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TRANSFORMATIVE PEDAGOGY IN THE DIGITAL AGE: UNRAVELING THE IMPACT OF ARTIFICIAL INTELLIGENCE ON HIGHER EDUCATION STUDENTS

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Abstract

Artificial Intelligence (AI) has become a transformative force in education, significantly influencing students. This research explores AI's impact on learning experiences, academic performance, career guidance, motivation, self-reliance, social interaction, and AI dependency. Utilizing a descriptive-comparative design, 194 student respondents were chosen through stratified sampling. The results show that students generally perceive AI positively. Students agree that AI enhances personalized learning, engagement, and critical thinking, although practical hands-on learning experiences received less favorable feedback. Academically, students concur that AI helps them identify weaknesses, improve assignments, and track progress, despite some reservations about its efficacy in exam preparation. For career guidance, students agree that AI effectively matches skills with career options, recommends internships, and provides resources, though it is less effective for long-term planning. Students also believe AI boosts motivation through gamified learning and progress tracking and fosters self-reliance via self-directed learning and critical thinking support. Socially, students agree that AI facilitates collaboration, peer learning, and networking. Additionally, students demonstrate a reliance on AI for their learning processes. Notably, female students report a more significant impact on social interactions than male students. The type of device used (laptop vs. cellphone) significantly affects the learning experience, with laptop users reporting a more substantial impact. Differences in AI's impact are noted among various courses, particularly benefiting education students more than those in hospitality management and agriculture. However, age and family income do not significantly influence AI's overall impact.
Keywords: *Artificial Intelligence, descriptive-comparative, impact on learning, higher education*

Introduction

Artificial intelligence (AI) integration has become a revolutionary force in the fast-changing field of higher education, reinventing the dynamics of the learning environment and modifying traditional pedagogical techniques (Qian et al., 2023; Kamalov et al., 2023). This research delves into the multifaceted dimensions of AI influence on students, with a comprehensive examination of key variables. The learning experience, a cornerstone of academic journeys, takes center stage in our investigation. As students navigate through their educational paths, the introduction of AI technologies holds the potential to revolutionize how information is absorbed and engaged, fundamentally altering the learning process itself. Furthermore, our study extends its focus to encompass various critical variables that contribute to a comprehensive grasp of how AI influences higher education learners. These variables include educational journey, academic achievements, career advice, drive, independence, social engagement, and reliance on AI (Capinding, 2024). By investigating these aspects, the researchers aim to discern the intricate interplay between AI integration and the diverse facets of students' educational experiences.

This research explored how AI impacted the richness, efficiency, and adaptability of the learning journey, considering factors such as content relevance, engagement levels, and individualized learning pathways. One of the most important parts of academic pursuits is the

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learning process, and incorporating AI has the power to greatly impact it (Melo, 2023). Artificial intelligence (AI)-powered solutions can enhance the learning process by customizing course materials, tailoring information to each learner's unique learning preferences, and offering immediate feedback (Culican, 2023). As a result, learning becomes memorable and enjoyable (Gupta, 2023). Furthermore, according to Meenakshi (2023), AI in education offers personalized learning experiences by analyzing individual learning patterns, enhances efficiency through task automation, provides 24/7 accessibility to learning resources, ensures adaptive learning tailored to proficiency levels, enables data-driven improvements in curriculum and teaching methods and creates engaging learning environments with interactive technologies. On the other hand, AI introduces certain negative effects that could undermine the human experience. According to Noema (2021), one major issue with AI adoption is that it both lessens human control and complicates AI's function in sustainable value generation, which affects how people perceive life in general. Furthermore, Grace et al. (2017) argued that AI experts forecast AI surpassing humans in numerous activities by 2024, 2026, 2027, and 2031. They suggest a 50% probability of AI handling all tasks within 45 years and automating all jobs within 120 years, potentially diminishing the human learning experience.

The integration of AI in education may influence academic performance, which is a noteworthy factor. In the Philippine context, despite the existence of laws and regulations encompassing general principles applicable to AI (Tupaz et al., 2023), there is currently a lack of specific protocols or rules governing the incorporation of AI in education (Mirasol, 2023). Students have the liberty to employ AI in their academic tasks, and its regulation is solely determined by their respective subject teachers or the institution. Thus, there might be a beneficial or negative effect of AI on student performance in school. Meenakshi (2023) has asserted that the use of artificial intelligence (AI) in the classroom can promote more student engagement, better understanding, and better academic achievement overall. On the other hand, according to Jarrahi (2018), artificial intelligence is outperforming the inherent biological constraints of humans, potentially resulting in a deterioration of cognitive capabilities. Moreover, in the event of AI misuse or excessive dependence, AI technologies may also impair students' critical thinking and problem-solving proficiencies (Yin, 2024). However, the impact of AI on students' learning may vary depending on their profiles or the specific settings in which they are situated.

Beyond the academic realm, the role of AI extends into career guidance, contributing to informed decision-making regarding academic and professional paths. According to Westman et al. (2021), artificial intelligence (AI) can cater to both students and staff across diverse modalities within career guidance services, contingent upon user requirements, the proficiency of staff, and the organizational capacity to utilize technology effectively. In addition, according to Bojorquez (2023), incorporating instruction on artificial intelligence (AI) into educational curricula is imperative. This approach fosters digital literacy, cultivates critical thinking abilities, and equips students with the necessary competencies for achieving academic and professional advancement in the future. Furthermore, Ho (2022) argued that leveraging data sourced from job postings, course catalogs, and students' CVs allows artificial intelligence (AI) to aid individuals in identifying discrepancies and charting their educational paths effectively. As an illustration, the University of Southern California utilizes artificial intelligence (AI) to offer personalized career counseling services, which are carefully crafted to cater to the distinct requirements of each student, adhering to academic standards and originality (Schwass, 2023). This study investigates how AI technologies empower students to make strategic choices aligned with their aspirations.

Motivation, a cornerstone for effective learning, is also in focus. By understanding how AI impacts student motivation, this research aims to discern whether AI acts as a catalyst for increased motivation or introduces new challenges that must be navigated. Huang et al. (2023) demonstrate that the integration of artificial intelligence (AI) markedly enhances students' learning performance, engagement, and motivation. For instance, Ali et al. (2023) provided empirical evidence demonstrating that ChatGPT acts as a motivational stimulant for learners, particularly aiding in the improvement of reading and writing abilities, while respondents displayed a neutral attitude regarding its impact on enhancing listening and speaking skills. Moreover, according to Siregar et al. (2023), the integration of chatbots, exemplified by ChatGPT, has the potential to substantially augment students' motivation. However, Ahmad et al. (2023) argued that AI greatly affects the decline in human decision-making and increases human laziness.

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Self-reliance, a critical skill for lifelong success, is under examination to understand how AI either fosters or hinders the development of this essential attribute. The integration of AI in the educational framework, particularly within SMART classes, enhances the efficiency and creativity of instructional sessions, catering to both in-class and remote learning dynamics (Dimitriadou & Lanitis, 2023). This integration contributes to fostering students' overall self-reliance, equipping them with the skills to navigate challenges in their academic pursuits (Zawacki-Richter et al., 2019). In addition, according to Godsall (2023), AI can improve students' self-confidence and encourage classroom participation when developed with equality and inclusivity. However, if AI is misused the students may not trust themselves, but rather it may lead to overreliance or dependency on AI (Chen et al., 2023). The research aims to shed light on the broader implications of AI integration on students' ability to become self-reliant learners.

The dynamics of student-student and student-teacher interactions, integral to the learning ecosystem, are explored to understand how AI technologies enhance or alter these crucial interactions within the educational setting. Liu (2022) asserted that artificial intelligence (AI) technologies, such as Waston and Knewton, may enhance the teaching and learning processes by increasing teaching effectiveness, optimizing course design, and involving students in deep learning. Lastly, the research investigates the delicate balance between leveraging AI as a tool for empowerment and the potential pitfalls of over-reliance. People who rely too much on AI technology may experience a decline in cognitive abilities, but they may also benefit from cognitive augmentation via AI (Nyholm, 2023). Understanding the extent of student dependency on AI technologies is imperative for informed discussions and future-oriented strategies in educational policy and practice. Through unraveling these critical variables, this research seeks to contribute nuanced insights into the evolving relationship between higher education learners and artificial intelligence.

