

Developing the Triarchic Responsibility Model (TRM-AI) for Human-AI Collaboration in Higher Education: A Comparative Analysis of Faculty and Students' Perspectives

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Abstract. Increasing presence of AI in education opens new avenues for Human-AI collaboration. However, it raises significant questions regarding cognitive efficiency, productivity, and academic ethics. This study examines and compares the perceptions and experiences of Human-AI collaboration in academic contexts between faculty members and higher education students. The study employed a comparative mixed-methods design, surveying 100 faculty members and 533 students at public higher education institutions. Quantitative results show that both groups view AI as a helpful, collaborative tool for improving cognitive processes and enhancing efficiency and productivity by saving time and effort in information processing, content creation, task completion, and idea generation. However, students were more positive about AI's impact on efficiency ($M = 2.98$) and productivity ($M = 2.93$), whereas faculty expressed greater concern regarding ethical issues ($M = 3.48$), including proper citation, transparency, accountability, and responsible use in teaching and learning. Qualitatively, students perceived Human-AI collaboration primarily as cognitive support to boost academic achievement, while the faculty emphasized critical thinking, originality, and academic integrity. Both groups cautiously agreed that AI can improve educational experiences if implemented correctly, demonstrating that strong Human-AI cooperation boosts efficiency and productivity provided there are ethical precautions and guaranteed responsible use. These findings support the TRM-AI framework, which emphasizes joint responsibility among students, instructors, and institutions to promote sustainable AI integration. While focused on Philippine public higher education institutions, the study contributes to global discussions on responsible AI integration and offers evidence-based recommendations for fair, ethical, and sustainable AI policy and practice.

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1. Introduction

Artificial intelligence (AI) is a growing component of the design, delivery, and assessment of academic tasks in higher education. Generative language models and adaptive tutoring systems are slowly enhancing course construction, automated grading, and student learning experiences. Such technologies can assist instructors and learners in enhancing cognitive efficiency by reducing effort and increasing productivity (Giannakos et al., 2024). Although there are benefits of such tools, major ethical concerns regarding academic integrity, authorship, dependency, and equity are raised (Alnsour et al., 2025). AI can have a substantial impact on teaching, assessment, and feedback processes. However, its influence on deeper, more meaningful learning outcomes is an issue that needs further investigation (Almeqdadi & Al Shadifat, 2024).

In this changing scenario, the idea of human-AI collaboration has become the prevailing paradigm in higher education. AI systems in this paradigm are not a replacement for human thinking but rather a cognitive partner that augments human skills. The co-creation method considers AI as an assistant for decision-making, creativity, and problem-solving by reducing cognitive burden, structuring challenging knowledge, and accelerating the academic process. At the same time, interpretation, evaluation, and ethical judgment depend centrally on human agency. It renders the traditional academic processes a joint cognitive system of human intelligence and technology. This is in line with the concept of cognitive offloading, the use of external technology to lessen cognitive effort and enhance task performance (Risko & Gilbert, 2016).

Although the capabilities of AI enhance the level of productivity and efficiency by complementing human cognition, its integration may transform how learners engage with information; thus, an examination of both its strengths and weaknesses is necessary. There is the possibility of hindering deep processing and critical thinking of students in the academic sphere; therefore, it is necessary to highlight its role within academic integrity. Adopting an ethical approach in using AI promotes the principle of transparency, proper citation, and accountability of scholastic output (Júnior et al., 2025; Funa & Gabay, 2025). It is important to understand how learners and instructors perceive and accept the use of AI in real educational settings to establish a coherent and sustainable educational policy, according to Miao et al., 2021 and Lee et al. (2024).

Generally, the studies only conduct research on faculty members and students individually; hence, there is a lack of insights into the commonality and uniqueness of their attitudes on the adoption of AI in the classroom (Petricini et al., 2024). Furthermore, there is not much empirical research conducted on the interaction among cognitive efficiency, ethical use, and educational productivity together with AI, especially in Southeast Asian higher education (Johnston et al., 2024). To address these research limitations and to enhance understanding of the

interplay between humans and AI, this paper utilized a comparative mixed-methods approach to bring faculty and students' views together.

The main objective of this research study is to investigate the aspects of Human-AI interaction in higher education related to cognitive efficiency, productivity, and academic integrity in alignment with SDG 4, the provision of an inclusive and equitable quality education. In specific terms, this study intends to examine the process of Human-AI collaboration in higher education contexts by focusing on its interactive application with students, instructors, and AI throughout the continuous interplay within the educational process. It puts forward a framework of the Triarchic Responsibility Model for AI Integration (TRM-AI), focusing on a shared responsibility for its use among students, teachers, and the institutions to foster effective, ethical, and holistic use of generative AI, which perceives AI as a cooperative cognitive agent within academia that functions through the interplay of human discretion, pedagogical guidance, and institutional regulations.

1.1 Objectives of the Study

- 1.1.1 To describe the demographic characteristics of the faculty and student respondents in terms of relevant profile variables.
- 1.1.2 To analyze faculty and student perspectives of human-AI collaboration in academic work in terms of cognitive efficiency, educational productivity, and ethical use;
- 1.1.3 To determine whether significant differences exist between faculty and students in their perspectives on AI use across the dimensions of cognitive efficiency, educational productivity, and ethical use.
- 1.1.4 To explore the experiences, perceptions, ethical concerns, and recommendations of faculty and students regarding the use of AI in academic tasks and the maintenance of academic integrity in human-AI collaboration.
- 1.1.5 To integrate the quantitative and qualitative findings to develop an empirically grounded Triarchic Responsibility Model for AI Integration (TRM-AI).

2. Literature Review

The generation of Artificial Intelligence (GenAI) has been an increasing force in transforming pedagogical and academic practices in higher education by increasing efficiencies in teaching, learning, and performing academic tasks.

2.1 Human -AI Collaboration in Higher Education

GenAI has been progressively thought of as an entity of collaboration, not only as a tool but also as a proactive entity, to assist humans in idea generation, content creation and problem-solving by augmenting human cognitive capacities through iterative interactions and making the co-construction of knowledge through iterative feedback from human decisions and machine responses a co-constructive learning process (Huang et al., 2026). Research also indicates that the collaboration of humans with AI transforms the existing understanding of traditional academic roles and responsibilities (Tzirides et al., 2024). In this interaction, humans play the roles of evaluators of AI output and critics to amend and enhance it, whereas

educators play the role of facilitators and regulators to help integrate AI appropriately and ethically in learning (Chiu & Rospigliosi, 2025). From individual human thinking and working to combined human-artificial intelligence cognitive tasks (hybrid intelligence systems), human-AI collaboration requires a significant change in these understandings.

Human-AI collaboration offers benefits, but is also highly ambiguous and problematic. With the increasing role of AI in knowledge production, concerns about authorship, responsibility and declaration arise in making distinctions between human texts and texts produced by machines (Hutson, 2025). There is a demand for governance and accountability systems that properly supervise AI-related academic work.

