverse applications for transforming teaching, learning, and administrative processes. For instance, AI-driven educational platforms furnished individualized learning experiences, adaptive tutoring, automated grading, and feedback generation [22]. This saves teachers time and also allows for more frequent assessments. A study by Shermis and Hamner [23] found that automated essay-scoring systems outperformed human raters in evaluating student writing. AI Intelligent tutoring systems, for example, deploy AI algorithms to dispense individualized instruction and feedback to students [3]. This approach allows for a tailored educational experience that meets each student's needs. One notable example is the MATHia platform, the AI-based tutor developed by Carnegie Mellon University, which uses AI to give individualized math instruction [24]. It is as effective as human tutoring in some contexts, significantly improving student performance [3]. Educational chatbots use natural language processing to engage with learners, answer questions, and provide support [25]. These technologies are equally used to create interactive language learning applications that can engage in conversations with learners, correct pronunciation, and provide instant feedback on grammar and vocabulary usage. Duolingo, a popular language learning app, uses AI to personalize lessons and effectively improve language proficiency [26].

Additionally, AI-driven data analytics tools help educators and teachers to analyze student performance data and identify areas for improvement. AI is also enhancing educational accessibility and inclusion. For students with disabilities, AI-powered tools can provide real-time captioning, text-to-speech conversion, and even sign language translation. Furthermore, AI can help identify students at risk of dropping out or needing additional support, allowing for early intervention. A study by Lakkaraju et al. [27] demonstrated the effectiveness of machine learning models in predicting and preventing student dropouts.

However, integrating AI into education also raises questions about equity, accessibility, and the role of human educators [22]. Similarly, ethical considerations, such as data privacy, algorithmic/training bias, and the impact on human labour, remain important areas of discussion and research within educational technology.

AI systems are used in healthcare for disease diagnosis, drug discovery, and individualized treatment plans. For instance, IBM's Watson for Oncology has been trained to analyze patient medical records and help doctors develop treatment plans for cancer patients [28]. AI's impact on healthcare extends beyond IBM's Watson. In medical imaging, AI algorithms detect abnormalities in X-rays, Magnetic Resonance Imaging, and Computerised Tomography scans, often with accuracy and consistency comparable to or exceeding that of human radiologists. For instance, one unique research showed that an AI system could detect breast cancer in mammograms more accurately than expert radiologists [29]. In drug discovery, AI is fast-tracking the detection of potential new medications. Companies like Atomwise use AI to predict how different molecules will bind to target proteins, potentially streamlining drug discovery, especially when evaluating massive libraries of chemical compounds. During the COVID-19 pandemic, AI tools were used to rapidly screen existing drugs for potential efficacy against the SARS-CoV-2 virus, accelerating research into effective treatments and speeding up trials by prioritizing promising candidates [30], [31]. AI is also being applied in personalized medicine. By analyzing large datasets of genetic information and medical records, AI systems can help predict an individual's risk of developing certain diseases and suggest personalized treatment plans. For example, researchers have developed AI models that can predict a patient's response to specific cancer treatments based on their genetic profile. This approach personalizes healthcare and helps identify the most effective interventions for complex diseases [30].

In the field of autonomous vehicles, AI plays a crucial role. Tesla, Waymo, and Uber use AI algorithms for object detection, path planning, and decision-making in their self-driving car technologies. These systems process data from various sensors to navigate roads safely [32]. Despite its advancements, the rapid proliferation of AI technologies has raised ethical concerns regarding issues such as bias, fairness, transparency, privacy, job displacement, accountability, and the potential misuse of AI technology, which sum up the subjects of ongoing debate and research. Researchers and policymakers are continuously contending with how to ensure that AI systems are built and deployed in a manner that aligns with ethical principles and respects human values [33]. There are also philosophical questions about the nature of intelligence and consciousness that arise as AI systems become more sophisticated [34].

The future of AI is likely to see continued integration into various areas of our lives. Potential developments include advanced personal assistants, improved healthcare diagnostics and treatments, and smarter cities with AI-optimised resource management. However, experts disagree on the timeline for achieving general AI, with estimates ranging from decades to centuries [35]. As AI continues to advance, its role in education is expected to grow, offering new opportunities for personalized learning, adaptive assessment, and administrative efficiency, as its development and implementation must be

approached carefully considering its societal impacts. This includes developing robust ethical frameworks, ensuring transparency in AI systems, and fostering interdisciplinary collaboration to address the complex challenges posed by AI, aiming to harness AI's potential to benefit humanity while mitigating its risks [36].

Researchers may consider exploring new frontiers in AI, including the design of artificial general intelligence (AGI), which aims to create computerized machines that possess human-level intelligence across a wide range and different levels of tasks. Additionally, interdisciplinary approaches combining AI with fields such as neuroscience, cognitive science, and philosophy are expected to yield deeper insights into the nature of intelligence and consciousness [37].

3. MOTIVATIONS FOR ARTIFICIAL INTELLIGENCE USE IN EDUCATION

Due to the increasing use of AI, various AI-enabled technologies are revolutionizing traditional educational practices by providing personalized support, instant feedback, and immersive learning experiences. Several factors that motivate teachers and students to employ the use of artificial intelligence in their academic work include the following:

- a. **Adaptive Learning Systems:** These systems utilize AI algorithms to personalize the learning experience for individual learners based on their learning preferences, strengths, and weaknesses. These systems analyze student performance data and adjust the pace, content, and instructional strategies to optimize learning outcomes. As a result, these systems help address the diverse needs of students in various subject areas through tailored instruction and support, as well as adaptive learning [38]. In Nigeria, for instance, Pass.ng is an adaptive learning platform designed to help students prepare for standardized exams, including JAMB, WAEC, and NECO. The platform uses AI algorithms to analyze students' practice test results and adapt the difficulty level of subsequent questions. It also provides personalized feedback and study recommendations, helping students focus on areas they need the most improvement.
 - b. **Intelligent Tutoring Systems (ITS):** Intelligent tutoring systems leverage AI techniques to provide interactive and personalized tutoring to students. These systems can simulate one-on-one tutoring sessions, offering immediate feedback, adaptive scaffolding, and customized learning paths [3]. ScholarX is an example of an EdTech company in Nigeria that offers an intelligent tutoring system to support students preparing for national exams like WAEC and JAMB. The platform uses AI to provide personalized tutoring, practice questions, and feedback. ScholarX tailors its tutoring sessions to address specific weaknesses and improve exam readiness by analyzing students' performance and learning behaviour. Through this modelling of students' knowledge, skills, and misconceptions, ITSs help identify areas for improvement and deliver targeted interventions to support learning.
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- c. **Automated Essay Scoring (AES):** Automated essay scoring systems use AI algorithms to evaluate and score written responses to essay prompts. These systems analyze various linguistic features, such as grammar, syntax, vocabulary, and coherence, to assess the quality of students' writing. AESs offers rapid and consistent grading, providing valuable feedback to students and instructors. While AESs cannot fully replace human evaluators, they can augment the grading process and reduce the burden on educators [39].

 - d. **Virtual Reality (VR) and Augmented Reality (AR):** Virtual reality technologies and systems are increasingly integrated into educational settings to create immersive and interactive learning experiences. AI-driven VR and AR applications can mimic real-world environments, scenarios, and experiments, allowing students to explore complex concepts in science, engineering, history, and other disciplines. These technologies enhance student engagement, motivation, and retention by providing hands-on learning experiences [40].

 - e. **Chatbots and Virtual Assistants:** Chatbots and virtual assistants powered by AI technologies are used in education to provide instant support, information, and guidance to students and educators. These conversational agents can answer questions, offer recommendations, and assist with administrative tasks, such as course registration and scheduling [41]. PrepClass is an example of a Nigerian online tutoring platform that uses chatbots and virtual assistants to enhance student learning. The AI-driven chatbot assists students in finding tutors, scheduling lessons, and accessing study materials. It provides instant answers to frequently asked questions and offers personalized study recommendations based on students' inquiries and learning progress. Chatbots enhance accessibility and convenience, enabling users to access resources and support services anytime.