The college students at Nueva Ecija University of Science and Technology – Gabaldon Campus have also employed various AI technologies in their learning processes. Due to the absence of regulations governing these technologies, teachers have observed excessive use of such tools by students in tasks such as essays, problem-solving, planning, design, and art projects. Thus, faculty members have concerns that it might have negatively impacted the students. This research aimed to describe the impact of artificial intelligence (AI) on various aspects of college students' experiences. Specifically, this research addressed the following questions: (a) How can the impact of AI on students be described in terms of learning experience, academic performance, career guidance, motivation, self-reliance, social interaction, and dependency on AI? and (b) Do these impacts vary based on students' profiles?

Research Methodology

Design

This study used quantitative methodologies, gathering and analyzing numerical data to identify patterns and averages, forecast outcomes, evaluate causality, and extend findings to bigger populations (Bhandari, 2023). Specifically, a quantitative descriptive-comparative study was conducted to evaluate the predictive strength of one variable in relation to another and to determine the presence of any statistical differences (Black, 1999). Additionally, descriptive-comparative research outlines the differences between populations or samples without manipulating independent variables (Cantrell, 2011). This design was used to illustrate how AI affects college student experiences, learning outcomes, guidance with careers, drive, autonomy, interaction with others, and AI reliance (Capinding, 2024). Additionally, the study sought to assess how the impact of AI differs among students when grouped according to their profiles.

Samples and Sampling Technique

Using a standard sample size calculator, the sample size was determined to be 194 participants out of a population of 671 (Raosoft, 2004). The research employed a stratified random sampling technique to select 194 student respondents from Nueva Ecija University of Science and Technology Gabaldon Campus during the second semester of the academic year

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2023-2024 (January – May, 2024). These students represent four distinct programs offered at the Nueva Ecja University of Science and Technology - Gabaldon campus, namely, College of Education, Bachelor of Science in Agriculture, Bachelor of Information and Communication Technology, and Bachelor of Hospitality Management. Among the sample, 77 (39.7%) were male, while 117 (60.3%) were female. Table 1 shows the demographic profile of the respondents.

The table displays the frequency and percentage distribution of respondents across various categories. Regarding gender, there are 77 male respondents (39.7%) and 117 female respondents (60.3%). In terms of age, 99 respondents (51%) are 18-19 years old, 70 respondents (36.1%) are 20-21 years old, 16 respondents (8.2%) are 22-23 years old, and 9 respondents (4.6%) are 24 years old and above. When looking at the courses, 54 respondents (27.8%) are in Education, 32 respondents (16.5%) are in Agriculture, 39 respondents (20.1%) are in Information and Communication Technology, and 69 respondents (35.6%) are in Hospitality Management. Regarding family income, 140 respondents (72.2%) have a monthly income below 10,957, 29 respondents (14.9%) have an income between 10,957 to 21,914, 14 respondents (7.2%) have an income between 21,914 to 43,828, 5 respondents (2.6%) have an income between 43,828 to 76,656, and 6 respondents (3.1%) have an income of 219,140 and above. Lastly, in terms of gadgets used, 158 respondents (81.4%) use a cellphone, and 36 respondents (18.6%) use a laptop.

Building upon these findings, ethical considerations were prioritized throughout the research process. Informed consent was obtained from all participants, emphasizing their right to withdraw at any time without penalty. To ensure participant confidentiality, data were anonymized and stored securely on a password-protected file. Given the nature of the study, minimal risk to participants was anticipated and none occurred. While students are generally considered adults, their potential vulnerability was acknowledged. Steps were taken to ensure participants fully understood their rights and voluntarily agreed to participate.

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Table 1
Students' Profile

Gender	Frequency	Percentage (%)
Male	77	39.7
Female	117	60.3
Total	194	100.0
Age	Frequency	Percentage (%)
18-19	99	51.0
20-21	70	36.1
22-23	16	8.2
24-above	9	4.6
Total	194	100.0
Course	Frequency	Percentage (%)
Education	54	27.8
Agriculture	32	16.5
Information and Communication Technology	39	20.1
Hospitality Management	69	35.6
Total	194	100.0
Family Income	Frequency	Percentage (%)
Below ±10,957 monthly income	140	72.2
±10,957 to ±21,914 monthly income	29	14.9
±21,914 to ±43,828 monthly income	14	7.2
±43,828 to ±76,66 monthly income	5	2.6
± 219,140 and above monthly income	6	3.1
Total	194	100.0
Gadget Used	Frequency	Percentage (%)
Cellphone	158	81.4
Laptop	36	18.6
Total	194	100.0

Questionnaires Validity and Reliability

The questionnaire used in this study was adapted from Capinding's (2024) validated questionnaire on the impact of AI on higher education learners. Capinding (2024) rigorously validated these questionnaires both in the Philippines and in consultation with Filipino experts. Comprising seven constructs—namely AI Dependency (9 items), Social Interaction (9 items), Career Guidance (10 items), Academic Performance (6 items), Learning Experience (6 items), Self-reliance (6 items), and Motivation (5 items)—the questionnaire underwent thorough development.

Furthermore, the instruments underwent reliability testing with Filipino students as participants. The findings revealed that the reliability coefficients for academic performance ($\alpha = .92$), career guidance ($\alpha = .91$), and self-reliance ($\alpha = .93$) demonstrated commendable reliability. In addition, learning experience ($\alpha = .88$), motivation ($\alpha = .89$), social interaction ($\alpha = .87$), and AI dependency ($\alpha = .86$) exhibited excellent reliability coefficients. These robust psychometric properties underscore the questionnaire's credibility and suitability for assessing the multifaceted impacts of artificial intelligence on higher education students.

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Data Collection

The researcher formally sought permission from the campus director of the NEUST-Gabaldon campus to undertake the study and administer the questionnaires. Subsequently, the questionnaires were disseminated to 671 college students via Google Forms on February 2, 2024. Following two months, 194 students participated by responding to the provided questionnaires. To ensure that the students responded, the researcher sought help from their class advisers.

Data Analysis

Frequency and percentage were utilized to characterize the profile of the respondents, while mean and standard deviation were employed to describe the impact of AI on students. Furthermore, a Multivariate Analysis of Variance (MANOVA), specifically employing Hotelling's Trace, was conducted to determine if there were significant differences in the impact of AI on students in higher education when grouped according to their profiles. The data were analyzed using IBM-SPSS version 21.

Table 2 displays the homogeneity of variances. Levene's test yields non-significant results, indicating acceptance of the null hypothesis that the variances are equal. Consequently, it is appropriate to proceed with the utilization of MANOVA.

Table 2
Levene's Test of Equality of Error Variances

Areas where AI has an impact on students	*F*	*df1*	*df2*	*p-value*
Learning Experience	1.669	70	123	.071
Academic Performance	1.706	70	123	.052
Career Guidance	1.527	70	123	.202
Motivation	1.559	70	123	.160
Self-reliance	1.558	70	123	.161
Social Interaction	1.531	70	123	.211
AI-Dependency	1.637	70	123	.902

Research Results

Impact of AI on Students' Learning Experience

Table 3 illustrates the impact of AI on students' learning experiences. According to the data, students perceive AI positively, noting its contribution to enhancing their educational journey. They agree that AI has significantly improved their learning encounters by offering personalized content and resources ($M = 2.64$, $SD = 0.85$), adjusting to their learning styles and paces, thereby enhancing the enjoyment and effectiveness of learning ($M = 2.57$, $SD = 0.83$). Moreover, students acknowledge AI's role in providing interactive and captivating learning materials ($M = 2.63$, $SD = 0.82$), fostering critical thinking, and honing problem-solving skills ($M = 2.51$, $SD = 0.88$), as well as supplying real-world examples and case studies to augment their learning experiences ($M = 2.62$, $SD = 0.84$). However, there is disagreement among students regarding AI's facilitation of hands-on and practical learning experiences ($M = 2.46$, $SD = 0.85$). Nonetheless, the overall consensus among students suggests that AI has a discernible impact on their learning journey, underscoring its potential to facilitate diverse learning experiences.