2.2 Faculty and Institutional Perspectives on AI Integration

The current literature regarding the faculty perspective suggests that GenAI will be seen as an efficiency tool that will save time for instruction and that is capable of facilitating several aspects of teaching tasks. On the other hand, it also argues that faculty approach AI with caution due to the low technical skills, lack of ethical guidelines and validity concerns, and concerns for AI integrity in assessments among the faculty members (Mah & Groß, 2024). The aforementioned insights are an indication of the current contradiction between how AI helps students in their learning processes and the university's responsibility to ensure academic integrity.

Recent studies show that a wide range of universities have been successful in policy and governance framework construction for the safe and ethical application of AI within the context of higher education (Jin et al., 2025). Nevertheless, an important gap continues to exist in translating policies into practice, and this implementation gap often leads to discrepancies in standards of academic integrity and implies the examination of the interpretation and implementation of institutional regulations in the context of AI-mediated learning.

2.3 Issues and Concerns on GenAI

Empirical evidence indicates that the systems enable rapid creation of instructional material, automated feedback generation, and adaptive learning resources customized to student needs (Sun & Sun, 2025). The Cognitive Load Theory provides a framework for understanding those educational changes. This describes how the quantity and type of mental demands on students plus teachers affect their learning process (Risko & Gilbert, 2016).

According to the Constructivist Learning Theory, learning is essentially an active process in which students construct knowledge through interactions with the subject matter, perceptual activities, and reflective practices (Hussain Mir et al., 2025). In this way, GenAI can be incorporated into the learning process by offering prompts, providing feedback that initiates iterative learning cycles, and explaining different aspects of the subject from multiple perspectives with examples (Zhan et al., 2025).

However, there is a concern about the potential decline of deep cognitive engagement, particularly in terms of diminished critical thinking and decreased learner autonomy (Ansari & Qamari, 2025). The speed that GenAI provides is not always a sign that a student understands a topic more thoroughly. It is important to look at how GenAI affects academic output, but the theory also emphasizes that researchers must observe whether those tools help or hurt how deeply a student thinks about a subject.

GenAI supports students and faculty when they gather data, organize materials, write drafts, and also complete repetitive academic work. By reducing secondary tasks, the tools ensure that more mental energy is available for complex activities like analyzing evidence, evaluating arguments, and solving difficult problems. On a contrasting perspective, a heavy dependence on responses from AI can cause a negative result if students as well as faculty members accept what the software produces without analyzing, checking, or thinking about the basic information (Abubakar et al., 2025). Thus, it ceases to be a tool for improving human cognition and takes the place of human thought if students begin to rely on technology to handle the laborious tasks of processing and synthesizing information for them (Chen et al., 2025).

In another standpoint, the use of GenAI is not only related to cognitive issues, but also to ethical and epistemic issues, namely: algorithmic bias, opaqueness of model decision-making, and elevated risks concerning the privacy of data (Azimi et al., 2026). Additionally, the use of AI in academics also poses threats to the concepts of authorship and academic responsibility, especially when the entire process of content production is influenced, if not fully performed, by the usage of AI-based tools (Balalle & Pannilage, 2025). This situation mandates an adaptation of frameworks of academic integrity beyond concepts such as plagiarism and academic misconduct. There are strong grounds for concern when exploring issues related to responsible AI and ethical decision-making. The assessment of GenAI's role in higher education cannot be confined to the balance of efficiency, convenience, and technological capacity. It must also include the assessment of transparency, fairness, privacy, and accountability, as well as corporate social responsibility and the safeguarding of the integrity of education (Rizun et al., 2026; Muchaku et al., 2025).

Responsibility is, to a large extent, distributed to each of the stakeholders of AI-integrated education. This means that students have a responsibility to the critical assessment and appropriate use of AI-produced content. Likewise, educators have a responsibility to create learning opportunities that are constructively aligned, engaging to students, and incorporating the responsible use of AI. Moreover, education providers are responsible for putting in place frameworks and systems that enable and guide the responsible use of AI. Therefore, GenAI in education is a situated technological, pedagogical, cognitive, ethical, and social responsibility. Therefore, finding methods to make cooperation between human and artificial cognition mutually reinforcing is more important than deciding between options when it comes to whether and how GenAI should be incorporated into education (Juan et al., 2026).

Based on the aforementioned insights, the theories directly underpin the study's focus on human-AI collaboration and the development of a Triarchic Responsibility Model for AI Integration (TRM-AI). The synthesis suggests that effective GenAI integration should not only be evaluated based on efficiency or productivity gains. Rather, it should be assessed on its ability to promote cognitive engagement and learning quality, human agency and autonomy, and ethical responsibility and accountability, all at the same time. These interrelated dimensions provide the conceptual foundation for investigating students' and faculty's experiences and uses of GenAI and for determining how responsible human-AI collaboration can be nurtured in higher education. Consequently, the concept of GenAI as a simple technological tool and its position as a revolutionary educational phenomenon need a balanced integration of efficiency, learning, human agency and responsibility.

The study's focus on human-AI collaboration and the development of a TRM-AI suggests that effective GenAI integration should not be evaluated only on the basis of efficiency or productivity gains. Instead, it should be judged by whether AI use fosters simultaneously cognitive engagement and learning quality, human agency and autonomy, and ethical responsibility and accountability. These interrelated dimensions provide the conceptual basis for investigating faculty and student experiences and uses of GenAI, and for determining how responsible human-AI collaboration can be nurtured in higher education. Hence, the perused literature goes beyond the idea of GenAI as a mere technology tool and establishes it as a revolutionary educational phenomenon that requires a balanced integration of efficiency, learning, human agency, and responsibility.

2.4 TRM-AI: An Integrative Theoretical Framework

The TRM-AI is developed as a system-level view of the responsible integration of AI, and it treats academic integrity as a distributed network of responsibilities across three domains: individual accountability (student), authority to manage (faculty), and the governing role (higher education institution). The human-AI interaction functions as the point of interface among the cognitive, ethical, and procedural dimensions of academic practice. The student is the "ethical agency" whose interaction with AI needs to be critically engaged with; the faculty is the "pedagogical gatekeeper" with the authority to guide responsible AI integration; and the institution is the "structural governor" responsible for systematic, clear, and enforceable rules.

The AI systems are not an "ethical agency" but rather a "socio-technical mediator" that affects choices and transforms the academic environment. The qualitative data from this research supports the model by indicating that the practice of academic integrity within the AI-enabled system is a fluid and dynamic phenomenon, driven by interactions among students, faculty, institutional and artificial intelligence systems. The findings emphasize the requirement to reimagine the construct of academic integrity as a dynamic, relational, and system-level phenomenon rather than as a fixed, rule-based compliance construct.