 - f. **Speech Recognition and Natural Language Processing:** According to Litman & Forbes-Riley [42], AI-driven speech recognition and natural language processing (NLP) technologies facilitate more accessible learning environments. These tools can transcribe lectures in real time, provide language translation, and assist in teaching languages and communication skills. NLP can also be used in chatbots to enhance interactive learning experiences and provide real-time assistance to students.

 - g. **Remote Proctoring and Exam Security:** AI technologies are being employed in remote proctoring and exam security to ensure the integrity of online assessments. These systems use AI to monitor test-takers through webcams, analyze their behaviour, and detect suspicious activities that may indicate cheating. This ensures that online examinations are conducted fairly and securely.
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- h. **Learning Analytics and Predictive Analytics:** Learning analytics involves using AI to collect, analyze, and interpret data about learners and their contexts to understand and optimize learning processes and environments [43]. Predictive analytics, a subset of learning analytics, uses historical data to predict future outcomes, such as student performance and retention. These tools can identify at-risk students, personalize learning experiences, and inform instructional strategies.
 - i. **Personalized Learning Pathways:** Personalised learning pathways leverage AI to create customized educational experiences that cater to individual students' needs, preferences, and learning styles. These systems analyze data from various sources, such as student performance, interests, and behaviour, to develop tailored learning plans that optimize engagement and achievement [24].
 - j. **Intelligent Content Creation:** AI is also used to create intelligent content, such as interactive textbooks, digital course materials, and customized learning modules. These AI-generated resources can adapt to students' learning paces and styles, making content more engaging and accessible. AI can also automate the creation of quizzes, summaries, and other educational resources, saving educators time. A practical example is ULesson, an EdTech start-up in Nigeria that uses AI to create interactive and adaptive educational content for primary and secondary school students. The platform offers video lessons, quizzes, and practice exercises tailored to the Nigerian school curriculum.
 - k. **Gamification and AI-Driven Game-Based Learning:** AI enhances gamification and game-based learning by creating personalized gaming experiences that adapt to learners' progress and preferences. These educational games can increase motivation and engagement by incorporating AI-driven elements that adjust the difficulty level, provide personalized feedback, and offer rewards based on individual performance.
 - l. **AI-Powered Assessment Tools:** These tools go beyond traditional testing methods by providing more dynamic and formative assessments. These tools can evaluate a broader range of student abilities, such as critical thinking, problem-solving, and creativity. They use AI algorithms to analyze student responses in real time and offer immediate, detailed feedback to students and educators. Practically, within the Nigerian context, Testify is a Nigerian-based platform that provides AI-powered assessment tools for educators. It enables teachers to create, administer, and grade exams online. The system uses AI to automatically score multiple-choice questions and essays, provide detailed analytics on student performance, and identify areas where students need improvement, thus helping teachers tailor their instruction to meet individual student needs.
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m. **Scalability and Cost-Effectiveness:** AI systems have the potential to reach many students at a lower cost compared to traditional human-led instruction, making education more accessible and affordable.

The types of AI technologies in education highlighted above represent just a few examples of how AI-based systems are being leveraged to enhance teaching and learning experiences. However, it is also important to note that aside from the increasingly prominent role AI plays in education due to continuous evolution, its implementation also raises concerns regarding privacy, equity, bias, and the potential replacement of human endeavours, thus requiring careful consideration and ongoing research to ensure that AI is deployed ethically and responsibly in educational settings. These concerns are better addressed within the ambit of academic integrity.

4. OVERVIEW OF ACADEMIC INTEGRITY

Academic integrity can be viewed as the global academic system's moral code or ethical policy. The term was made popular by Rutgers University's Professor Donald McCabe, who is considered the "grandfather" of academic integrity. Other prominent academic integrity scholars, proponents, and advocates are Thomas Lancaster (UK), Tracey Bretag (Australia), Tomáš Foltýnek (Czech Republic), Cath Ellis (Australia), Sarah Elaine Eaton (Canada), and Tricia Bertram Gallant (US). As a fundamental educational principle, academic integrity entails honesty, trust, fairness, and responsibility in scholarly endeavours [44]. It involves upholding ethical standards and adhering to principles of integrity, honesty, and transparency in all aspects of academic work, including research, report writing, teaching, and assessment. This aligns with the perspective of La Trobe University [45], defining academic integrity to imply practising those values by being honest in the academic work one does within the academia, taking responsibility for learning, being fair to others, and following the conventions of ethical scholarship.

The International Center of Academic Integrity (ICAI) gives an authoritative definition of academic integrity. ICAI [46] defines academic integrity as a commitment to six fundamental values: honesty, trust, fairness, respect, responsibility, and courage. According to ICAI, these values serve as the foundation for ethical behaviour in academic communities, enabling these communities to translate ideals into action essential for cultivating a fair and trustworthy academic environment. According to Japanese perspectives on academic integrity for Turnitin, Professor Tosh Yamamoto of Kansai University describes academic integrity thus: "Academic integrity is, I believe, a philosophical mindset to reflect the learning mind to the mirror of honesty, sincerity, contribution to the future society, and also scientific attitude and ethics and morals" [47].

Central to academic integrity is the notion of academic honesty, which entails the proper attribution of sources, the avoidance of plagiarism, and the ethical use of information and ideas [48]. Students are expected to produce original work, acknowledge the contributions of others, and maintain the integrity of their academic achievements. Academic integrity is upheld through various institutional policies, ethical frameworks, codes of conduct, and academic regulations that outline expectations for student behaviour

and consequences for academic misconduct [49]. Academic integrity is practised in most educational institutions. These institutions play a vital role in promoting a culture of academic integrity by fostering a supportive learning environment, providing resources for academic skill development, and offering guidance on ethical practices [50].

Academic integrity is often noted in mission statements, policy briefs, research ethics guidelines [51], [52], [53], procedures, and honour codes. Presently, it is also being taught in research ethics classes and is being noted in the curriculum. Many higher education institutions now have links on their websites, leading to information on academic integrity and defining what the term means to their specific institution. An honour pledge, sometimes created before an assignment that students sign, can help improve the culture of academic integrity [54]. Many institutions have initiated a more inclusive approach to inspiring academic integrity by creating Student Honor Councils [55], [56] and playing a more active role in making students aware of the consequences of academic dishonesty. However, maintaining academic integrity in the digital age presents new challenges and complexities. The widespread availability of online resources, digital technologies, and collaborative tools has made it easier for students to engage in academic dishonesty, such as plagiarism, cheating, and unauthorized collaboration [55]. Moreover, the pressure to excel academically, coupled with the perceived leniency of consequences for misconduct, can contribute to a culture of cheating and undermine the principles of academic integrity [57].

Educators and institutions have implemented strategies and technologies to promote academic integrity and deter academic misconduct in response to these challenges. These may include educational interventions on ethical scholarship, the use of plagiarism detection software, the development of clear academic integrity policies, and the adoption of alternative assessment methods that emphasize critical thinking and creativity [53], [58]. Overall, academic integrity is essential for maintaining educational institutions' credibility, reliability, and reputation and ensuring the integrity of academic credentials. By fostering a culture of honesty, trust, and responsibility, educators and institutions can uphold the principles of academic integrity and promote ethical conduct among students, scholars, and researchers.

4.1. Behaviours that Support Academic Integrity

Generally, behaviours that support academic integrity encompass a range of practices and attitudes that reflect a commitment to ethical principles in educational settings. These behaviours are critical for maintaining a culture of respect, responsibility, honesty, trust, fairness, and courage, as outlined by the International Center for Academic Integrity [46]. These behaviours are briefly highlighted here.

- a. Honesty:** Honesty is the pillar of academic integrity. It involves being truthful in all aspects of academic work, including class tasks, assignments, examinations, and research. Students who practice honesty avoid plagiarism, cheating, and any form of misrepresentation of their work. According to McCabe and Pavela [59], honest
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students acknowledge the sources of their ideas and give credit where it is due, ensuring that their academic contributions are their own.