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Table 3
Impact of AI on Students' Learning Experience

Learning Experience	*M*	*SD*	Interpretation
AI has improved my learning experience by offering tailored information and tools.	2.64	0.85	Agree
AI has tailored to my learning style and speed, making it more pleasurable and efficient.	2.57	0.83	Agree
AI has developed dynamic and engaging educational materials.	2.63	0.82	Agree
AI has enabled interactive and experiential learning opportunities.	2.46	0.85	Disagree
AI has promoted the development of critical thinking and problem-solving abilities.	2.51	0.88	Agree
AI has offered practical examples and case studies to enrich my learning experience.	2.62	0.84	Agree
Total Weighted Mean	2.57	0.71	Agree

AI's Influence on Students' Performance in School

Table 4 presents the influence of artificial intelligence (AI) on students' academic performance. Students concur that AI has contributed to enhancing their academic performance (M = 2.59, SD = 0.82), aided in identifying and addressing weaknesses in specific subjects (M = 2.59, SD = 0.82), improved the quality of assignments and exams through AI-based feedback (M = 2.57, SD = 0.85), assisted in attaining learning goals (M = 2.50, SD = 0.85), and provided timely and accurate progress assessments (M = 2.51, SD = 0.80). Conversely, students express disagreement regarding AI's effectiveness in exam preparation (M = 2.43, SD = 0.91). Overall, students agree that AI influences their academic performance positively (M = 2.53, SD = 0.71), indicating a beneficial impact of AI on students' academic endeavors.

Table 4
Impact of AI on Students' Academic Performance

Academic Performance	*M*	*SD*	Interpretation
AI has helped enhance my academic performance.	2.59	0.82	Agree
AI-powered tools have assisted me in pinpointing and tackling my weaknesses in particular subjects.	2.59	0.82	Agree
AI-based feedback has assisted me in enhancing the quality of my assignments and exams.	2.57	0.85	Agree
AI has supported me in reaching my learning objectives.	2.5	0.85	Agree
AI has offered timely and precise evaluations of my progress.	2.51	0.80	Agree
AI has aided me in preparing for exams more efficiently.	2.43	0.91	Disagree
Total Weighted Mean	2.53	0.71	Agree

The Impact of AI in Guiding Students on their Career Paths

The impact of artificial intelligence (AI) in directing students onto professional pathways is examined in Table 5. Students generally agreed on the usefulness of AI in career guidance, with an average score of 2.52 (SD = 0.71). They found AI effective in matching their skills and interests to suitable options (2.5). AI was also seen as valuable in recommending internships and jobs aligned with career goals (2.6). Furthermore, students valued AI's guidance in developing

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necessary skills (2.53) and offering mentorship and networking opportunities (2.51) within their chosen field. Additionally, AI helped them access career development resources and workshops (2.55) and identify emerging trends and technologies relevant to their field (2.59). However, there was disagreement on AI supporting long-term career planning (2.45), and there was also some disagreement about AI providing entirely accurate information on potential careers (2.45). This suggests that while AI can be a helpful tool in various aspects of career exploration and development, human input might still be preferred for long-term strategic planning.

Table 5
Impact of AI in Guiding Students in their Career Path

Career Guidance	*M*	*SD*	Interpretation
AI has delivered precise and current information about various career paths.	2.45	0.76	Disagree
AI tools have aligned my skills and interests with appropriate career opportunities.	2.50	0.83	Agree
AI has suggested internships or job opportunities that align with my career goals.	2.60	0.84	Agree
AI has helped me in developing the skills needed for my desired career.	2.53	0.83	Agree
AI has provided mentorship and networking opportunities within my area of interest.	2.51	0.80	Agree
AI has made it easier to access career development resources and workshops.	2.55	0.81	Agree
AI has assisted me in recognizing emerging trends and technologies in my field.	2.59	0.79	Agree
AI has aided in my long-term career planning and development.	2.45	0.81	Disagree
Total Weighted Mean	2.52	0.71	Agree

Impact of AI on Students' Motivation

Table 6 shows that AI has a positive influence on student motivation. Students agreed with statements about AI providing opportunities for gamified learning (2.58, Agree), offering feedback and recognition for achievements (2.52, Agree), providing insights and progress tracking (2.51, Agree), connecting them with peers with similar goals (2.50, Agree), and facilitating goal setting and action planning (2.55, Agree). The overall weighted mean score is 2.53 (*SD* = 0.74), with an agreement to be the interpretation for the construct.

Table 6
Impact of AI on Students' Motivation

Motivation	*M*	*SD*	Interpretation
AI has offered gamified learning opportunities, making the process more enjoyable and engaging.	2.58	0.79	Agree
AI has provided feedback and acknowledged my achievements.	2.52	0.82	Agree
AI has offered insights and progress tracking to help keep me motivated.	2.51	0.79	Agree
AI has linked me with peers who have similar goals and interests.	2.50	0.84	Agree
AI has assisted in setting goals and creating action plans for academic success.	2.55	0.83	Agree
Total Weighted Mean	2.53	0.74	Agree

Impact of AI on Students' Self-Reliance

Table 7 shows the impact of Artificial Intelligence (AI) on students' self-reliance. The table displays students' weighted mean agreement and standard deviation (SD) on various statements related to self-reliance. Overall, the weighted mean score is 2.53 (*SD* = 0.73), indicating a general agreement among students that AI has a positive impact on self-reliance.

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Students agreed that AI facilitated self-directed learning and inquiry into issues beyond the curriculum (M = 2.50, SD = 0.84), supported their ability to think critically and solve problems on their own (M = 2.53, SD = 0.80), enhanced their confidence and self-reliance in academic pursuits (M = 2.52, SD = 0.81), and offered materials and methods for self-evaluation and self-improvement (M = 2.59, SD = 0.81). There was also agreement that AI fostered introspective thinking and self-assessment of learning progress (M = 2.57, SD = 0.80). However, there was a slight disagreement with the statement that AI helped develop self-discipline and accountability in studies (M = 2.46, SD = 0.83).

Table 7
Impact of AI on Students' Self-Reliance

Self-reliance	*M*	*SD*	Interpretation
AI has fostered self-directed learning and exploration of subjects beyond the curriculum.	2.50	0.84	Agree
AI-powered tools have enhanced my ability to think critically and independently solve problems.	2.53	0.80	Agree
AI has boosted my confidence and self-reliance in academic endeavors.	2.52	0.81	Agree
AI has supported me in developing self-discipline and accountability in my studies.	2.46	0.83	Disagree
AI has offered resources and tools for self-assessment and personal growth.	2.59	0.81	Agree
AI has promoted reflective thinking and self-evaluation of my learning progress.	2.57	0.80	Agree
Total Weighted Mean	2.53	0.73	Agree

Impact of AI on Students' Social Interaction

Table 8 shows the positive impact of Artificial Intelligence (AI) on students' social interaction. Students agreed with all nine statements on a scale of 1 (strongly disagree) to 4 (strongly agree), with an overall weighted mean score of 2.54 (SD = 0.69). This indicates a general agreement that AI has a positive influence on social interaction among students.

Students felt that AI facilitated collaboration and teamwork in group projects (M = 2.50, SD = 0.81). AI-powered platforms provide forums for knowledge exchange and online conversations (M = 2.58, SD = 0.77) and encourage peer-to-peer learning and support (M = 2.52, SD = 0.78). Students also felt that AI technologies encouraged courteous and inclusive communication in online learning settings (M = 2.58, SD = 0.75) and connected them with a diverse community of learners (M = 2.53, SD = 0.81), which expanded their social network (M = 2.54, SD = 0.77). AI also facilitated networking opportunities with professionals and experts (M = 2.54, SD = 0.77), supported group-based learning activities (M = 2.59, SD = 0.79), and promoted cultural exchange and understanding among students (M = 2.53, SD = 0.78). Finally, AI-powered platforms were seen as facilitating mentoring relationships between students (M = 2.51, SD = 0.78).