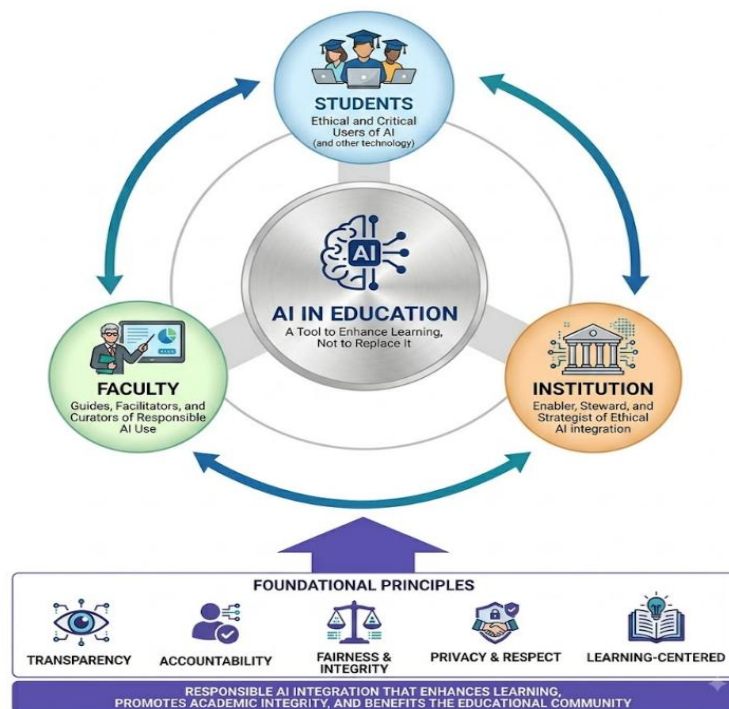


Figure 1: The Triarchic Responsibility Model for AI Integration (TRM-AI)

TRM-AI in Figure 1 envisions a higher education institution as an interconnected network, rather than one entity that has the responsibility for making an effective AI integration successful. At the innermost point of the model is “AI in Higher Education” framed not as a replacement but rather as an evolving tool to enable and accelerate human learning. Positioned around AI in Education are three triarchic stakeholders: the students as responsible and critical consumers who are required to uphold academic integrity and critically review the AI-generated content; the faculty as mentors and enablers who are required to be innovative in their design of assessments, role models of the use of AI, and continuous learners of pedagogical approaches; and the institution as the central custodian which is expected to provide adequate and transparent policy and resources that will promote equitable access and facilitate continuous education and training.

The Five Foundational Principles: Transparency, Accountability, Fairness and Integrity; Privacy and Respect, and Learning-Centeredness form the substrate underpinning the triarchic partnerships in TRM-AI to enable effective AI integration for the entire higher education ecosystem. In its operations, TRM-AI is more than a structural framework. It is dynamic, with a feedback loop mechanism among the three stakeholders that continually evolves with technology in higher education, always leading to better human-centered learning and teaching assisted by AI.

The TRM-AI goes beyond existing responsible AI adoption models by shifting from a largely technology-focused approach to a shared responsibility model that includes humans, AI systems, and institutions. Its theoretical contribution emphasizes that responsible AI integration requires the balance of AI-enabled efficiency and productivity with human judgment, ethical responsibility,

accountability, and institutional governance. On a practical level, the model provides higher education institutions with a framework for the development of AI policies, training programs, ethical guidelines and governance mechanisms that promote responsible and sustainable human-AI collaboration.

3. Methodology

The research design used a comparative mixed-methods approach to study perceptions and use of AI in academia, specifically in terms of productivity, efficiency, and ethics. The investigation used both quantitative and qualitative data and integrated the findings from the two strands to obtain a more holistic understanding of the research problem (Creswell & Plano Clark, 2018). The study included 100 faculty and 533 students from different academic areas and teaching positions who met established inclusion criteria that were established.

Participants were recruited from higher education institutions through purposive sampling. They were selected based on the predetermined inclusion criteria and their relevance to the objectives of the study, specifically their experience or familiarity with the use of AI in teaching, learning, or academic activities. This approach guaranteed that the participants could provide relevant and meaningful information regarding human-AI collaboration in higher education. Survey respondents who expressed willingness and availability were selected for the interview. Prior to participation, respondents were informed of the purpose of the study, the voluntary nature of their participation, and the confidentiality of the information collected. Before data collection, all participants were briefed about the study and provided their consent.

The research instrument was developed based on the research objectives, relevant literature, and established concepts related to AI integration, human-AI collaboration, productivity, efficiency, responsibility, and ethical AI use. Items were developed through reviewing and synthesizing relevant constructs identified from previous studies relevant to the higher education context. The first instrument was then reviewed by 20 experts with relevant knowledge and experience in education, educational technology, and/or artificial intelligence. The experts reviewed the instrument to assess its relevance, clarity, and appropriateness, and to determine whether the items measured the intended constructs.

Based on experts' suggestions, ambiguous, redundant, or unclear items were modified or deleted. The instrument was then content validated to determine if the items adequately represented the constructs being measured. Where appropriate, reliability analysis was conducted using Cronbach's alpha to assess the internal consistency of the scales. The validated instrument was then administered to the participants of the study. These procedures assisted in ensuring that the instrument generated data suitable to the quantitative research objectives. Qualitative data were analysed using thematic analysis in NVivo. The researchers first organized and uploaded the interview transcripts into NVivo and read and reread the data to become familiar with participants' responses. Relevant statements and meaningful segments were identified and assigned initial codes

based on their content and relevance to the research questions. The initial codes were reviewed, compared, and categorized based on similarities and relations. NVivo was used to collate related codes into overarching categories and emerging themes.

The themes were then tested against the original transcripts to ensure they represented the participants' viewpoints. Similar or overlapping themes were combined, and those without enough supporting evidence were refined or removed. Finally, the themes identified were interpreted in relation to the study objectives and theoretical framework. The qualitative findings were then compared with the quantitative findings to identify convergent, complementary, or divergent findings. These findings contributed to the development and evaluation of the TRM-AI.

In the interpretation stage, the quantitative results provided evidence of the relationships and patterns observed among the variables, while qualitative findings provided deeper explanations of participants' experiences and perceptions. The convergence and complementarity of these findings guided the identification of the key dimensions and relationships underlying the TRM-AI. Thus, the proposed TRM-AI was not only developed from the existing literature but from the integration of theoretical insights and empirical evidence generated by the study. This enhanced the empirical grounding of the framework and offered a basis for assessing its applicability to human-AI collaboration in higher education.

3.1 Data Collection Analysis

For the quantitative component, primary quantitative data were collected using a researcher-developed survey questionnaire to assess participants' perceptions of the cognitive, productivity, and ethical implications of AI. The survey also yielded quantitative data on participants' perceptions and allowed for comparison between students and faculty. The instrument showed an acceptable internal consistency with Cronbach's alpha of 0.87. Descriptive statistics summarized the participants' responses and characterized their perceptions of AI. A further Mann-Whitney U test was performed to assess the dissimilarities in opinions between students and faculty members, particularly concerning the cognitive, productivity, and ethical consequences of AI.