- b. Trust:** Trust is built when students, faculty, and institutions consistently demonstrate integrity. Trustworthy behaviours include submitting original work, accurately reporting data, and following institutional guidelines for academic conduct. Eaton and Edino [60] emphasize that trust fosters a positive learning environment where academic freedom and the open exchange of ideas can flourish.
- c. Fairness:** Fairness involves adhering to clear and consistent standards of academic conduct. This includes understanding and following the rules regarding citations, avoiding any form of academic dishonesty, and treating all members of the academic community with equity. Bretag [48] discusses how fairness in assessment and feedback practices helps maintain academic integrity by ensuring that the same criteria judge all students.
- d. Respect:** Respect in academic settings involves valuing the contributions and rights of others. Respectful behaviours include properly acknowledging the work of others, collaborating ethically, and engaging in constructive and honest communication. Respect for intellectual property is crucial, as highlighted by Pecorari and Petrić [61], who argue that recognizing other scholars' efforts helps build a respectful academic community.
- e. Responsibility:** Responsibility entails accountability for one's actions and understanding the consequences of academic dishonesty. Students who take responsibility for their learning proactively seek help when needed, manage their time effectively, and understand the importance of academic integrity. Fishman [62] notes that responsibility also extends to creating an environment discouraging dishonest behaviours through education and support.
- f. Courage:** Courage involves standing up for what is right, even in the face of peer pressure or potential personal loss. This might include reporting academic misconduct, resisting the temptation to cheat, and advocating for a culture of integrity. According to Lang [63], students who demonstrate courage in maintaining academic integrity contribute significantly to the ethical standards of their institutions.
- g. Encouraging Integrity through Institutional Support:** Institutions play a crucial role in supporting academic integrity by creating policies, providing resources, and fostering an environment that promotes ethical behaviour. Bretag [48] emphasizes the importance of institutional commitment to academic integrity through clear policies, educational programs, and consistent rules enforcement.

More specifically, the Australian Government Tertiary Education Quality and Standards Agency (TEQSA) [64] emphasizes that students can grow a culture of academic

integrity by acknowledging the source of the information they use, clearly citing or referencing the source, sitting their examinations and submitting their work; accurately reporting research results/findings and abiding by established research policies; using information appropriately according to copyright and privacy laws; and doing the ‘right thing’ by acting ethically, even when they face difficulties.

4.2. Behaviours that Undermine Academic Integrity

Student behaviours that undermine academic integrity encompass a range of actions that violate ethical standards and compromise the integrity of scholarly work. Sometimes, students mistakenly believe that these behaviours do not have consequences. However, such behaviours that breach academic integrity, according to The University of Sydney [66] and TEQSA [64], include:

- a. Plagiarism:** Plagiarism entails presenting someone else’s works, ideas, or words as one’s own without proper attribution or acknowledgement of the source/owner of the work. This includes copying text from any sources, for example, material in hard copy (books, assignments journals, and theses), soft copy (internet write-ups, email attachments, and e-journals), other digital formats (audio-visual, and MP3s) and live presentations (lectures, slides, and speeches) without citation. It does not matter whether the act is done intentionally or unintentionally, whether one changes the words to make them theirs or copy and paste. One appropriate thing is that when someone else’s work, thoughts, and ideas are to be used, the source material must be referenced. Failure to do so undermines the originality and credibility of academic scholarship.
 - b. Inappropriate Citation Practices:** Inappropriate citation practices also constitute plagiarism as they involve misrepresenting the contributions of others or manipulating citations to inflate the significance of one’s work, regardless of the medium in which the original material was published. This may include citing irrelevant sources, paraphrasing without acknowledgement, omitting relevant sources that contradict one’s argument, or engaging in citation stacking like self-plagiarism (reusing one’s work without citation) or excessive self-citation and mutual citation with colleagues).
 - c. Unauthorised Collaboration:** Unauthorised collaboration involves working together on assignments, projects, or examinations without the instructor's permission. This may include sharing answers, collaborating on individual assignments, or submitting group work as individual work [48]. Unauthorized collaboration undermines the principles of individual achievement and fair assessment.
 - d. Recycling or Resubmitting Work:** Recycling entails submitting (or resubmitting) scholarly work that has already been graded without your teacher’s permission. For example, submitting a report, in part or whole, that you were graded on in a first-year class as part of your work in a third-year class is considered recycling. Discuss this with your teacher first to build on your previous work.
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- e. Fabrication and Falsification of Information:** Fabricating or falsifying data involves altering research-focused assessment tasks, such as experimental research or interview data, to support a predetermined conclusion. It can also include inventing data sources that never existed, evidence, or ideas by citing publications that are incorrect or that do not exist. This unethical practice undermines the validity and reliability of scientific research and violates the academic community's trust, resulting in serious consequences for both individuals and institutions.
- f. Collusion:** Collusion entails engaging in illegitimate cooperation with one or more other students to complete assessable work inadvertently. This is different from working on group tasks that teachers set. Instances of illicit cooperation include working with friends to write an essay or report meant to be an assessable individual piece of work. It can also include inadvertently sharing written tasks like reports, essays, quizzes, or test questions and answers with other students. Illicit cooperation can unfairly give a student or group of students an advantage over others. Students should also never share their academic work with others as there is a risk that the person you share it with could upload or sell it to an illegal commercial cheating service or circulate it to others.
- g. Exam Cheating:** Cheating on exams involves dishonest behaviours to gain an unfair advantage over others. According to McCabe *et al.* [59], several different behaviours that constitute exam cheating include writing 'cheat notes' on one's body, copying or attempting to copy from other students' work, communicating with other learners or people inside or outside the examination venue while the exam is still in progress, using unauthorized materials or devices such as smartphones or textbooks into exams to access information related to the examination while it is in progress, or obtaining examination questions in advance.
- h. Contract Cheating and Impersonation:** Contract cheating is a type of illegal commercial cheating that involves outsourcing academic work to third parties who complete assignments, theses, dissertations, or examinations on behalf of students for a fee. Contract cheating undermines the educational process by circumventing learning and assessment objectives. Actions that support illegal contract cheating services are also considered breaches of academic integrity. These include buying completed homework from a tutoring or ghost-writing company; asking someone else to write part or all of an assignment for one's academic tasks; paying a private tutoring company to coach one on how to complete an assignment; submitting 'model' assignment reports provided by a private tutor or tutoring company; getting someone to sit an examination for you; sitting an examination for someone else; buying, selling or swapping completed tasks or assignment answers via 'sharing' websites or social media platforms like Facebook, WhatsApp, and Telegram, and outright contracting of postgraduate research project writing.
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- i. Use of Generative Artificial Intelligence and Writing Tools:** The rise of generative artificial intelligence (AI) and writing tools, such as OpenAI's GPT-3, GPT-4, and other similar tools, pose significant challenges to academic integrity as it is changing the way schools think about assessment. Generative AI is a branch of AI that takes in much information about something and then uses that information to create new content that is similar but original. Students employ these tools to generate coherent and sophisticated text, which they use dishonestly to complete their assignments and academic work. This behaviour undermines the fundamental values of academic integrity outlined by the International Center for Academic Integrity (ICAI) [46]. While the many benefits that these tools may bring are acknowledged, the use of AI tools by students to create or modify assessable work is strongly discouraged for the following reasons:
- i. Using AI tools to produce essays, written reports, and other assignments allows students to submit such works as their own without proper attribution. This practice is a direct violation of the value of honesty. As Walker, King, and Brookes [65] discuss, the ease of access to AI-generated content increases the temptation for students to commit plagiarism, as the tools can produce high-quality text that is difficult to detect using traditional plagiarism detection methods.
 - ii. Educators often rely on the authenticity of students' submissions to accurately assess their understanding and capabilities. When students use AI-generated content, it creates a false representation of their knowledge and skills, and this weakens the educational process and diminishes the trust essential for a healthy academic environment. As Eaton and Turner [66] highlight, educators' trust in students is compromised when the authenticity of student work cannot be guaranteed.
 - iii. The increased use of generative artificial intelligence (GenAI) applications in education resulted in a global reconsideration of policies and procedures relating to plagiarism and other breaches of academic integrity [67], [68], [69]. The incursion of large language models (LLMs) has impacted discussions of plagiarism and what constitutes ethical student academic work. Although some scholars claim that GenAI contributes to an increase in academic misconduct [70], [71], others argue that ethical use of GenAI tools does not automatically constitute a breach of academic integrity [72], [73]. There is no consensus about whether GenAI is responsible for decreasing or increasing academic integrity. Notwithstanding these perspectives, generative AI tools can give students an unfair advantage over peers who adhere to academic integrity principles. This violates the value of fairness, as not all students have equal access to these tools or choose to use them unethically. Bretag *et al.* [48] argue that the inequitable use of AI technologies in academic work creates a disparity in student performance and can lead to unfair academic outcomes.
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- iv. Using AI-generated content without proper citation or acknowledgement disrespects the intellectual property rights of the creators of these tools. It disregards the efforts and contributions of those who develop and refine AI technologies. Pecorari and Petrić [61] emphasize the importance of respecting intellectual property as a cornerstone of academic integrity, and using AI without acknowledgement contradicts this principle.
- v. Students who rely on AI to complete their assignments are dodging their responsibility to engage with the learning material and develop their skills. This behaviour undermines the educational process, as students do not genuinely engage with the content or improve their knowledge. Fishman [62] points out that taking responsibility for one's learning is a critical component of academic integrity, and using AI to avoid this responsibility is detrimental to personal and academic development.
- vi. Using AI-generated content to complete assignments demonstrates a lack of courage to face academic challenges honestly. It reflects a willingness to take shortcuts rather than putting in the effort to learn and succeed legitimately. Lang [63] argues that courage in academic settings involves tackling difficult tasks with integrity, and using AI to cheat is a failure to exhibit this bravery.