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Table 8
Impact of AI on Students' Social Interaction

Social Interaction	*M*	*SD*	Interpretation
AI has improved student communication and teamwork in group assignments.	2.50	0.81	Agree
AI-powered platforms have allowed for online debates and information exchange.	2.58	0.77	Agree
AI has promoted peer-to-peer learning and assistance among students.	2.52	0.78	Agree
Artificial intelligence systems have facilitated inclusive and polite interactions in virtual learning settings.	2.58	0.75	Agree
AI has connected me to a varied group of learners, broadening my social circle.	2.53	0.81	Agree
AI has improved networking chances with professionals and specialists in my sector.	2.54	0.77	Agree
AI has facilitated collaborative learning and problem-solving activities.	2.59	0.79	Agree
AI has facilitated cultural interchange and understanding among students.	2.53	0.78	Agree
AI-powered platforms have helped students create mentorship ties.	2.51	0.78	Agree
Total Weighted Mean	2.54	0.69	Agree

Students' Dependency on AI

The table shows students' dependency on AI tools and resources. The table displays students' weighted mean agreement and standard deviation (SD) on various statements related to their reliance on AI in their studies. Overall, the weighted mean score is 2.53 (SD = 0.71), indicating a general agreement among students that they depend on AI in their studies.

Students reported a moderate reliance on AI tools across all statements. There was agreement with statements regarding using AI for tasks such as summarizing complex information (M = 2.53, SD = 0.83), identifying relevant sources and materials (M = 2.57, SD = 0.79), checking for plagiarism (M = 2.51, SD = 0.81), and providing feedback on writing assignments (M = 2.53, SD = 0.80). Students also agreed that AI has emerged as a reliable information and advisory resource (M = 2.57, SD = 0.79) and that they actively seek out AI-powered tools and resources (M = 2.53, SD = 0.80) to enhance their learning experience. There was also agreement that AI has increased their efficiency and productivity in academic tasks (M = 2.51, SD = 0.81). Students felt that AI has improved the quality of their learning outcomes (M = 2.61, SD = 0.80). However, the statement with the highest mean score indicated that students rely the most on AI for support with studying for exams (M = 2.61, SD = 0.80).

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Table 9
Students' Dependency on AI

AI Dependency	*M*	*SD*	Interpretation
I rely significantly on artificial intelligence programs to help me with my studies.	2.46	0.82	Disagree
Artificial intelligence has had a huge impact on my educational decisions and practices.	2.51	0.78	Agree
AI has helped me feel more secure and capable in my academics.	2.53	0.83	Agree
AI has changed how I approach learning and problem solving.	2.57	0.79	Agree
AI has become a reliable source of knowledge and direction for me.	2.57	0.79	Agree
I actively seek AI-powered tools and resources to improve my learning experience.	2.53	0.80	Agree
AI has improved my efficiency and productivity in academic settings.	2.51	0.81	Agree
I believe that AI has enhanced the quality of my learning output.	2.61	0.80	Agree
Total Weighted Mean	2.53	0.71	Agree

Comparison of the Impact of AI on Students, Grouped According to Sex

Table 10 shows the comparison of the impact of AI on students when grouped according to sex. There is no substantial difference between male and female students in terms of how AI affects their learning experience ($t_{(192)} = -.25$, $p > .05$), academic performance ($t_{(192)} = -.84$, $p > .05$), career guidance ($t_{(192)} = -.74$, $p > .05$), motivation ($t_{(192)} = -.99$, $p > .05$), self-reliance ($t_{(192)} = -1.36$, $p > .05$), and dependency on AI ($t_{(192)} = -1.38$, $p > .05$). On the other hand, there is a significant difference between male and female students in terms of the impact of AI on their social interaction ($t_{(192)} = -1.99$, $p < .05$). It implies that female students are more impacted by AI in terms of their social interaction.

Table 10
Comparison of the Impact of AI on Students, Grouped According to Gender

Gender		*N*	*M*	*MD*	*t*	*df*	*p*-value
Learning Experience	Male	77	2.56	-0.02	-0.25	192	.81
	Female	117	2.58				
Academic Performance	Male	77	2.48	-0.09	-0.84	192	.40
	Female	117	2.57				
Career Guidance	Male	77	2.50	-0.04	-0.74	192	.46
	Female	117	2.54				
Motivation	Male	77	2.51	-0.04	-0.99	192	.32
	Female	117	2.55				
Self-reliance	Male	77	2.44	-0.14	-1.36	192	.18
	Female	117	2.58				
Social Interaction	Male	77	2.42	-0.20	-1.99	192	.049
	Female	117	2.62				
AI-Dependency	Male	77	2.45	-0.14	-1.38	192	.17
	Female	117	2.59				

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Comparison of the Impact of AI on Students, Grouped According to Gadget Used

Table 11 presents a comparison of the impact of AI on students, grouped according to the gadget used. The analysis reveals that there is no significant difference between students who used a laptop or cellphone in terms of the impact of AI on their academic performance ($t_{(192)}$ = -1.23, p > .05), career guidance ($t_{(192)}$ = -.80, p > .05), motivation ($t_{(192)}$ = -.50, p > .05), self-reliance ($t_{(192)}$ = -.35, p > .05), social interaction ($t_{(192)}$ = -.22, p > .05), and AI-Dependency ($t_{(192)}$ = -.33, p > .05). However, a significant difference emerges between students who used a laptop or cellphone regarding the impact of AI on their learning experience ($t_{(192)}$ = p < .05). This suggests that students who use a laptop are significantly more impacted by AI in terms of learning experience compared to students who use a cellphone.

Table 11
Comparison of the Impact of AI on Students, Grouped According to Gadget Used

Gadget Used		*N*	*M*	*MD*	*t*	*df*	*p*-value
Learning Experience	Cellphone	158	2.53	-0.25	-2.10	192	.04
	Laptop	36	2.78				
Academic Performance	Cellphone	158	2.50	-0.16	-1.23	192	.22
	Laptop	36	2.66				
Career Guidance	Cellphone	158	2.49	-0.06	-0.80	192	.42
	Laptop	36	2.55				
Motivation	Cellphone	158	2.51	-0.04	-0.50	192	.62
	Laptop	36	2.55				
Self-reliance	Cellphone	158	2.52	-0.05	-0.35	192	.73
	Laptop	36	2.57				
Social Interaction	Cellphone	158	2.54	-0.03	-0.22	192	.82
	Laptop	36	2.57				
AI-Dependency	Cellphone	158	2.53	-0.04	-0.33	192	.74
	Laptop	36	2.57				

Multivariate Significance Test for Course with Dependent Variables

The MANOVA results revealed a statistically significant difference between and among the course groups on the combined dependent variables, indicated by Hotelling's Trace = 0.187, F = 1.309, p < .05. The effect size was substantial, with a partial η^2 of 0.69. The observed power of 0.999 suggests a 99.9% probability that the results would be significant.

Table 12
Multivariate Significance Test for the Course

	Value	*F*	Hypothesis *df*	*Error df*	*p*-value	Partial Eta Squared (η^2)	Observed Power[d]
Hotelling's Trace	0.187	1.309	21.000	440.000	.0263	0.69	0.999

Post Hoc Test for the Learning Experience, Grouped According to Course

Table 13 indicates that AI significantly affects the learning experience of education students (M = 2.88) more than it does for hospitality management (M = 2.33) and agriculture (M = 2.44) students. However, there is no significant difference in the impact of AI between

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education (*M* = 2.88) and IT (*M* = 2.67) students. Similarly, the impact of AI on hospitality management (*M* = 2.33), agriculture (*M* = 2.44), and IT (*M* = 2.67) students is not significantly different.

Table 13
The Post Hoc Test for Learning Experience, Grouped According to Course

	COURSE	*N*	Subset		
			a	b	
Tukey HSD[a,b]	Hospitality Management	69	2.3307		a
	Agriculture	32	2.4425		a
	Information and Communication Technology	39	2.6790	2.6790	ab
	Education	54		2.8865	b

Post Hoc Test for Academic Performance, Grouped According to Course

Table 14 shows that the impact of AI on students' academic performance is significantly greater for those in education courses (*M* = 2.86) compared to those in hospitality management (*M* = 2.27) and agriculture (*M* = 2.52). However, the impact on education students (*M* = 2.86) is not significantly different from that on IT students (*M* = 2.54). Additionally, there is no statistically significant difference in the impact of AI on academic performance among students in hospitality management (*M* = 2.27), agriculture (*M* = 2.52), and IT (*M* = 2.54).