Qualitative data were collected through semi-structured interviews to gain an in-depth understanding of individual perspectives on AI use in academic settings. The interviews focused on the issues encountered, the concerns about the application of the technology, and the proposed actions for the application of AI ethics. The researcher used semi-structured interviews to get detailed accounts and perspectives that complemented the patterns identified from the quantitative survey data.

The interview data were analyzed using thematic analysis, which is a systematic, theoretically flexible qualitative analytic method used to identify, organize, and provide insight into patterns of meaning across a qualitative data set (Braun &

Clarke, 2006). The interview transcripts were read through and coded to identify common ideas and patterns, which were then sorted into themes and sub-themes that reflected the participants' experiences, concerns, and recommendations about the use of AI in higher education. The qualitative data were organized, coded, categorized, and managed with NVivo. The themes, sub-themes, and real-world implications that emerged were then interpreted in relation to the study's focus on AI productivity, efficiency, and ethics.

The quantitative and qualitative findings were then integrated and synthesized to build a more holistic understanding of AI perceptions and usage in academia, in line with the principle of integration in mixed-methods research (Creswell & Plano Clark, 2018). The quantitative results delivered comparative evidence about the perceptions of students and faculty members. The qualitative results explained the issues faced, ethical concerns, and proposed actions around AI application in more depth. The synthesis of the two sets of findings was used for developing a policy for guiding AI applications in higher education. Ethical considerations were observed throughout the research process, particularly in the process of obtaining the necessary approvals, confidentiality of participants' information, and informed consent. Such measures were taken to protect the rights, privacy, and voluntary participation of the respondents in the data collection and research process.

4. Results and Findings

This chapter highlights significant findings obtained from the data collection and interviews with the respondents.

4.1 Quantitative Findings

Table 1: Demographic Characteristics of Respondents (N = 633)

Variable	Category	Faculty (n)	Student (n)	Total (n)	%
Role	Faculty	100	—	100	15.8
	Students	—	533	533	84.2
Age	≤ 20 years	0	394	394	62.2
	21–30 years	89	53	142	22.4
	≥ 31 years	11	2	13	2.1
Gender	Male	28	158	186	29.4
	Female	45	379	424	67.0
	Prefer not to say	9	14	23	3.6
Academic Field	Social Sciences & Education	52	302	354	55.9
	Business & Engineering	11	150	161	25.5
	Health Sciences	6	47	53	8.4
	Natural & Agricultural Sciences	13	23	36	5.7
AI Usage Frequency	Daily	15	467	482	76.1
	Weekly	20	64	84	13.3
	Monthly / Occasional	65	2	67	10.6

Note. Percentages are based on the total sample (N = 633). Health Sciences include Allied Medicine and Medicine. Em dashes (—) indicate not applicable.

The responses shown in Table 1 come from 633 participants in higher education institutes and predominantly consisted of students (84.2%) over faculty (15.8%), a generally true representation of people on higher education sites, offering an interesting view on AI usage in these environments. The majority of participants are under 20 (62.2%), over 21-30 years old (22.4%), the “digital natives” of society, those who are typically quick to adopt new technologies. The gender split was mostly female (67.0%), and disciplines are spread between social sciences, education, business, and engineering at the head; the majority of staff members are relatively early in their careers. While the overall usage was often daily, it seemed more focused on students, while the majority of faculty use AI strategically and on demand.

This pattern indicates that the adoption of AI in higher education could be based not only on age and digital familiarity but on the users' specific role and intent as well. The higher use among students is likely because they grew up with and readily embrace digital technologies, while faculty may only use it strategically and on-demand to serve specific objectives. Therefore, higher use may not equate with a more thorough integration of AI.

Table 2: Efficiency Dimension Among Respondents on the Use of AI in Academic Tasks (N=633)

Statement	Weighted Mean	Standard Deviation	Interpretation
1. AI helps me complete academic tasks faster	3.18	0.72	High Agreement
2. AI reduces the effort I exert in searching for academic resources	3.01	0.81	High Agreement
3. AI provides accurate and relevant academic information	2.67	0.89	Moderate Agreement
4. AI tools help me organize and summarize large amounts of data	3.11	0.79	High Agreement
5. AI saves me time in drafting academic outputs	3.06	0.83	High Agreement
6. AI minimizes errors in the academic tasks I perform	2.84	0.82	Moderate Agreement
7. AI assists me in clarifying complex academic concepts	3.15	0.78	High Agreement
8. AI enables me to accomplish multiple tasks simultaneously	2.99	0.76	Moderate Agreement
9. AI makes my academic work process more systematic	2.91	0.83	Moderate Agreement
10. AI lessens the amount of time I spend on repetitive tasks	3.09	0.80	High Agreement
Overall Efficiency Mean	2.98	0.80	Moderate to High Agreement

As seen from Table 2, a generally moderate to high agreement has been observed among the participants regarding the utility of AI in academic activities ($M = 2.98$, $SD = 0.80$), with students generally considering AI a useful helper to enhance their academic efficiency. The most highly accepted uses, which include helping students finish their academic tasks more quickly ($M = 3.18$), explaining complex topics clearly ($M = 3.15$), or organizing and summarizing any needed information ($M = 3.11$), show that students prefer using AI to help them be more efficient than simply letting it replace their entire learning and research effort. This is consistent with studies regarding AI being assistive technologies, which extend human capacity in education (Devi Prasanna & Venthamarai, 2025; Garzón et al., 2025).

On the contrary, there was only a moderate agreement with the items of the accuracy and conciseness of the information provided by AI ($M = 2.67$) and reducing errors ($M = 2.84$), respectively. These results indicate that students are still skeptical of just believing in the result of AI for all of their needs. This is consistent with recent studies about generating inaccurate and fabricated content with generative AI (Lindkvist et al., 2026). These results support the TRM-AI, emphasizing that effective human-AI collaboration requires shared responsibility among students, faculty, and institutions to ensure that AI enhances efficiency without compromising academic quality.

Table 3: Productivity Dimension Among Respondents on the Use of AI in Academic Tasks

Statement	Weighted Mean	Standard Deviation	Interpretation
1. AI improves the overall quality of my academic outputs	2.94	0.77	Moderate Agreement
2. AI helps me generate new ideas for research or projects	3.22	0.78	High Agreement
3. AI increases my motivation to complete academic work	2.81	0.86	Moderate Agreement
4. AI enhances my ability to manage academic workload	3.02	0.79	High Agreement
5. AI supports creativity in producing academic outputs	2.92	0.82	Moderate Agreement
6. AI helps me meet deadlines more efficiently	3.08	0.76	High Agreement
7. AI strengthens my decision-making in academic tasks	2.85	0.81	Moderate Agreement
8. AI allows me to handle more responsibilities effectively	2.89	0.83	Moderate Agreement
9. AI encourages collaboration and teamwork in academic tasks	2.61	0.94	Moderate Agreement
10. AI contributes to my continuous improvement in academic performance	2.91	0.91	Moderate Agreement
Overall Productivity Mean	2.93	0.83	Moderate Agreement

Table 3 shows that the agreement for the productivity dimension of the study is moderate ($M = 2.93$, $SD = 0.83$), which indicates that AI aids students' productivity in academic tasks. The highest rated indicator in the productivity dimension: "AI helps me generate new ideas for research or projects." ($M = 3.22$, $SD = 0.78$) shows that students think that AI assists them with the idea generation processes for tasks. This supports the finding of Nathaniel et al. (2025), who explained that AI is considered helpful for students by enhancing learning through helping students with idea generation, writing, problem solving, etc., when properly utilized.