Considering that AI has come to stay and, to a large extent, is now part of today's life, it is only appropriate for institutions to devise a means to accommodate it positively. For example, students should see these tools as ethically acceptable if expressly permitted to do so. This means that the illicit use of AI tools in completing writing tasks would be considered a breach of academic integrity, and submitting the generated content for assessment must be treated as contract cheating. If AI-based writing assistance tools (grammar checkers, translators, paraphrasing tools, analytics, reference generators) are allowed, then the students should be advised to acknowledge this in their work in a footnote or reference section.

5. CONSEQUENCES FOR BREACHING ACADEMIC INTEGRITY

An academic integrity breach involves any conduct that threatens the integrity of an institution's academic work and scholarly standards. Students and researchers may face various disciplinary penalties for breaching academic integrity and indulging in 'academic misconduct' or 'academic dishonesty'. It is often thought that culprits rarely get caught. However, research shows that teachers and academic institutions can detect breaches of academic integrity, and students doing the wrong thing get caught [74]. Furthermore, ways of catching cheats are constantly improving. Consequences for breaching academic integrity vary depending on the severity of the violation, institutional policies, and disciplinary procedures. These consequences are designed to uphold the principles of fairness, deter future misconduct, and maintain the credibility of academic qualifications. These consequences encompass:

- a. **Academic Penalties:** Academic penalties may include receiving a poor grade for the assignment writing task, of course, having the assignment or exam in question invalidated, or being required to redo the assignment under supervision. These penalties aim to hold students accountable for their actions and ensure that academic standards are upheld.
- b. **Disciplinary Action:** A consequence of breaching academic integrity may involve formal investigations, hearings, and sanctions imposed by academic or disciplinary committees. Depending on the severity of the violation and institutional policies, disciplinary action may range from academic warnings or probation to suspension or expulsion from the institution [49].
- c. **Damage to Reputation:** Breaching academic integrity can have long-term consequences for a student's reputation and future career prospects. Keith-Spiegel and Tabachnick [75] assert that instances of academic misconduct may become part of a student's academic record, affecting their opportunities for employment, graduate school admissions, or professional licensure.
- d. **Legal Ramifications:** In extreme cases, academic misconduct may result in legal action, particularly if it involves violations of copyright law, intellectual property rights, or fraud. Legal consequences may include civil lawsuits, criminal charges, or fines imposed by regulatory authorities.
- e. **Ethical Repercussions:** Breaching academic integrity can have ethical repercussions beyond immediate consequences. It undermines the values of honesty, integrity, and trust fundamental to scholarly inquiry and the academic community. Fishman [62] posits that students who engage in academic misconduct may experience guilt, shame, or regret, impacting their personal and professional development.

In addition to the risk of the above consequences, students who have breached academic integrity may repeat the assessment task or unit of study, fail the writing task, unit of study, or course, and face criminal charges. Such students are left to contend with the impact of their actions on their relationships with other peers, family and friends, and future careers. The repercussions of their actions may even cause them to suffer financial loss or even lose their student visa (in the case of overseas studies) or their admission through expulsion from the institution.

6. TECHNIQUES FOR AVOIDING DETECTION OF AI-GENERATED WORK

Students may employ various techniques to ensure their AI-generated content goes undetected. These methods range from subtle alterations to more sophisticated approaches, aiming to make AI-generated work appear original and human-authored. Among these techniques are:

- a. **Manual Editing and Rewriting:** After generating content using AI, students resort to manually editing and rewriting portions of the text to match their writing style better. This often involves changing sentence structures, adjusting vocabulary, and adding personal anecdotes or reflections.
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- b. **Paraphrasing Tools:** Students may employ paraphrasing tools such as Grammarly, Quillbot, paraphraser.io, or other online tools to rephrase AI-generated content. These tools help alter the text enough to evade plagiarism detection software, which often relies on identifying exact or near-exact matches.
- c. **Spinning Content:** Content spinning involves using software to rewrite AI-generated text automatically. The spinner changes words and phrases with synonyms and reorders sentences to produce a new version structurally different from the original. A common spinning tool is Spinbot, an online tool that uses AI to rephrase/paraphrase sentences, paragraphs, and essays with human-level quality and speed. Like Grammarly, Quillbot, Paraphraser.io, and other notable online tools, Spinbot has other features, including grammar checking, paraphrasing, and summarising.
- d. **Combining Multiple Sources:** To make AI-generated work less detectable, students might combine content from multiple AI outputs or mix AI-generated text with their writing. This technique creates a more varied and less uniform document that is harder to identify as AI-generated.
- e. **Using Obfuscation Techniques:** Obfuscation involves altering certain text parts, such as replacing certain words with synonyms, adding extra spaces, or using invisible characters to confuse plagiarism detection software.
- f. **Altering Metadata:** Students tend to alter the metadata of digital documents to avoid detection. This can include changing the document's author name, creation date, and other metadata properties that can be checked for consistency and originality.
- g. **Human-AI Hybrid Writing Technique:** In this approach, students start with an AI-generated draft and then substantially revise it to include their ideas, analysis, and perspectives. This blend of AI-generated and human-authored content can make it difficult for detection tools to pinpoint the AI's contribution.
- h. **Consulting AI to Avoid Detection:** Students use AI to generate content and suggest ways to avoid detection. Advanced AI models often provide tips on rewriting or altering text to evade plagiarism detectors based on their understanding of these systems.
- i. **Layering Human Input:** Students may layer significant human input over AI-generated content by adding extensive personal insights, reflections, and contextual information uniquely tied to their experiences or specific course materials, making the work appear more authentic.

To sum up, students can access many techniques to circumvent the detection of AI-generated content in their academic work to make AI outputs appear original and human-authored. Some students even employ AI to receive suggestions on better obfuscating AI-generated text. As AI language models advance, new and more sophisticated evasion techniques will likely emerge, making it increasingly challenging for educational institutions to identify and address academic misconduct involving AI. Ultimately, this arms race between detection tools and evasion tactics highlights the need for a well-thought approach that combines technological solutions with robust academic integrity policies, educational interventions, and a strong culture of ethical scholarship.

Consequently, fostering a deep understanding of the principles of academic integrity among students may be the most effective long-term strategy to uphold the values of original and honest work, even in the face of powerful AI writing assistants.