Table 14
The Post Hoc Test for Academic Performance is Grouped According to Course

	COURSE	*N*	Subset		
			a	b	
Tukey HSD[a,b]	Hospitality Management	69	2.2728		a
	Agriculture	32	2.5203		a
	Information and Communication Technology	39	2.5382	2.5382	ab
	Education	54		2.8615	b

Multivariate Significance Test for Age with Dependent Variables

The MANOVA results revealed that there was no statistically significant difference between and among the age groups on the combined dependent variables, indicated by Hotelling's Trace = 0.163, $F = 1.141$, $p > .05$. The effect size was small, with a partial η^2 of .052. The observed power of 0.839 suggests an 83.9% probability that the results would be significant.

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Table 15
Multivariate Significance Test for Age

	Value	*F*	Hypothesis *df*	Error *df*	*p*-value	Partial Eta Squared (η^2)	Observed Power[d]
Hotelling's Trace	0.163	1.141	21.000	440.000	.302	0.052	0.839

Multivariate Significance Test for Age with Dependent Variables

The MANOVA analysis indicated no statistically significant differences between the family-income groups concerning the combined dependent variables, as evidenced by Hotelling's Trace = 0.160, $F = 0.838$, $p > .05$. The effect size was small, with a partial η^2 of 0.039. The observed power was 0.771, indicating a 77.1% probability that the results would reach significance.

Table 16
Multivariate Significance Test for Family Income

	Value	*F*	Hypothesis *df*	Error *df*	*p*-value	Partial Eta Squared (η^2)	Observed Power[d]
Hotelling's Trace	.160	.838	28.000	586.000	.707	.039	.771

Discussion

The insights from Table 3 on how AI affects students' learning experiences shed light on how education is evolving. The data clearly show that AI is becoming more integrated into education, providing personalized learning experiences that are suited to each student's needs (Fernandes et al., 2023). Students have expressed positive views on how AI improves learning, indicating its potential to change traditional education methods. One interesting finding is that AI can personalize content and resources, which students appreciate. This customization caters to different learning styles and speeds, making learning more efficient (Harry, 2023). Also, AI creates interactive and stimulating learning materials, boosting student engagement and motivation (Kaledio et al., 2024).

Furthermore, it is important to recognize how artificial intelligence aids in the development of critical thinking and problem-solving abilities. AI bridges the theoretical and practical gap by utilizing real-world examples to prepare students for their future employment. However, there's some disagreement about whether AI supports hands-on learning, suggesting room for improvement in integrating AI with practical teaching methods. For example, Trisnawati et al. (2023) showed Artificial intelligence in education positively impacts 21st-century skills but may decrease students' abilities in critical thinking, creative thinking, and character. In addition, the data show a positive view of AI's impact on learning. While there are areas for improvement, the findings highlight AI's potential to transform teaching and learning (Melo, 2023). As educators adopt AI into their classrooms, it is critical to strike a balance between technology and human contact to guarantee children receive a well-rounded education.

The data in Table 4 paints an interesting picture of how students perceive the influence of artificial intelligence (AI) on academic achievement. Many students appear to view AI as a beneficial ally in their educational path. To begin, many students believe that AI has improved their overall academic performance. This allows instructors to spend more time educating and guiding students. Ahmad et al. (2022) argued that AI plays a pivotal role in enriching student learning experiences, reducing the burden on teachers, and streamlining the process of grading and assessment. They like how AI-powered technologies have assisted them in identifying and addressing gaps in certain disciplines. Furthermore, they have found AI-generated feedback

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to be very useful in increasing the quality of their assignments and tests. It's like having a personal tutor to help them along the road. In line with the findings of Hanaysha et al. (2023), artificial intelligence (AI) is noted to enhance student's educational experiences and elevate their academic achievements by facilitating personalized learning experiences customized to meet individual requirements.

Furthermore, students believe that AI has helped them achieve their learning objectives. It's like having a virtual coach encouraging them and keeping them on track. When it comes to analyzing their development, students believe AI delivers quick and accurate feedback, allowing them to keep informed about how they are performing. According to Xu et al. (2021), an AI-assisted personalized feedback system (AI-PFS) improves student performance by giving individualized and trustworthy feedback, increasing academic accomplishment by 95.32 percent. However, it is worth noting that students are less trusting in AI's capacity to assist them in efficiently preparing for tests. This might signal that there is still potential for improvement in the way AI is integrated into exam preparation approaches. Overall, it appears that AI is seen positively in students' academic lives, providing support and guidance along the way (Varma et al., 2023). However, there is also a need to optimize its role, particularly in terms of test preparation, to ensure that it serves students' requirements in all aspects of their academic journey.

Table 5 offers a rich tapestry of insights into the complex dynamics of integrating Artificial Intelligence (AI) into the realm of career guidance for students. One notable finding is the overall acknowledgment by students of AI's utility in this domain. Despite varying opinions, the consensus leans towards recognizing AI as a valuable tool, particularly in tasks such as matching skills and interests with suitable career options, and recommending internships and jobs that align with career aspirations. This indicates that AI can enhance the early phases of career exploration by providing students with personalized recommendations tailored to their profiles. Cheng and Liang (2023) highlight that AI-driven career guidance education has greatly influenced career exploration, decision-making, and cultural sensitivity, particularly in the context of China.

However, amidst the recognition of AI's benefits, there exists a notable hesitation among students regarding its ability to provide entirely accurate information on potential career paths. This skepticism underscores the complexity of relying solely on AI for decision-making in career planning. It raises important questions about the reliability and comprehensiveness of the data and algorithms underpinning AI-driven career guidance systems. Additionally, it underscores the importance of transparency and accountability in creating and implementing these systems to guarantee they benefit students. Schoeffer et al. (2023) also emphasized that while human dependence on AI recommendations is essential for making accurate decisions, both excessive and insufficient reliance can harm decision accuracy.

Furthermore, while AI is praised for its role in aiding short-term career-related tasks such as skill development, mentorship, and networking opportunities, it is often seen as less effective in supporting long-term career planning. This observation highlights the critical need for human involvement to navigate the complexities of career trajectories over time. Strategic decision-making in long-term career planning must consider not only current skills and interests but also evolving industry trends, personal aspirations, and external factors like economic conditions and societal changes. Therefore, while AI can provide valuable insights and recommendations, it should complement rather than replace human expertise in guiding students through the nuances of long-term career planning. Conversely, according to Woolf et al. (2013), AI has the potential to support long-term educational goals by offering personalized mentorship, teaching 21st-century skills, utilizing interaction data, providing global classroom access, and promoting lifelong learning.

Moreover, table 5 sheds light on the multifaceted role of AI in guiding students toward their career paths. While AI holds promise in streamlining certain aspects of career exploration and development, its integration should be approached with caution, ensuring that it is complemented by human insight and expertise. Moreover, efforts should be made to address concerns regarding the accuracy and transparency of AI-driven career guidance systems, while also recognizing the limitations of AI in supporting long-term career planning. By taking a balanced approach that takes advantage of both AI and human experience, institutions can better equip students with the tools and resources they need to negotiate the complexity of the current labor market and seek rewarding and sustainable jobs.

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The data presented in Table 6 reveal that AI significantly enhances student motivation across various dimensions. The findings indicate that students generally agree that AI contributes positively to their educational experience through several mechanisms. One of the prominent ways AI boosts motivation is by providing opportunities for gamified learning. This suggests that incorporating game-like elements into educational content makes learning more engaging and enjoyable for students. Gamification may transform routine chores into fascinating challenges, creating a more dynamic and engaging learning environment (Subhash & Cudney, 2018).

Students also responded positively to statements about AI offering feedback and recognition for their achievements. Timely and personalized feedback is crucial in keeping students motivated (Wang & Lehman, 2021). When students are recognized for their efforts, it reinforces their sense of accomplishment and encourages them to continue striving toward their goals. The provision of insights and progress tracking by AI systems scored a mean of 2.51. This aspect highlights the importance of self-awareness in learning. When students can track their progress, they gain a clearer understanding of their strengths and areas for improvement, which helps them stay motivated and focused on their learning objectives (Yousufi et al., 2023).