Similarly, AI helps students in terms of managing deadlines and workload is high ($M = 3.08$, $M = 3.02$), which implies that AI can assist students in organizing their academic tasks more efficiently and effectively. This is supported by Khalifa & Albadawy (2024) who stressed the importance of using AI to increase productive capacity and work efficiency in every academic process. Nevertheless, AI encourages collaboration and teamwork in academic tasks, receiving a low mean ($M = 2.61$, $SD = 0.94$).

This suggests that students generally regard AI as a tool that assists their individual work but not their collaborative tasks. This supports the argument by Mimoudi (2025) that the generous potential of educative usage that can be given by Gen AI is generally considered beneficial. However, the problem arises when it comes to implementing them with collaborative learning, and this remains a continuing challenge. These results consolidate the TRM-AI framework by underlining the critical role of students, faculty, and institutions to collectively enhance the students' ability to benefit from AI with the meaningful cooperation of AI.

Collectively, these findings empirically support the TRM-AI model by explaining both the productive affordances and the interactive constraints of AI use in academic settings. The high student ratings for generating ideas and for managing academic workloads, on the other hand, may indicate that increased productivity comes at least in the short-term at the individual, not collaborative level. This finding aligns with TRM-AI's claim that it cannot rely on AI use at the individual level alone. Students continue must take responsibility for thoughtful, critical AI use, the faculty must provide direction for instructional application, and institutions must provide environments in which students can work productively and collegially. These considerations confirm TRM-AI's emphasis on the productive contributions of AI versus the importance of human interaction, instructional oversight, and cooperative responsibility in maximizing educational benefits.

Table 4: Ethics Dimension Among Respondents on the Use of AI in Academic Tasks (N=633)

Statement	Weighted Mean	Standard Deviation	Interpretation
1. I am aware of the ethical issues in using AI for academic work	3.18	0.89	High Agreement
2. I believe AI-generated outputs must be cited properly	3.73	0.69	Very High Agreement
3. Using AI without acknowledgment is a form of academic dishonesty	3.61	0.74	Very High Agreement
4. I am careful about depending exclusively on AI for academic work	3.33	0.82	High Agreement
5. I avoid using AI in ways that could misrepresent my abilities	3.21	0.88	High Agreement
6. I believe students may misuse AI for plagiarism	3.41	0.79	High Agreement
7. Institutions must provide clear policies on the ethical use of AI	3.58	0.67	Very High Agreement
8. I think overuse of AI can weaken independent learning and critical thinking	3.55	0.77	Very High Agreement
9. I value the balance between AI use and personal effort in academic work	3.49	0.74	High Agreement
10. I believe AI should be used as a supportive tool, not as a replacement for human work	3.70	0.62	Very High Agreement
Overall Ethics Mean	3.48	0.76	High Agreement

As shown in Table 4, a higher degree of agreement exists on the ethics dimension ($M = 3.48$, $SD = 0.76$), implying that the respondents consider that AI usage in the context of academic activities requires proper procedures and principles for use.

Higher rated indicator item within the dimensions is to properly cite the sources of AI-generated works ($M = 3.73$, $SD = 0.69$), followed by only using AI for the support and assistance for their work rather than directly substituting human-related labor in work completion ($M = 3.70$, $SD = 0.62$), which is also in agreement with the argument by Hasan (2026) that proper recognition and attribution of generated content should be maintained, and students' work requires to be based on human authorship and human creativity is necessary when using this generative AI."

In the dimension of ethics, the majority of students expressed strong agreement towards the view that it is academic dishonesty to use AI without any acknowledgment of utilizing it ($M = 3.61$, $SD = 0.74$), and they believe that institutions should formulate policies for academic use of AI ($M = 3.58$, $SD = 0.67$). Such strong beliefs among students are in harmony with Kaşaracı et al. (2025), who stated that institutions need to develop policies and frameworks of responsible implementation and use of AI systems, and with Azevedo et al. (2025) who said

that it is imperative to consider some areas where it will be necessary to rethink the existing higher education landscape to manage and integrate generative AI, to guarantee that it will benefit our students and society, while taking full control and accountability for our decisions about it. Altogether, these results justify that TRM-AI works for the tripartite of ethical practice by involving all parties in preserving academic integrity.

Overall, the results strongly provide empirical evidence for the moral foundation of the TRM-AI framework. High ratings for appropriate citation, AI human authorship, transparency of AI use, and establishing policy offer evidence that ethical use of AI is viewed by students as more than just individual responsibility but as shared academic responsibility. This clustering of measures serves to reinforce the tripartite structure of the model: students should be transparent in AI use, instructors can facilitate appropriate AI use and remind students about ethics and integrity in writing/coursework, and the institution can define and develop policy and support appropriate AI use. Indeed, the robust rating for ethics (M= 3.48) together with strong agreement regarding institutional policy (M=3.58) suggests that Ethical AI depends on more than practice, as well as on organizational support. These results support the main premise of TRM-AI. High ethical standards in AI-supported education are achieved through shared responsibility among all stakeholders.

Comparison of Faculty and Student Views Across Efficiency, Productivity, and Ethics Dimensions

Table 5: Descriptive Statistics and Mann-Whitney U Test Results on the Perspectives of Faculty vs. Students

Dimension	Group	N	Mean	SD	Mann-Whitney U	p-value	Interpretation
Efficiency	Faculty	100	2.76	0.86 0.79	18,542	<0.001	Significant
	Students	533	3.05				
Productivity	Faculty	100	2.71	0.88 0.81	19,847	<0.001	Significant
	Students	533	2.97				
Ethics	Faculty	100	3.63	0.68 0.77	20,234	<0.001	Significant
	Students	533	3.45				
Overall Attitude	Faculty	100	3.01	0.83 0.80	24,156	0.142	Not Significant
	Students	533	3.11				

Table 5 reveals a significant difference between faculty and students in the Mann-Whitney U test in efficiency, productivity, and ethics, with no significant difference in the overall attitudes between faculty and students toward the use of AI in the university work performed by students. The table shows that the students have significant greater estimates of AI's efficiency and productivity compared with faculty members. Students perceive AI use more favorably in performing tasks on the work by AI in college tasks. It seems that the students are more likely to use GenAIs because of their advantages for learning, writing, and problem-solving (Liu et al, 2025; Kim et al, 2024). The researcher found that university students have a greater propensity for embracing new technology, such

as GenAI, for its benefits (Liu et al, 2025; Kim et al, 2024). On the contrary, we have a significantly greater ethical concern on the part of faculty members, as we see that college educators have significantly more ethical awareness than students in this study. Therefore, the faculty have a serious regard for ethical concerns more than the students, and a role in the ethical usage of AI in academic integrity. This can be attributed to the assumption that the faculty place great importance and interest in the ethics of using AI, in which educators play the central role in ensuring a proper ethical and humane application and human oversight (UNESCO, 2024).