7. IMPACT OF AI-GENERATED WORK ON STUDENTS' ACADEMIC INTEGRITY

Integrating AI-generated work in education presents opportunities and challenges, particularly concerning academic integrity. There are enormous *opportunities* that AI-generated work presented to the content generators, some of which include:

- a. **Improved Grades and Performances:** AI-powered tools potentially help students achieve better grades by providing well-written and well-researched content. In addition, these tools help with personalized learning, automated feedback, and optimized study plans.
- b. **Increased Efficiency and Productivity:** AI tools potentially increase efficiency and productivity in certain aspects of academic work, such as research, data analysis, or task automation, freeing up time for more strategic and creative student work.
- c. **Better Understanding and Insights:** Students gain deeper insights into complex topics through AI tools. AI systems can provide valuable insights and explanations into complex topics; for example, AI-powered analytics and visualizations could potentially enhance a student's understanding of a subject.
- d. **Curiosity and Exploration:** Due to the possibilities of AI that abound, students are intrigued by AI's potential, and this sparks curiosity and encourages further exploration of topics by providing new perspectives or generating novel ideas.

On the other hand, the impact of AI-generated work does not come without *challenges* that such AI-powered work poses, encompass the following:

- a. **Facilitation of Plagiarism and Academic Misconduct:** Students may use AI tools such as text generators and automated essay writers to produce essays, assignments, or exam responses without proper attribution, passing off AI-generated content as their work, which is a violation of academic honesty principles. This can facilitate plagiarism and academic misconduct, raising significant academic integrity concerns. Improving grades achieved through such means would be considered unethical and undermine the principles of fairness and accurately assessing a student's knowledge and skills.
 - b. **Challenges in Detection:** AI-generated content can be sophisticated and difficult to distinguish from human-written work, posing challenges for traditional plagiarism detection software. This increases the difficulty for educators in identifying academic dishonesty and ensuring the authenticity of student submissions.
 - c. **Impact on Learning Outcomes:** Relying on AI-generated work can negatively impact students' learning outcomes in that when students submit AI-generated assignments, they miss out on the learning process involved in researching, writing, and critically engaging with the material. This can lead to gaps in knowledge and skills essential for
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their academic and professional development. Using AI-generated content as a substitute for one's original work constitutes a breach of academic integrity.

- d. **Impact on Academic Skills Development:** Insights gotten from AI, when used as a replacement for a student's critical thinking, analysis, and synthesis of information rather than as supplementary resources or learning aids, undermines the development of essential academic skills and the demonstration of genuine understanding.
- e. **Erosion of Ethical Standards:** Using AI-generated work without proper acknowledgement can erode ethical standards and undermine the values of honesty, integrity, and accountability in education. Students who engage in such practices may avoid academic responsibilities, which can have long-term implications for their personal and professional integrity. On the contrary, any gains made by students academically should not come at the expense of compromising ethical standards and academic values.

From the foregoing, while AI tools can offer valuable assistance and augmentation in the academic realm, it is essential to maintain a clear boundary between appropriate use and academic misconduct. Academic integrity principles emphasize the importance of original work, proper attribution, and the development of critical thinking skills. Any potential benefits of AI-generated work should be carefully weighed against the risks of undermining these fundamental academic honesty and integrity principles. As a helpful remedy, educational institutions should provide clear guidelines and policies regarding the ethical use of AI tools in academic settings and promote digital literacy and academic integrity education to ensure that students understand the potential pitfalls and maintain high standards of ethical conduct.

8. STRATEGIES FOR DETECTING AND MINIMISING THE RATE OF AI-GENERATED WORK

The strategies for detecting and drastically minimizing the possibilities for AI-generated work are evolving alongside advancements in AI technology. To mitigate the negative impact of AI-generated work on academic integrity, educators and institutions can implement several countermeasures, which can be categorized into technical, procedural, educational, and collaborative approaches, each aiming to reduce instances of academic misconduct and maintain academic integrity.

8.1. *Technical Strategies*

- a. **Advanced Plagiarism Detection Software:** Utilising sophisticated plagiarism detection tools that can identify AI-generated content is crucial. These tools employ machine learning algorithms and natural language processing to detect inconsistencies in writing style and linguistic patterns that may indicate the use of AI [76]. Such a tool is Turnitin, a widely used AI-integrated plagiarism detection tool to identify AI-generated content. The software uses machine learning algorithms to detect subtle patterns and inconsistencies in writing that may indicate the use of AI. It has a feature to flag suspicious text for further review by educators.
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- b. **AI Content Verification Tools:** Developing AI tools designed to verify student submissions' authenticity can help detect AI-generated content. These tools can cross-check student submissions against known AI-generated text databases and assess the likelihood of AI involvement [77]. GPTZero and GLTR algorithms are AI tools specifically designed to detect AI-generated text. It uses natural language processing techniques to analyze text for signs of being generated by language models like GPT-3. Educational institutions can use GPTZero to verify the authenticity of student submissions.

8.2. Procedural Strategies

- a. **Redesigning Assessments:** Designing assessments that are less susceptible to AI-generated content can significantly reduce instances of academic misconduct. Examples include oral exams, in-class writing tasks, personalized projects, and practical assessments.
- b. **Frequent Low-Stakes Assessments:** Implementing frequent, low-stakes assessments can discourage students from using AI-generated work. These assessments provide continuous feedback and reduce the pressure on high-stakes exams, making students less likely to resort to dishonest practices.

8.3. Educational Strategies

- a. **Academic Integrity Education:** Institutions can organize educational campaigns to raise awareness among students about the importance of academic integrity and the ethical implications of using AI-generated work. Discussions about the ethical use of AI can even be incorporated into the curriculum to encourage students and ensure responsible use [50]. This approach will help students appreciate the value of their work and the importance of maintaining academic integrity in the digital age. Universities can better adopt this strategy by holding workshops and orientation sessions focused on academic integrity, emphasizing the ethical implications of using AI-generated work and promoting a culture of honesty. These sessions can include discussions on proper citation practices, the consequences of academic misconduct, and the importance of original work.
 - b. **Promoting Originality and Creativity:** Encouraging students to produce original and creative work can reduce the temptation to use AI-generated content. Assignments that require critical thinking, personal reflection, and unique perspectives are harder for AI to replicate accurately. Particularly, assignments that require students to draw on personal experiences, conduct original research, or develop unique solutions to problems can promote creativity and originality. For instance, a project where students must create a business plan for a new product encourages original thought and makes it difficult to rely on AI-generated content completely.
 - c. **Instructor Training and Awareness:** According to Dawson & Sutherland-Smith [78], training instructors to recognize signs of AI-generated work and understand the
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capabilities of AI tools can enhance their ability to detect and prevent academic dishonesty. Institutions can offer professional development programs such as workshops on the latest advancements in AI technologies, hands-on training with detection software to allow instructors and faculty members to familiarise themselves with the software, and strategies for designing assessments that minimize cheating.

8.4. Collaborative Approaches

- a. **Creating a Culture of Integrity:** Building a culture of integrity within educational institutions involves collaborative efforts from students, faculty, and administration. Policies and practices emphasizing the value of honest work and the consequences of academic misconduct can foster a more ethical academic environment.
- b. **Peer Reporting Systems:** Establishing peer reporting systems where students can anonymously report instances of suspected academic dishonesty can help detect AI-generated work. Such systems should be designed to protect the identity of the reporting students and ensure fair investigation processes.

9. SOME THEORETICAL FOUNDATIONS

Several theories are relevant to the discussion of this present study. However, the integration of the Technology Acceptance Model (TAM) and the Academic Integrity Framework are considered in this current discussion following a review of the other theories in the light of their empirical criticisms. This integrated framework provides a comprehensive lens to examine the intersection of artificial intelligence (AI) and academic integrity in higher education.

9.1. Technology Acceptance Model (TAM)

Technology Acceptance Theory emerged from the thesis work of Fred D. Davis Jr., which was submitted in 1985 to the Sloan School of Management at the Massachusetts Institute of Technology. The original concept was to develop and test a theoretical model of the impact of system characteristics on a person's acceptance of technological systems [79]. The broad objectives were to improve understanding of user acceptance processes, present a new theoretical lens into the successful development of information systems, and provide the theoretical foundation for a practical user acceptance test so that developers and users can evaluate and propose new processes before implementation [80].