Furthermore, AI's role in connecting students with peers who have similar goals scored a mean of 2.50. Collaborative learning and peer support are essential components of a motivating educational experience. By facilitating connections among students with shared interests and goals, AI can create a supportive community that fosters mutual encouragement and collective growth. Facilitating goal setting and action planning is another area where AI positively impacts student motivation. Effective goal setting helps students develop a clear roadmap for their learning journey. AI can help develop structured and attainable plans, making the journey to success clearer and less daunting. Moreover, Geist (2017) noted that the societal impact of AI largely hinges on advancements in automated planning, which involves designing computer programs that formulate plans to achieve specific objectives.

The overall weighted mean score of 2.53 (SD = 0.74) indicates a general agreement among students that AI positively influences their motivation. This composite score reflects the collective impact of the various dimensions discussed above. The standard deviation of 0.74 suggests a moderate level of variability in student responses, indicating that while most students agree on AI's positive influence, there are differing degrees of enthusiasm and perceived benefit. Furthermore, the findings demonstrate that AI plays a significant role in enhancing student motivation through gamified learning, feedback and recognition, progress tracking, peer connections, and goal setting. Together, these components create a more engaging and supportive atmosphere for learning. However, it is essential to consider individual differences in student responses and continuously refine AI systems to cater to diverse motivational needs.

Overall, the findings in Table 7 suggest a generally positive perception among students regarding the impact of AI on their self-reliance. With a weighted mean score of 2.53 and a standard deviation of 0.73, there is a significant level of agreement among students, indicating that they perceive AI as a beneficial tool in fostering self-reliance across various academic domains. Similarly, as noted by Toribio (2023), AI models like ChatGPT have the potential to alleviate academic stress among science-focused students by encouraging them to assume responsibility for their learning, enhancing self-reliance, and nurturing a mindset oriented towards growth.

The findings underline the importance of AI in enabling self-directed learning and discovery outside of the predefined curriculum. Students recognize AI's capacity to provide personalized learning experiences and access to a wealth of educational resources, empowering them to pursue their interests autonomously and deepen their understanding of subjects. Similarly, Hasibuan and Azizah (2023) asserted that artificial intelligence (AI) has the potential to completely transform education by creating individualized, immersive learning environments that encourage creativity.

Moreover, students acknowledge AI's contribution to fostering critical thinking and problem-solving skills. Silapachote and Srisuphab (2017) suggested that the incorporation of artificial intelligence into foundational computing courses is an efficient method for imparting computational thinking abilities. This technique encourages undergraduate students in computer science and engineering to think collaboratively, logically, and critically. By engaging with AI-powered tools and platforms, students are prompted to analyze information independently and devise innovative solutions to complex challenges, thereby enhancing their academic performance and preparing them for real-world scenarios.

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Furthermore, AI is seen as a catalyst for boosting students' confidence and self-reliance in academic pursuits. Through tailored feedback mechanisms and adaptive learning algorithms, students receive personalized support and guidance, enabling them to navigate their learning journey with assurance and efficacy. In addition, AI in education can help students develop a stronger belief in their ability to succeed in school, which can then lead to better academic performance (Lee, 2020).

AI also promotes introspective thinking and assessment of learning progress. By leveraging AI-driven analytics and assessment tools, students gain insights into their strengths and areas for improvement, fostering a proactive approach to their academic development and cultivating a growth mindset. According to Oliehoek et al. (2017), AI in education can enhance student development through personalized real-time feedback, driving learner self-reflection and facilitating defensible decisions.

However, the findings also reveal a slight disagreement regarding AI's role in fostering self-discipline and accountability in studies. This suggests a need for further exploration to address the motivational and self-regulatory aspects of learning within AI-driven educational interventions. While biases from theoretical and empirical models can impact human-controlled educational systems, accountability in AI decision-making is essential for inclusion, diversity, and justice in both AI-based and human-controlled interactions (Porayska-Pomsta & Rajendran, 2019).

The study's findings shed light on the significant positive impact of Artificial Intelligence (AI) on students' social interaction within educational settings. With an overall weighted mean score of 2.54 and a standard deviation of 0.69, students widely agree that AI contributes to fostering collaborative and inclusive learning environments. According to Mena-Guacas et al. (2023), AI has the potential to improve education by encouraging cooperation and competency development, but more study is required to fully comprehend its effect and how to best utilize it in the classroom.

AI is recognized as a facilitator of collaboration and teamwork in group projects, providing platforms for students to coordinate efforts, share ideas, and collectively solve problems. Additionally, AI-powered tools offer virtual spaces for online discussions and knowledge sharing, transcending geographical barriers and time constraints to enable meaningful discourse among peers. Moreover, AI promotes inclusive and respectful interactions by mitigating biases and fostering a culture of mutual respect and understanding among students. According to Keshishi and Hack (2023) integrating AI with traditional teaching methods and human interaction can boost students' emotional intelligence, yet it's crucial to address ethical considerations and mitigate potential risks.

Through AI-driven algorithms, students are connected with a diverse community of learners, expanding their social networks and providing networking opportunities with professionals and experts. Social connections and anticipated results shape how people share knowledge within online communities, where a common vision and communication style are pivotal factors (Chiu et al. 2006). AI-supported group-based learning activities optimize group dynamics and enhance collective learning outcomes, enriching the educational experience for all participants. Furthermore, AI fosters cultural exchange and understanding by facilitating cross-cultural interactions and collaborations, cultivating empathy and global citizenship skills.

Additionally, AI-powered platforms are essential for promoting student-to-student mentoring relationships, tailored mentorship experiences, and a mentorship culture within the academic community. The study emphasizes how AI has the capacity to significantly improve student social interaction and community building in educational settings, laying the groundwork for the next generation of cooperative and socially conscious lifelong learners. By collaborating in real time, enhancing human decision-making, and maximizing efficiency in educational settings, the synergy between AI and human intelligence can enhance the educational process (Ifenthaler & Schumacher, 2023).

The study's findings shed light on the extent of students' dependency on Artificial Intelligence (AI) tools and resources in their academic pursuits. With an overall weighted mean score of 2.53 and a standard deviation of 0.71, it is evident that students exhibit a general agreement regarding their reliance on AI in various aspects of their studies.

Across all statements, students reported a moderate reliance on AI tools, indicating their propensity to integrate AI-driven solutions into their learning processes. Notably, students agreed

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with statements highlighting the diverse functionalities of AI, including summarizing complex information, identifying relevant sources and materials, checking for plagiarism, and providing feedback on writing assignments. This underscores the versatility and utility of AI in supporting students' information retrieval, analysis, and academic writing endeavors. According to Chen et al. (2020), AI's integration into education has notably advanced administrative processes, instructional methods, and learning outcomes through efficiency enhancements, increased student retention, and personalized curriculum development.

Furthermore, students perceive AI as a trusted source of information and guidance, actively seeking out AI-powered tools and resources to augment their learning experience. This reflects a shift in students' attitudes towards technology, viewing AI not merely as a supplementary tool but as an integral component of their academic toolkit. Trustworthy AI (TAI) presents ethical, legal, and technological hurdles in its development, implementation, and utilization, grounded in five principles: beneficence, non-maleficence, autonomy, justice, and explicability (Thiebes et al., 2020). Conversely, Ryan (2020) argued that AI's absence of emotional states and accountability for actions renders it unreliable, leading to reliance rather than trust.

The statement with the highest mean score highlights a noteworthy finding: a strong dependence on AI to help with exam preparation. This emphasizes how important artificial intelligence is to helping students prepare for exams by offering practice questions, adaptive study materials, and individualized learning pathways that are catered to each student's tastes and needs. Wang (2020) adds that the adaptive test system, which is based on item response theory and AI recognition model, also efficiently reduces test duration and enhances ability level estimate for students of varying levels.

Moreover, students attribute increased efficiency, productivity, and quality to the integration of AI into their academic workflows. By leveraging AI-driven solutions, students can streamline mundane tasks, optimize time management, and achieve higher levels of performance and academic excellence. Furthermore, according to Nazari et al. (2021), AI-driven writing tools enhance behavioral involvement, emotional connection, cognitive engagement, self-assurance in writing, and the experience of positive and negative emotions when compared to writing without AI assistance.