Therefore, even though differences were found in some sub-dimensions, this study concluded that there is no significant difference in overall attitude. Both parties widely agree on the usefulness and the need for using AI in higher education, as AI is regarded as widely accepted as an indispensable aspect of technology in modern higher education. However, the potential risk needs to be controlled and managed to guarantee that AI can do its task. The outcome is therefore in the direction of the TRM-AI, according to which students, faculty and the institutions play a mutually complementary role to ensure appropriate functioning of human-AI co-action.

4.2 Qualitative Findings

Table 6: Thematic analysis on the use of AI in Academic tasks

Themes	Sub-Theme	Sample Quotations
Efficiency	Task Completion & Data Handling	"AI helps me organize a large amount of data for my assignments, saving a lot of my time." – Student 12
		"I use Quill Bot to finish my research summaries faster than doing it manually." – Student 7
Productivity	Idea Generation & Workload Management	"AI like ChatGPT gives me a lot of new ideas when I am brainstorming for my thesis." – Student 21
		"It helps break down large projects into smaller, manageable tasks." – Faculty 5
Ethical Awareness	Citation & Integrity	"I want to cite AI outputs to avoid plagiarism, but I am afraid that my instructor will not accept them as references for my thesis." – Student 15
		"It is unethical to use AI to replace thinking." – Faculty 8
Challenges & Limitations	Accuracy & Complex Tasks	"Sometimes AI summaries are inaccurate and can mislead students." – Faculty 10
		"AI is useful for assignments, but not for research design or advanced teaching tasks." – Faculty 4
Role-Based Differences	Students vs. Faculty	"I use Grammarly every day in my academic tasks; it's part of my study routine." – Student 6
		"I only use AI occasionally, mostly to generate new ideas." – Faculty 1
Recommendations	Ethics Education & Policy	"Universities should train students on proper AI use and citation." – Student 9
		"We need clear policies and guidelines that balance efficiency and academic integrity." – Faculty 5
Integration Insights	Complementary Use & Awareness	"AI like ChatGPT should be used to assist, not to replace, critical thinking or problem-solving." – Student 3
		"Everyone needs to understand both the benefits and risks of using AI." – Faculty 9

The thematic analysis revealed that both students and faculty recognize AI as a valuable supportive tool in academic work, although their experiences and patterns of use differ. Students primarily emphasized AI's contribution to efficiency through faster task completion, data organization, idea generation, and workload management. As one student explained, *"AI helps me organize a large amount of data for my assignments, saving a lot of my time"* (Student 12), while another noted that AI provides ideas during thesis brainstorming (Student 21). Faculty members likewise acknowledged AI's usefulness, particularly in routine academic tasks and organizing complex workloads.

However, their accounts were more cautious regarding the use of AI in research design, advanced teaching tasks, and other activities requiring professional judgment. This distinction is reflected in the observation of Faculty 4 that AI is useful for assignments but less appropriate for research design and advanced teaching tasks. These findings are consistent with Wrench and Sanae Elmoudden (2026) and Dabbagh and Fake (2026), who reported that GenAI can support writing, brainstorming, and information processing while remaining limited as a substitute for higher-order cognitive processes.

Beyond efficiency and productivity, participants' accounts revealed that responsible AI use is closely connected to ethical awareness and human judgment. Students expressed concerns regarding proper citation and the possibility of AI-assisted work being perceived as plagiarism. Student 15, for example, stated, *"I want to cite AI outputs to avoid plagiarism, but I am afraid that my instructor will not accept them as references for my thesis."* Faculty members similarly emphasized that AI should not replace human thinking, with Faculty 8 asserting, *"It is unethical to use AI to replace thinking."* These perspectives demonstrate that participants do not view AI use simply as a matter of technological convenience; rather, they recognize the need to maintain academic integrity, transparency, critical thinking, and human responsibility. This finding is consistent with Schmidt et al. (2025), who emphasized the importance of AI literacy, clear institutional policies, and the preservation of human judgment in higher education.

The participants' concerns about accuracy and the limitations of AI further reinforce the need for human oversight. Faculty members noted that AI-generated summaries may contain inaccurate information and that AI remains less suitable for complex research, teaching, and decision-making tasks. Faculty 10 cautioned that *"Sometimes AI summaries are inaccurate and can mislead students,"* while Faculty 4 similarly distinguished between AI's usefulness for routine assignments and its limitations in research design and advanced teaching. These observations support Tian and Zhang (2025), who emphasized the necessity of human verification and critical evaluation of AI-generated outputs. Thus, the qualitative findings suggest that effective AI integration requires users to recognize both what AI can accomplish efficiently and where human expertise remains indispensable.

Taken together, these findings provide a clear transition from participants' experiences to the proposed TRM-AI. The model is grounded in the central premise that responsible human-AI collaboration cannot be achieved through the actions of a single stakeholder. Instead, responsibility must be distributed among students, faculty, and the institution, with each actor contributing a distinct but complementary function. The student component of TRM-AI is reflected in participants' emphasis on responsible and critical AI use. Students are expected to use AI as an aid to learning rather than as a substitute for their own thinking, disclose AI assistance when required, verify AI-generated information, and observe appropriate standards of academic integrity. The students' accounts regarding efficiency, citation, and the appropriate role of AI demonstrate that responsible AI integration requires not only technological competence but also individual accountability.

The faculty component emphasizes human judgment, pedagogical guidance, and academic oversight. Faculty members' concerns about inaccurate outputs and the limitations of AI in complex research and teaching tasks demonstrate the continuing importance of educators in evaluating AI-generated information and determining when and how AI should be used. The faculty, therefore, serve not merely as users of AI but as critical mediators of AI-supported learning, guiding students in ethical use, evaluating AI-assisted outputs, and ensuring that human reasoning and disciplinary expertise remain central to academic work.

The institutional component addresses the broader structures necessary to sustain responsible AI integration. Participants' recommendations for AI education, clear policies, and appropriate guidelines indicate that responsible use cannot depend solely on the discretion of individual students or faculty. Institutions must establish clear expectations concerning acceptable AI use, academic integrity, citation and disclosure, AI literacy, data protection, and accountability. Institutional support, therefore, provides the policy, training, and governance environment within which responsible human-AI collaboration can occur.