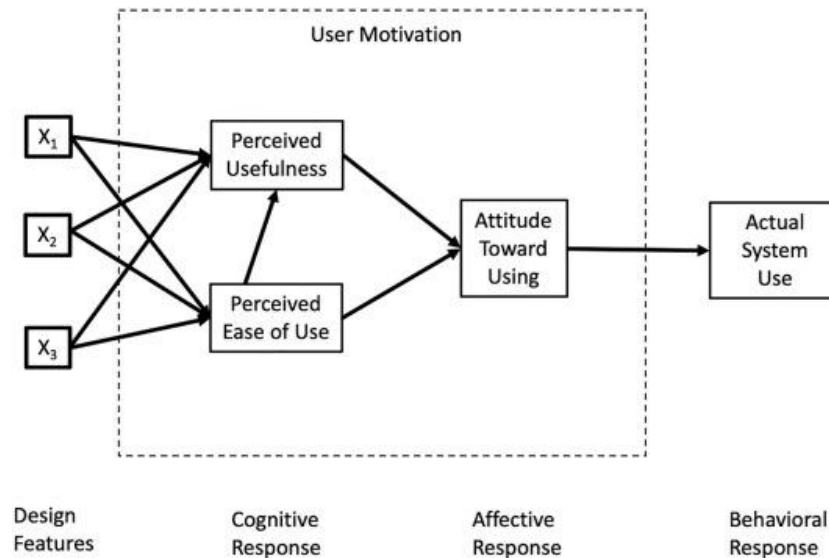


Figure 1. Technology Acceptance Model [79]

The Technology Acceptance Model (TAM) hypothesized that a user's general attitude toward using a system is a primary factor determining whether they use it. Attitude towards system usage depends on two belief functions: perceived usefulness and perceived ease of use. These two are directly influenced by alternative systems represented as binary proxy variables. These relationships are theorized by Davis [80] to be linear.

Davis [80] clarified that "use", in the context of the theory, is a repeated, multiple-act behavioural criterion that is specific concerning a particular system, action (direct use), and the context of the user's job, independent of time. On the other hand, attitude refers to the extent of evaluative effect that a person associates with using the innovation in his or her assigned job. Perceived usefulness was defined as the extent to which individuals believe that using a particular system would enhance their job performance, while perceived ease of use is the degree to which an individual believes that using a particular system would be free of physical and mental effort [80]. Perceived ease of use was theorized to significantly affect perceived usefulness since *ceteris paribus*, a system that is easier to use, will lead to increased job performance and greater usefulness for the user.

TAM upholds that a substantial fraction of a person's total job content is dedicated to using the technological system, implying that if the user becomes extra efficient in that fraction of the job through increased ease of use, he or she becomes more productive overall. In this sense, the characteristics of the new technology may indirectly contribute to usefulness by affecting ease of use.

Technology acceptance models aim to explain how people may understand and accept technological innovations and how they may use them. For any new technology, many factors affect people's decision-making on how and when they will use it [81]. The dynamics of early adoption and continuous use of technological innovations imply that TAM requires updating to explain detailed components affecting technology usage. Although some studies have been carried out to model the determinants of perceived ease of use [82], the determinants of perceived usefulness have been distinctly omitted [83].

Across the many studies on TAM, perceived usefulness has consistently been a strong contributor to usage intentions, with standard regression coefficients typically around 0.6 [84]. Since perceived usefulness is crucial to usage intentions, it is important to understand the contributing variables of this construct and how their influence changes over time while utilizing an innovative system. Perceived ease of use, TAM's other direct determinant of intention, has exhibited a less regular impact throughout reported research. A better comprehension of the contributors to perceived usefulness would enable system implementers to plan interventions to increase user acceptance and eventual usage of new technology [84].

Therefore, there was a need to extend TAM to explain additional key determinants of TAM's perceived usefulness and usage intention constructs to comprehend better how these factors' effects change with the innovation's persistent user experience [84]. This extended TAM is now referred to as TAM2. Building on TAM, TAM2 provides additional theoretical constructs across social influence processes (subjective norm, voluntariness, and image) and cognitive instrumental processes (job relevance, output quality, result demonstrability, and perceived ease of use).

Building on the existing tenets of the Theory of Reasoned Action [85] and the subsequent Theory of Planned Behaviour [86], Venkatesh and Davis [84] developed TAM2 by tapping into social influences via *subjective norm*, described as a person's perception that the majority who are vital to him assumed he should perform a certain behaviour. Subjective norm determines behavioural intention in TRA and the subsequent TPB. The explanation for the direct impact of subjective norms on intention is that people may choose to perform a behaviour, even if they are not themselves favourable toward the behaviour or its outcomes, if they consider essential referents to assume they ought to. They may be sufficiently influenced to conform with the referents [84]. This plays out in the gradual adoption of GenAI by users who were hitherto lackadaisical.

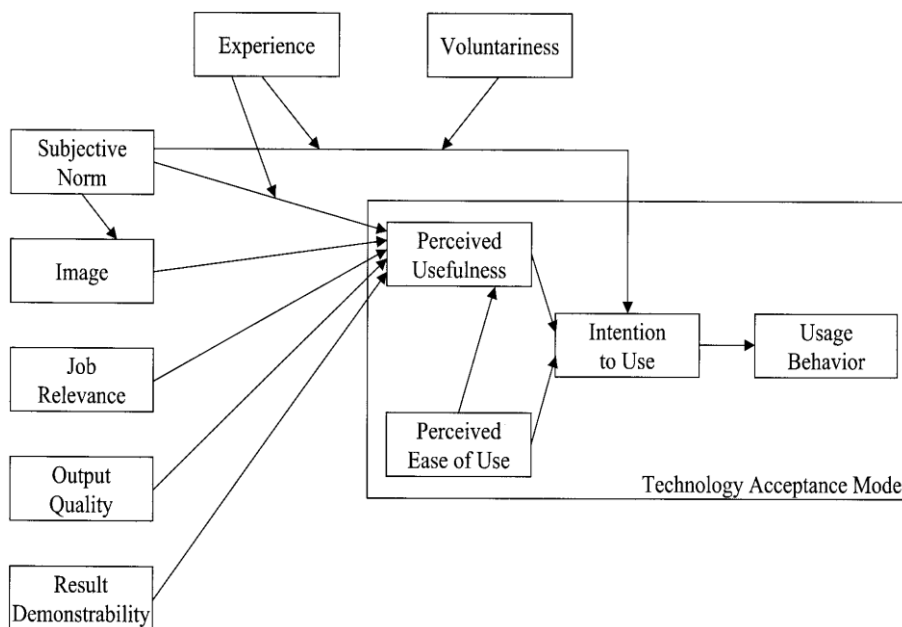


Figure 2. TAM2 [84]

In terms of voluntariness and compliance with social influence, Venkatesh and Davis [84] theorized the direct compliance effect of subjective norms on intention to operate whenever a person thinks that a social actor wishes him or her to behave in certain ways and the social actor can praise the behaviour or punish non-behaviour. This may be the case when specific instructions regarding using GenAI are spelt out for students. TAM2 theorizes that in a new technology usage context such as GenAI adoption, the direct compliance-based effect of subjective norm on intention being different from perceived usefulness and perceived ease of use will occur in obligatory, but not voluntary, technology utilization settings. To differentiate between mandatory and voluntary system utilization settings, TAM2 sees *voluntariness* as a moderating variable, defined as “the extent to which potential adopters perceive the adoption decision to be non-mandatory” [84].