Additionally, even while incorporating AI into the classroom has many advantages, it also brings up significant issues with relation to students' autonomy, capacity for critical thought, and moral usage of technology. In the future, educators and legislators must work to achieve a balance between fostering students' autonomous thought and creativity in the digital era and utilizing AI's potential to improve learning experiences. Furthermore, measures to provide fair access to AI tools and resources should be taken in order to reduce inequalities and guarantee that every student can take advantage of the potential provided by technology breakthroughs in education.

The findings from Table 10 offer a nuanced understanding of how AI affects students, particularly when considering gender dynamics. The study shows that there are no significant variations between male and female students in a variety of factors, including learning experience, academic achievement, guidance with careers, drive, self-reliance, and reliance on AI. This suggests that both genders perceive and engage with AI technologies similarly in these areas, reflecting a balanced distribution of benefits and challenges.

In terms of how both genders view and engage with AI technologies within the educational context, there do not appear to be any notable differences between male and female students across various dimensions, including educational experience, academic achievement, career guidance, motivation, self-reliance, and reliance on AI. This finding indicates that neither gender appears to have a distinct advantage or disadvantage when it comes to harnessing the potential benefits of AI for learning, academic achievement, career planning, or personal development. It implies that both male and female students are equally receptive to AI interventions and encounter comparable challenges or opportunities in integrating these technologies into their educational journey. This balanced distribution of AI's impact across genders underscores the universality of its influence in shaping the educational landscape and highlights the importance of promoting equitable access and utilization of AI tools to support diverse student populations. Alternatively, Lin et al. (2021) suggested that intrinsic motivation plays a significant role in driving primary students' interest in learning AI, with boys exhibiting greater motivation

than girls. Moreover, Dai et al. (2020) found that students' readiness for AI is shaped by their confidence and perception of its relevance, rather than their literacy in AI, with boys displaying higher confidence and readiness levels than girls.

However, a notable exception arises concerning social interaction, where a significant difference emerges between male and female students. The finding suggests that female students are more impacted by AI in terms of their social interactions. This insight underscores the complexity of AI's influence on interpersonal dynamics within educational contexts, highlighting potential gender-specific preferences, social norms, or experiences related to technology-mediated communication. Additionally, Zhang and Lu (2023) claimed that Social AI yields significant benefits for a variety of demographic groups, including young adult women's mental health and social anxiety management. To fully understand the underlying causes of this disparity and to guide the creation of specialized therapies that provide welcoming and encouraging social settings, more research is necessary.

Table 11 provides an in-depth analysis of the ways in which the use of distinct devices affects the effects of AI on pupils in a variety of areas. According to the data, there are no statistically significant differences between students who used laptops or mobile phones in terms of how AI affects their academic achievement, motivation, independence, social interaction, and career guidance. This suggests that, regardless of the device used, students perceive similar levels of AI's influence in these domains. On the other hand, according to Kraushaar and Novak (2010) student multitasking with laptops during lectures can negatively impact academic performance and memory recall, as well as increase processing time and processing errors.

The impact of AI on the learning process varies significantly depending on the device used, which implies that device selection has a major influence on how students interact with AI-enabled learning resources and activities. One potential explanation for this distinction could be related to the differences in screen size, input methods, and functionality between laptops and cell phones. Laptops typically offer larger screens and more robust computing capabilities, facilitating richer and more immersive interactions with AI-powered learning tools such as virtual labs, simulations, or collaborative platforms. In contrast, cell phones, while convenient for quick access to information and communication, may offer a more limited interface for engaging with complex educational content, potentially impacting the depth and quality of the learning experience. Similarly, Sage et al. (2022) demonstrated that both smartphones and laptops are equally proficient in facilitating academic assignments; however, students tend to regard laptops as possessing greater value and educational utility, while opinions regarding smartphones are more varied. Conversely, preservice educators tend to view laptops as superior tools for mobile learning compared to mobile phones, with a more favorable attitude toward incorporating laptops into educational practices (Şad & Göktas, 2014).

Moreover, the observed differences may also reflect broader sociocultural factors and educational contexts influencing students' technological preferences and usage patterns. For instance, students who primarily use laptops may have access to more extensive resources or institutional support for technology-enabled learning initiatives, whereas cellphone users may rely more on personal devices for accessing educational content outside of formal classroom settings. Albó et al. (2018) suggested that laptops yield superior outcomes in terms of student engagement, collaborative interaction, and satisfaction when accessing academic videos within a collaborative classroom environment. These disparities in access and support structures could contribute to variations in how students perceive and benefit from AI integration in their learning experiences.

Table 11 provides an in-depth analysis of the ways in which the use of distinct devices affects the effects of AI on pupils in a variety of areas. Overall, the data shows that there are no statistically significant differences between students who used laptops and those who used mobile phones when it comes to how AI affects their academic achievement, motivation, self-reliance, social interaction, and career guidance. This suggests that, regardless of the device used, students perceive similar levels of AI's influence in these domains. On the other hand, according to Kraushaar and Novak (2010) student multitasking with laptops during lectures can negatively impact academic performance and memory recall, as well as increase processing time and processing errors.

A notable variation in the way AI affects learning implies that students' interactions with AI-enabled educational resources and activities are greatly influenced by the device they

choose. One potential explanation for this distinction could be related to the differences in screen size, input methods, and functionality between laptops and cell phones. Laptops typically offer larger screens and more robust computing capabilities, facilitating richer and more immersive interactions with AI-powered learning tools such as virtual labs, simulations, or collaborative platforms. In contrast, cell phones, while convenient for quick access to information and communication, may offer a more limited interface for engaging with complex educational content, potentially impacting the depth and quality of the learning experience. Similarly, Sage et al. (2022) demonstrated that both smartphones and laptops are equally proficient in facilitating academic assignments; however, students tend to regard laptops as possessing greater value and educational utility, while opinions regarding smartphones are more varied. Conversely, preservice educators tend to view laptops as superior tools for mobile learning compared to mobile phones, with a more favorable attitude toward incorporating laptops into educational practices (Şad & Göktas, 2014).

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The findings from Table 13 reveal a nuanced landscape of AI's impact on students across different academic disciplines. Education students experience a significantly higher impact from AI (M = 2.88) compared to their peers in hospitality management (M = 2.33) and agriculture (M = 2.44). This could be attributed to the comprehensive integration of AI tools in education curriculums, where AI-driven teaching aids, personalized learning platforms, and adaptive technologies are likely more prevalent. Education programs often emphasize evaluating and incorporating new teaching technologies, making students more aware of AI's benefits. Additionally, education faculties might be more involved in researching AI applications, further enhancing students' exposure and experience. According to Chen et al. (2020), AI in education has greatly advanced administration, instruction, and learning by increasing efficiency, promoting student retention, and improving curriculum personalization.

On the other hand, the impact of AI on IT students (M = 2.67) is not significantly different from that of education students. This similarity can be explained by the technological familiarity of IT students, who are naturally inclined towards technology and likely use AI tools extensively for coding, debugging, and data analysis. IT programs commonly incorporate dedicated courses covering AI, machine learning, and data science, offering thorough understanding and hands-on practice. Additionally, the significance of AI within the IT sector equips students for professions increasingly reliant on AI technologies, significantly shaping their educational journey. As outlined by Dwivedi et al. (2019), AI holds promise for transforming various industries and societal aspects. However, addressing challenges and research agendas is imperative to guarantee its effective integration and long-term influence.

In contrast, hospitality management (M = 2.33) and agriculture (M = 2.44) students experience a lower impact from AI. This could be due to the limited integration of AI into their curriculums, where AI applications might be more niche or emerging. Both fields have significant hands-on components that may not yet be fully optimized by AI. For example, while AI can optimize hotel management systems or agricultural machinery, these impacts might not be as directly felt by students. The applications of AI in these fields might also be less apparent or impactful in day-to-day learning experiences.

The similar impact of AI on hospitality management, agriculture, and IT students suggests that AI's presence in these fields is relatively uniform. This uniformity might reflect emerging applications of AI, tailored to specific needs within each sector, resulting in moderate but comparable levels of impact. For instance, AI-driven customer service in hospitality, precision farming in agriculture, and automation in IT all offer benefits that might not yet be fully realized in educational settings. Furthermore, similar adoption rates of AI technologies across these sectors could contribute to the observed consistency in impact.