The relationship among these three components is complementary rather than hierarchical. Students exercise responsible agency on their own AI use; the faculty provide professional and pedagogical oversight; and institutions establish the policies, resources, and accountability mechanisms that guide both. The qualitative findings show that weaknesses in any one component may undermine responsible AI integration. For example, students may understand the importance of ethical AI use but remain uncertain without clear institutional guidance, while institutional policies may have limited impact without faculty guidance and student compliance. TRM-AI consequently conceptualizes responsible AI integration as a shared and interconnected responsibility rather than an individual obligation.

The qualitative findings extend the quantitative results by providing contextual explanations for the observed patterns of efficiency, productivity, and ethical awareness. More importantly, the convergence of participants' experiences around responsible student use, faculty oversight, and institutional guidance

provides substantive empirical support for the three-part structure of TRM-AI. Although the qualitative findings do not constitute formal statistical validation of the model, they demonstrate that its core components are grounded in the actual experiences, concerns, and recommendations of the study participants. Thus, TRM-AI proposes that sustainable human-AI collaboration in higher education depends on balancing the benefits of AI-enabled efficiency and productivity with human agency, academic integrity, critical judgment, and institutional accountability.

5. Discussion

The findings indicate that AI is no longer an external technology in higher education but is increasingly embedded in academic work as an assistive resource for both students and faculty. Participants recognized AI's capacity to generate ideas, organize and summarize information, support task completion, and improve the efficiency of academic work. This finding is consistent with Jose et al. (2025), who reported that AI can reduce cognitive burden and improve efficiency by decreasing the time required to complete different tasks. However, the present findings suggest that efficiency should not be equated with learning. Although AI may reduce the time and effort required for routine academic tasks, meaningful learning remains dependent on the user's ability to evaluate, interpret, verify, and apply AI-generated information. Thus, the educational value of AI appears to depend not on the amount of work transferred to technology, but on whether the time and cognitive resources gained through AI assistance are redirected toward higher-order thinking, reflection, and decision-making.

The significant differences between faculty and students in perceived cognitive efficiency and educational productivity provide further insight into the nature of human-AI collaboration in higher education. Students reported greater benefits from AI in these areas, which may be associated with their more frequent use of AI for immediate academic demands such as generating ideas, organizing information, summarizing materials, and completing assignments. The faculty, in contrast, encounter AI within broader responsibilities involving instructional design, assessment, research, disciplinary expertise, and academic judgment.

As a result, their comparatively lower perceptions of efficiency and productivity may reflect not resistance to AI but a more cautious assessment of its usefulness for tasks requiring contextual understanding, professional expertise, and accountability. This suggests that perceptions of AI effectiveness are shaped not only by the technology itself but also by the user's academic role, the nature of the task, and the level of judgment required. The findings consequently extend human-AI collaboration literature by indicating that the benefits of AI are experienced differently depending on the responsibilities and expectations associated with academic roles.

Despite these differences, students and faculty shared a generally positive overall perspective toward AI in academic work. This convergence is particularly significant because it challenges a simplistic student-versus-faculty divide in AI adoption. Students may experience more immediate and visible productivity

benefits, whereas faculty may evaluate AI through the broader lens of educational quality, academic standards, and professional responsibility. Nevertheless, both groups appear to recognize that AI can be useful without necessarily replacing human intelligence. This finding supports Azevedo et al. (2025), who characterized AI as an assistive intelligent tool (AIT) that augments human capabilities while preserving human authorship in learning processes. The findings support a complementary view of human–AI collaboration in which AI contributes speed, information processing, and idea generation, while humans remain responsible for contextual understanding, critical evaluation, interpretation, and final decision-making. In this sense, the findings point toward a form of collaborative intelligence in which AI and human capabilities are complementary rather than substitutive.

The qualitative findings further explain how this relationship is experienced in actual academic contexts. Students emphasized the usefulness of AI in managing workload, generating ideas, and completing academic requirements, while the faculty recognized its value for routine and supportive tasks but expressed greater caution regarding complex teaching, research, assessment, and decision-making. These differences suggest that the perceived usefulness of AI is closely associated with the complexity and consequences of the academic task. AI may be highly effective when used to support routine cognitive activities, but its limitations become more consequential when tasks require disciplinary expertise, contextual interpretation, ethical judgment, or accountability for educational outcomes. The findings challenge an overly deterministic view of AI in education: greater technological capability does not automatically translate into greater educational value. Rather, the quality of human judgment surrounding AI use remains central to meaningful academic work.

Ethical responsibility emerged as another important dimension of human–AI collaboration. Both students and faculty recognized the importance of responsible use, although the faculty placed greater emphasis on academic integrity, attribution, and appropriate use in their academic responsibilities. This difference may reflect the distinct institutional roles of faculty, who are responsible for evaluating student work, maintaining academic standards, and protecting the credibility of educational processes. Students, meanwhile, may encounter AI more directly as a tool for managing academic workload and improving efficiency. Nevertheless, the generally favorable ethical perceptions across both groups suggest that AI use is not necessarily viewed as inherently unethical. Instead, participants appear to distinguish between responsible and irresponsible use based on factors such as transparency, attribution, verification, and the preservation of human authorship. This finding reinforces the argument of Azevedo et al. (2025) that AI integration requires appropriate governance and policies within higher education.

The findings further suggest that academic integrity in the context of AI should not be understood solely in terms of whether a student used AI. A more fundamental concern is whether the student maintains intellectual ownership and responsibility for the academic work produced. When AI is used to generate

ideas, summarize information, or assist in writing, the user must still evaluate the accuracy and relevance of the output, recognize potential bias or inaccuracies, appropriately acknowledge AI assistance, and take responsibility for the final product. This reframes academic integrity from a primarily prohibitive concern toward a broader principle of transparent, accountable, and critically engaged human-AI collaboration. Accordingly, the recommendations emerging from the participants' perspectives point toward clearer institutional guidance on acceptable AI use, disclosure and attribution requirements, verification of AI-generated information, AI literacy, faculty development, and assessment practices that allow students to demonstrate independent reasoning and authentic learning.

The integrated quantitative and qualitative findings provide the empirical grounding for the proposed TRM-AI. The model emerged from the convergence of three central insights: AI provides meaningful support for academic efficiency and productivity; students and faculty experience and evaluate AI differently because of their distinct academic roles; and responsible AI use requires continued human judgment, academic integrity, and ethical accountability. These findings indicate that responsible AI integration cannot be achieved by placing responsibility solely on individual users. Instead, responsibility must be distributed across the key actors who shape the educational environment.