TAM2 also explains the interaction between *image* and social influence. GenAI users often respond to social normative influences to establish or maintain a favourable *image* within a reference social group such as their undergraduate class. According to the theory, image is the extent to which an innovative system is perceived to improve a person’s status in his or her social system. TAM2 theorizes that subjective norms positively influence image because if essential individuals of a student’s social group (such as classmates and lecturers) believe that he or she should carry out a behaviour, then performing it will tend to raise his or her standing within the group. The increased power and impact of esteemed status provide a standard basis for extra productivity with technological innovation. An individual may thus think that using a new technology will enhance his or her job performance (which is the definition of perceived usefulness) indirectly due to image enhancement, against any performance benefits directly ascribable to using the new system. This identification effect is captured in TAM2 as the impact of subjective norm on image and the consequence of image on perceived usefulness [84].

Considering the emerging components of the model, one may ask how the impact of these social influence processes varies with increasing *experience* using a target innovation such as the GenAI chatbot. Venkatesh and Davis [84] assert that research suggests that the direct influence of subjective norms on intentions may weaken over time with increased system experience. Therefore, TAM2 theorizes that the direct consequence of subjective norms on intentions for mandatory usage contexts will be strong before system implementation and during early usage but will subside over time as progressive direct experience with a system will provide a growing basis for intentions toward ongoing use. Similarly, the effect of subjective norms on perceived usefulness (internalization) is expected to wane with time since more direct experience contributes to concrete sensory information, replacing reliance on social cues as a basis for usefulness perceptions. In contrast, TAM2 does not expect the impact of image on perceived usefulness (identification) to weaken over time since status gains from system use will continue if group norms continue to favour the usage of the particular innovation. This explains the exponential usage of GenAI among present-day university students, for whom the mix of social image chatbot usage is obvious.

Beyond the social influence processes impacting perceived usefulness and usage intention discussed above, Venkatesh and Davis [84] theorize four cognitive instrumental contributors to perceived usefulness: job relevance, output quality, result demonstrability, and perceived ease of use. TAM2 asserts that more recent theoretical developments in action, work motivation, and behavioural decision theory share that the motivation for engaging in specific behaviours stems from a mental representation connecting instrumental behaviours to higher-level goals or purposes. Following this line of reasoning, TAM2 theorizes that students will use a mental representation for assessing the match between important writing goals and the consequences of using a particular AI innovation as a basis for deciding about the use-performance contingency (i.e., perceived usefulness) [84].

TAM2 defined job relevance as an individual's perception of the degree to which the technological system, such as a particular GenAI brand, applies to a writing task. In other words, job relevance is a function of the importance of students' schoolwork and the tasks the chosen chatbot can support. Job relevance is a cognitive judgment directly impacting perceived usefulness, distinct from social influence processes.

TAM2 also posits that, despite consideration of what tasks a system can perform and the extent to which those tasks match their job goals (job relevance), users will take into consideration how well the system performs those tasks, which Venkatesh and Davis [84] described as perceptions of *output quality*. Output quality is expected to differ substantially from and contribute to variation in perceived usefulness against job relevance because a unique underlying judgmental process is involved. Concerning social image, judgments of job relevance are more expected to take the form of a compatibility test whereby innovative brands judged not to be job-relevant are eliminated from a person's choice set for future consideration. This is especially true in university students' choice of GenAI chatbot. Decisions about output quality, in contrast, are less likely to be used for removing options from consideration [84]. Instead, they are more likely to take the form of a profitability test in which, given a choice set containing multiple relevant systems such as available GenAI chatbot brands, students would be inclined to choose a brand that delivers the highest output quality.

Venkatesh and Davis [84] assert that even effective systems can fail to garner user acceptance if users have difficulty attributing gains in their tasks to using the innovative system. Therefore, TAM2 opines that *demonstrability, defined as the tangibility of technological innovation results*, will directly affect perceived usefulness. This implies that users can be expected to build more positive perceptions of the usefulness of an AI if the covariation between usage and positive results is readily discernible. Conversely, if an AI chatbot produces effective task-relevant results desired by higher education students but does so in a shroud fashion, users of the chatbot are unlikely to understand how useful such a chatbot is.

TAM2 retains *perceived ease of use* from TAM as a direct contributor to perceived usefulness, since all things being equal, the less effortful a system is to use, the more using it can increase job performance (e.g., writing tasks). Over the years, extensive research evidence shows that perceived ease of use is significantly connected to intention, both

directly and indirectly, through its effect on the perceived usefulness of technological innovation.

Regarding changes in the cognitive instrumental influences with extended user experience, TAM2 theorizes that, eventually, people will continue to rely on the match between their task goals and the impact of innovation usage (job relevance) as a ground for their continual usefulness perceptions. Just as the role of what a technological system does remains influential, it is expected that how well a particular GenAI chatbot does what it is expected to do (output quality) will remain a vital influence of perceived usefulness over time. Similarly, there is no ground to expect the impact of the demonstrability of a specific AI tool on its perceived usefulness to become either stronger or weaker over time. Although there is no empirical basis for such temporal shifts, the influence of perceived ease of use on perceived usefulness has sometimes been found to increase over time, whereas the direct impact of perceived ease of use on usage intention has been observed in some studies to decrease over time, and in others to increase over time [84].

The Technology Adoption Model (TAM) is a useful framework for understanding how and why individuals and organizations adopt new technologies, including artificial intelligence (AI). For AI tools to be widely adopted, they need intuitive interfaces requiring minimal training. This includes user-friendly dashboards, straightforward integration with existing systems, and seamless interactions. As AI technology evolves, its accessibility increases. Tools like natural language processing (NLP) allow non-technical users to interact with AI systems more easily, reducing barriers to adoption. Academic institutions will likely adopt AI if it demonstrates clear benefits, such as improved efficiency, faster decision-making, and cost savings. For instance, the GenAI chatbot can automate repetitive writing tasks, freeing up students' resources for more strategic activities.

TAM has shown that the decisions of peers and competitors can significantly impact adoption. If leading entities within a higher education setup adopt AI, others, including students, may follow suit to remain competitive. The availability of infrastructure, resources, and support can also affect students' GenAI adoption and specific chatbot preferences. Higher educational institutions with strong IT support and data management systems are more likely to integrate AI technologies successfully. It is important to note that concerns about job displacement, data privacy, and ethical implications can hinder adoption. The lack of necessary skills among students can impede the implementation, effective use, and preference of AI technologies.

The Technology Adoption Model provides a valuable lens through which to understand the dynamics of AI adoption. Organizations can better navigate the challenges and opportunities associated with integrating AI into their operations by focusing on perceived ease of use and usefulness alongside other factors like social influence and facilitating conditions. As AI technology evolves, addressing ethical usage and barriers and enhancing user experience will be crucial for widespread adoption.

9.2. Academic Integrity Framework (Adapted for AI Considerations)

The Academic Integrity Framework, initially proposed by McCabe and Trevino [44], serves as a basis for examining academic honesty within educational institutions. When adapted to include considerations of AI, this framework becomes a vital tool for understanding how technological advancements impact academic integrity. The key components of the framework, in this context, include:

- a. **Ethical Expectations and Standards:** Institutions typically set clear guidelines around academic integrity, particularly concerning plagiarism, cheating, and the ethical use of resources. AI adds complexity to this, requiring updated policies on using AI-generated content, code, or assistance.
- b. **Institutional Response to Misconduct:** Universities and schools must adapt their policies to detect and respond to academic misconduct facilitated by AI. This includes implementing AI detection tools and educating students about the ethical implications of using AI for academic work.
- c. **Prevention Strategies:** The framework also includes strategies for promoting academic honesty, such as teaching students about the proper use of AI, fostering an understanding of academic ethics in the digital age, and developing robust detection systems to identify AI-generated content.

This adapted framework provides a comprehensive approach to analyzing the ethical implications of AI in academic settings. It allows institutions to categorize how AI impacts academic integrity, assess the effectiveness of detection and prevention measures, and identify gaps in current academic integrity policies. Moreover, it highlights the evolving nature of academic integrity as AI becomes more integrated into the educational system.

This study thus utilizes an integrated theoretical framework that combines the Technology Acceptance Model (TAM) and the Academic Integrity Framework to examine how AI awareness, adoption, and ethical considerations intersect in educational contexts. Incorporating both frameworks, this conceptualization explores the complex relationship between students' attitudes toward AI, the social and institutional pressures they experience, and how these factors ultimately affect their academic integrity. These theories allow for an in-depth analysis of the interplay between AI adoption, student behaviour, and institutional integrity policies. The diagrammatic representation of the integrated framework for this conceptualization is shown in the figure 3 below:

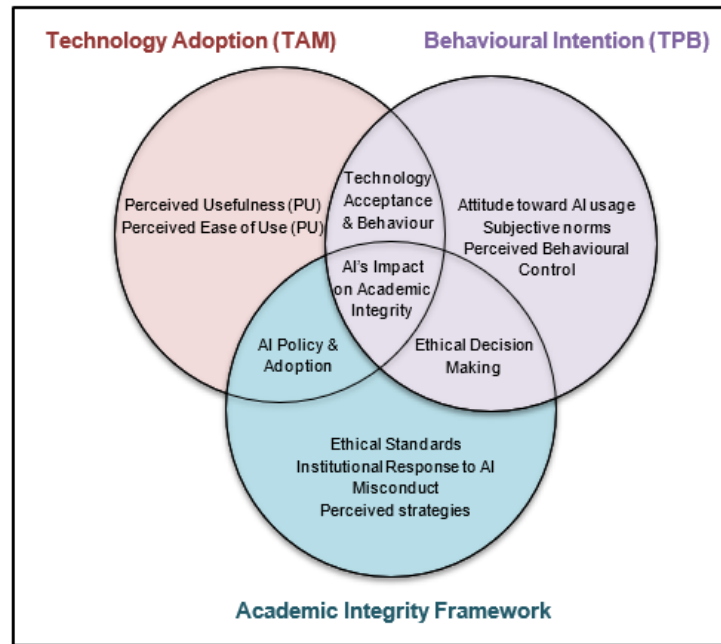


Figure 3. Integrated Theoretical Framework

10. RELATED EMPIRICAL STUDIES

As AI technologies increasingly permeate computer science education, a growing body of research has investigated the impact on academic integrity. Empirical studies have explored how AI-powered tools and resources affect students' behaviour, learning outcomes, and the assessment of academic work. This review synthesizes these studies' findings to understand better the complex relationship between AI and academic integrity in computer science education.

One of the most prominent applications of AI in education is plagiarism detection. Newton and Lang [87] conducted a qualitative study using AI-enhanced proctoring systems in online exams. Using observational and interview data from students and educators, they examined the effectiveness of AI-driven monitoring through webcams and screen recording to deter cheating. Results suggested a reduction in instances of academic dishonesty, with students reporting awareness of being observed as a deterrent. However, concerns were raised about continuous surveillance's psychological impact and privacy implications. Despite its deterrent effect, this study did not explore the adaptability of AI systems to different educational contexts or account for evolving student behaviours.

Foltýnek, Meuschke, and Gipp [88] analyzed the performance of AI-based plagiarism detection tools through a quantitative analysis of false positive and false negative rates in plagiarism identification. Their results showed that while AI tools significantly increased the detection rate of copied content, some detected matches were inaccurately flagged, resulting in false positives. This limitation suggests a gap in AI's capability to distinguish between intentional plagiarism and coincidental matches, impacting students' trust in these systems. More research is required to address this gap and examine the reliability and acceptance of AI plagiarism tools among faculties and

students, particularly focusing on trust in system accuracy. Relatedly, Sun and Chen [89] audited AI systems in integrity enforcement, revealing biases against non-native English speakers in plagiarism detection algorithms. Their quantitative analysis indicated a disproportionate number of false positives among this demographic, raising concerns about fairness. Although the study recommends developing more inclusive AI tools, it stops short of proposing specific solutions. This indicates that more research is needed to address this gap by exploring alternative approaches to ensure equitable AI practices.

Several studies have investigated how AI can both prevent and facilitate cheating. For example, Holden, Norris, and Pohl [90] conducted a mixed-methods study to assess AI's dual role in preventing and facilitating academic misconduct. Combining survey data on students' use of AI tools and incident reports of academic violations, they found that AI proctoring systems reduced online cheating; however, they also discovered that students used AI tools to deceive these systems creatively. This suggests a gap in AI's robustness against sophisticated misuse. New research is needed to explore this further by assessing the adaptability of AI tools in monitoring and their effectiveness against advanced forms of academic dishonesty.

Cotton *et al.* [91] conducted a theoretical analysis of the ethical implications of AI in educational contexts, reviewing AI applications in personalized learning and administrative automation. Through a systematic literature review, they identified fairness, transparency, and potential misuse as core ethical challenges. However, the study largely centred on theoretical risks rather than empirical data on student behaviour. Further insights are necessary to build on Cotton *et al.*'s work by empirically analyzing how AI-induced ethical dilemmas affect students' academic choices and attitudes toward integrity. Sotiriadou *et al.* [92] conducted an empirical study on AI tools for detecting contract cheating, using AI algorithms that analyze text-matching and linguistic patterns to identify suspicious work. Their results confirmed AI's potential in spotting outsourced work; however, the study highlighted limitations in the policy framework governing AI use, with a need for clearer regulations to prevent academic misconduct effectively. Newer studies must aim to extend Sotiriadou *et al.*'s work by examining institutional policies around AI and exploring the effectiveness of these policies in promoting ethical behaviour.

Recent studies have, however, looked into how AI can be used proactively to promote academic integrity. For instance, Johnson *et al.* [93] implemented an AI-driven intervention to educate students on academic integrity, using a mixed-methods approach of pre- and post-intervention surveys to measure changes in understanding of ethical scholarship. The study found a significant reduction in plagiarism following the intervention. However, Johnson *et al.* did not explore long-term impacts on student behaviour. To address this, further studies are needed that will incorporate longitudinal data to assess the sustained effects of AI-driven integrity interventions.

Roberts *et al.* [94] examined the role of AI in ethics education through simulations and interactive modules, aiming to enhance students' understanding of academic integrity. Using a quasi-experimental design, they observed increased engagement and ethical understanding among students who used AI-driven simulations. Nonetheless, they did not assess the transfer of ethical knowledge to real-life academic tasks. Similarly, Miller *et al.*

[95] conducted a longitudinal study assessing the effectiveness of AI tools in preventing academic misconduct over five years. Their findings suggested an initial reduction in cheating, followed by student adaptation to bypass these tools. This trend indicates a need for continuous updates and student education on ethics. Newer studies are required to examine this dynamic, specifically analyzing how frequently AI tools should be updated to stay effective and exploring the role of ongoing efforts in academic integrity education in deterring misconduct.

The empirical review highlights various studies exploring the intersection of artificial intelligence (AI) and academic integrity. The review indicates the necessity for new research to examine the plethora of issues around AI deployment in education and the dynamism of the nexus of AI usage and academic integrity. Ongoing debates on using AI tools in education must objectively cross-examine all perspectives to maximize academic benefit and sustain academic integrity.

11. CONCLUSION

The conceptualization discussed so far has illuminated the multifaceted issue of the influence of Artificial Intelligence on academic integrity, particularly among students. The integration of AI tools in education has had profound effects on academic integrity. While these tools support student productivity, they also present ethical challenges regarding authorship, plagiarism, and the authenticity of submitted work.

The clarifications provided in this study should raise awareness among students about the ethical and credibility issues associated with using AI for academic work. This study may educate students on the potential consequences of misusing AI technologies by uncovering how AI can support and undermine academic integrity. As such, increased awareness may empower students to make more informed and responsible choices regarding the use of AI in their academic endeavours, ultimately promoting a mindset that prioritizes originality, ethical scholarship, and personal responsibility, thus leading to a more conscientious student body that values the principles of academic integrity.

More research is needed to guide the academic community and educational institutions in drafting clear policies around AI usage in education. Conversations about AI usage must be held open-mindedly without any prehistoric prejudice by conservatives. A scientific approach will seek to strengthen positive AI usage and deter inadvertent intentions among students. Such a clear pathway to AI policy-making will guarantee the setting up of relevant institutional frameworks for AI usage in education.

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