The theoretical contribution of TRM-AI lies in this shared yet differentiated conception of responsibility. Students are responsible for using AI transparently, critically, and ethically while maintaining ownership of their learning. The faculty are responsible for guiding appropriate pedagogical use, designing learning experiences that preserve human intellectual engagement, and maintaining academic standards. Institutions are responsible for establishing policies, AI literacy initiatives, faculty development opportunities, assessment guidelines, and support systems that enable responsible AI integration. Thus, the framework extends existing discussions of responsible AI, AI governance, and human-AI collaboration by moving from general ethical principles toward a role-based account of responsibility specifically situated within higher education. Its contribution is not merely to argue that AI should be used responsibly, but to clarify who bears responsibility, what that responsibility involves, and how the responsibilities of students, faculty, and institutions are interdependent.

Consequently, TRM-AI positions responsible AI integration as an institutional and educational process rather than simply a matter of individual technology use. The findings suggest that the central challenge for higher education is not whether AI should be incorporated into academic work, but how its use can enhance human capabilities without displacing human intellectual agency. By placing students, faculty, and institutions within a shared responsibility structure, TRM-AI provides an empirically grounded framework for maintaining academic integrity, critical thinking, transparency, and accountability while recognizing the legitimate benefits of AI. The model thus shifts the focus from AI adoption alone toward responsible human-AI collaboration in which technological capability and human intellectual responsibility remain mutually reinforcing.

6. Conclusion

Artificial intelligence is no longer optional; it is already shaping the way that faculty and students perform in academia, as well as the overall process and learning enhancement. It is more apparent among students who were found to likely utilize the tool, as AI is well known for boosting their productivity and helping them cope with academic pressure and deadlines. The data also confirms that the optimization of processing speed and efficiency does not inherently guarantee a corresponding increase in pedagogical or qualitative value, showing that the need for human discretion, critical thinking, and ethical considerations is still important. This confirms that human-artificial intelligence can be best used collaboratively rather than as an autonomous replacement for humans.

In terms of moral consciousness, the faculty are more inclined to recognize the importance of their responsibility for maintaining the standards in academia and for any associated ethical questions or dilemmas of AI. Still, results suggest that there is a rather positive inclination of faculty and students toward the use of AI. Therefore, academic institutions should adapt to the new technologies in accordance with clear and honest guidelines for any user to have access. With the aid of the guidelines proposed, AI will be the collaborator rather than a replacement of academic quality, a robust human-AI collaborative tool with guidelines for governance of AI, and for ethics and shared practices of an institution. Thus, its students and faculty in academic operations will continue to flourish.

The study establishes a framework for TRM-AI to further strengthen the human-AI collaborative work process in higher learning establishments. The system describes how collaborative work processes emerge when both the intelligences of humans and AI are harnessed in achieving some shared goals of academic work for the common good of the learning community. This model further dictates the different individual roles for both the institution and faculty and students in using AI to promote responsible, ethical, as well as effective integration of it into any learning operation.

It acts as a collaborating partner supporting the strengths of its human user, without necessarily substituting for human intellectual judgment, responsibility or accountability. This human-AI collaborative effort is deemed to only be achieved with effective use of AI along with the combined efforts of institutions, faculty and students towards building up the integrity of an educational setting, and encouraging the responsible use and exploitation of technology to aid the overall learning and academic objectives of both.

7. Recommendations

The findings of this study have important implications for the responsible implementation of AI in higher education. The TRM-AI may be operationalized through a coordinated institutional approach that distributes responsibility among students, faculty, and institutions. Rather than treating responsible AI use solely as an issue of individual compliance, higher education institutions (HEIs)

should establish structures, competencies, and practices that enable all three stakeholders to participate meaningfully in responsible human-AI collaboration. At the institutional level, HEIs should develop comprehensive, regularly updated AI-governance policies that clearly define acceptable and unacceptable uses of AI in teaching, learning, research, assessment, and administrative work. These policies should address AI disclosure requirements, academic integrity, data privacy and security, intellectual property, transparency, accountability, and the appropriate use of GenAI in student outputs.

Policies should also provide clear procedures for addressing AI-related academic misconduct while recognizing legitimate and pedagogically purposeful uses of AI. Importantly, institutional policies should be developed through participatory consultation involving administrators, faculty, students, information technology (IT) personnel, research offices, and other relevant stakeholders. Such an approach would operationalize the institutional responsibility component of TRM-AI while allowing policies to remain responsive to rapidly evolving AI technologies.

HEIs should likewise establish AI literacy initiatives for faculty and students. AI literacy should extend beyond technical skills and include the ability to critically evaluate AI-generated information, recognize hallucinations and bias, protect personal and institutional data, properly acknowledge AI assistance, and make informed ethical decisions regarding AI use. Student AI-literacy programs may be embedded in orientations, general education courses, research courses, and discipline-specific subjects. Faculty and staff may likewise be provided with structured learning opportunities that focus on responsible AI use, prompt design, verification of AI-generated content, copyright and privacy considerations, and the pedagogical implications of human-AI collaboration. These initiatives would strengthen the capacity of students and faculty to exercise the individual responsibilities emphasized in TRM-AI.

Faculty development should be institutionalized as an ongoing professional development priority rather than treated as a one-time training activity. Faculty members should be supported in redesigning learning activities and assessments so that AI is used as a learning support while preserving students' opportunities to demonstrate independent reasoning, creativity, disciplinary understanding, and authentic engagement. Professional development may include workshops on AI-assisted instructional design, AI-supported research, responsible use of AI tools, assessment redesign, AI-related academic integrity issues, and strategies for evaluating AI-assisted student work. The faculty should also be encouraged to share effective practices and collaboratively develop discipline-specific guidelines for responsible AI integration.

The TRM-AI framework also has significant implications for assessment practices. As GenAI becomes increasingly capable of producing conventional academic outputs, HEIs should reconsider assessment approaches that rely heavily on easily generated products. Assessment practices may incorporate authentic and process-oriented tasks, oral examinations or defenses, reflective journals,

portfolios, project demonstrations, drafts and revisions, and other activities that allow students to demonstrate how they arrived at their conclusions. Where AI use is permitted, students may be required to disclose the tools used, describe how AI contributed to their work, verify AI-generated information, and critically reflect on the strengths and limitations of the technology. Such practices shift assessment from simply determining whether AI was used toward evaluating students' capacity to use AI responsibly, critically, and transparently.

Finally, the implementation of TRM-AI should be supported by continuous monitoring and evaluation. Institutions may establish mechanisms for periodically reviewing AI policies, collecting feedback from faculty and students, documenting emerging AI-related challenges, and evaluating the effectiveness of AI literacy and faculty development initiatives. The framework may serve not as a static policy model but as a basis for continuous institutional learning and improvement. Through coordinated policies, AI literacy programs, faculty development, and assessment reform, HEIs can move from merely regulating AI use toward cultivating a culture of responsible human-AI collaboration. In this way, TRM-AI provides a practical foundation for aligning technological innovation with academic integrity, educational quality, human agency, and institutional accountability.

Conflict of Interest

The author declares that there is no conflict of interest in the conduct, authorship, and publication of this paper.

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