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The varying impact of AI on different student groups can be attributed to the degree of AI integration in their curricula, the practical versus theoretical nature of their studies, and the current state of AI adoption in their respective fields. In addition, AI and machine learning integration in education can personalize and improve student learning experiences, but more research is needed to fully understand its capabilities and limitations (Tiwari, 2023). Understanding these dynamics helps educators and policymakers tailor AI applications to maximize their benefits across all disciplines.

The research findings presented in Table 14 provide a comprehensive overview of how AI impacts students' academic performance across different fields of study. The data reveal that students enrolled in education courses benefit significantly more from AI (M = 2.86) compared to those in hospitality management (M = 2.27) and agriculture (M = 2.52). This substantial difference suggests that AI applications and tools are likely to be more effectively implemented or integrated within education programs, leading to enhanced learning experiences and better academic outcomes for education students. The higher mean score for education students might reflect the nature of educational technology tools designed to support teaching and learning, which could include AI-driven tutoring systems, personalized learning platforms, and other educational applications that directly target pedagogical improvements (Tapalova et al., (2022).

Conversely, the influence of AI on education students (M = 2.86) exhibits no significant deviation from its impact on IT students (M = 2.54). This resemblance suggests that AI offers comparable advantages in both domains, potentially attributed to its extensive integration into the IT curriculum. Here, students frequently interact with AI technologies as integral components of their learning experience, engaging in activities such as hands-on projects and utilizing AI-driven coding platforms and other technology-centered educational resources to deepen their comprehension and practical skills in IT. According to McBride et al. (2021), inclusive AI curriculum materials should prioritize the cultivation of students' AI identity, employing ethical considerations, fostering community engagement, and nurturing leadership development, all while maintaining high pedagogical standards across all instructional materials.

Remarkably, among students majoring in hotel management, agriculture, and IT, the effect of AI on academic achievement does not differ statistically significantly (mean scores of 2.27, 2.52, and 2.54, respectively). This finding suggests a relatively uniform influence of AI across these fields, despite the diverse nature of their academic content and industry applications. The uniformity might be due to the generic benefits of AI in enhancing analytical skills, providing data-driven insights, and improving access to information, which are valuable across various disciplines.

The lack of significant differences among hospitality management, agriculture, and IT students also points to potential areas for improvement in the integration of AI within these fields. For example, hospitality management programs could delve into AI applications like customer service bots, predictive analytics for service management, and AI-driven marketing strategies to significantly enhance students' learning experiences. Doborjeh et al. (2021) stated that by using settings and readily accessible multimodal data sets, AI approaches may improve decision-making and support in the tourist and hospitality industries. AI solutions for sustainable practices, crop monitoring, and precision farming might also benefit agricultural initiatives. Furthermore, as Linaza et al. (2021) point out, AI technologies in agriculture may improve decision support, track conditions, and optimize production—all of which can increase yields while lowering greenhouse gas emissions and water use.

The study's conclusions shed important light on how AI affects students of all ages' learning experiences, academic achievement, career counseling, motivation, independence, and social interaction. Despite expectations that age might moderate these impacts, the study revealed no statistically significant differences, as indicated by Hotelling's Trace = 0.163, F = 1.141, $p > .05$. This suggests that the enhancements brought by AI in these areas are consistent across different age demographics. AI's integration into educational environments to provide personalized learning pathways, adaptive content, and immediate feedback benefits learners of all ages equally. In terms of academic performance, AI applications such as intelligent tutoring systems and predictive analytics support academic achievement uniformly, highlighting AI's potential to aid students irrespective of age.

In career guidance, AI's ability to analyze labor market trends, match profiles with career paths, and offer personalized advice is equally effective for users of all ages. This implies that AI-

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driven career guidance tools can benefit students, mid-career professionals, and older individuals alike. Similarly, AI's influence on motivation through gamification, personalized feedback, and adaptive learning environments is consistent across age groups, showing its effectiveness in enhancing motivation for both younger and older users. The study also found that AI's impact on self-reliance is not age-dependent, suggesting AI can foster independence and self-directed learning across various age demographics. Additionally, AI's facilitation of virtual collaboration impacts social interaction uniformly, and the degree of AI dependency does not vary with age. These findings highlight that AI technologies can be effectively implemented across diverse age groups without extensive customization, allowing educators, policymakers, and developers to focus on creating robust, universally applicable AI solutions that enhance educational and career outcomes for all users, regardless of age. Conversely, AI could affect older individuals in various ways. For instance, According to Sawchuk (2019), AI-based elder care systems may jeopardize senior citizens' security and privacy by disclosing their health information, lifestyle profiles, and shopping preferences to big businesses like Google and Amazon.

The research findings from the MANOVA analysis provide comprehensive insights into how AI impacts various dependent variables, including learning experience, academic performance, career guidance, motivation, self-reliance, social interaction, and AI dependency, across different family-income groups. The analysis revealed no statistically significant differences between these groups concerning the combined dependent variables, as indicated by Hotelling's Trace = 0.160, $F = 0.838$, $p > 0.05$. The small effect size, with a partial $\eta 2$ of 0.039, suggests that family income accounts for only 3.9% of the variance in the combined dependent variables, indicating that family income is not a strong predictor of how AI impacts these areas. Despite the reasonably high observed power of 0.771, which indicates a 77.1% probability of detecting significant differences if they existed, the lack of significant findings reinforces the conclusion that family income does not substantially influence the impact of AI on these variables.

These findings imply that AI technologies have a uniform impact across different family-income groups. This uniformity suggests that AI-driven educational and career guidance tools are equally effective regardless of family income, making them valuable resources for addressing educational and career needs across diverse economic backgrounds. Specifically, the consistent benefits of AI on learning experience and academic performance highlight its potential to bridge educational gaps associated with economic disparities. Moreover, the influence of AI on motivation, self-reliance, and social interaction does not vary significantly with family income, indicating that AI's capacity to enhance these areas is not dependent on economic background. This finding is crucial for the development of AI tools aimed at fostering personal and social development, as it suggests that these tools can be designed to be inclusive and accessible to all users, regardless of their economic situation. Conversely, Nwatu et al. (2023) demonstrated that low-income households consistently achieve poorer results than wealthier groups in vision-language models, emphasizing the necessity for inclusive AI development.

Conclusions and Implications

The study provides a thorough study that sheds light on the various ways that artificial intelligence (AI) is affecting education. A recurring theme shows up in a number of areas, including learning experiences, academic achievement, career counseling, motivation, self-reliance, social interaction, and reliance on AI: AI is being incorporated into educational settings more and more to provide students with individualized learning experiences and cutting-edge tools that meet their varied needs and preferences. The findings reveal a positive reception of AI's integration into education. It is recognized for its potential to revolutionize traditional teaching methods by personalizing content and boosting engagement. Students largely perceive AI as beneficial to their academic performance, appreciating its role in improving learning experiences and aiding skill development. However, there are lingering concerns about its impact on hands-on learning and critical thinking skills, as well as room for improvement in integrating AI into test preparation methods.

Moreover, AI's utility in career guidance tasks like skill matching and recommendation is acknowledged, yet doubts persist regarding its accuracy in providing career information, highlighting the importance of human involvement in long-term career planning. AI's positive

impact on student motivation through gamified learning, personalized feedback, and goal setting is evident, though there's a need for tailored approaches due to individual differences in response. While AI is seen as fostering self-directed learning and collaborative environments, concerns exist regarding autonomy and equitable access. Variations in the impact of AI across demographic groups, disciplines, and technological contexts are observed, emphasizing the need for a nuanced understanding of its influence. While AI holds significant promise for transforming education, addressing concerns and ensuring its integration promotes autonomy, critical thinking, and equitable access are essential. Through effective and ethical leveraging of AI's capabilities, educators can harness its potential to create more personalized, engaging, and inclusive learning environments in the digital era.

Recommendations

Several recommendations can be made to maximize the utilization of artificial intelligence (AI) in education based on thorough research findings. Firstly, there is a need to enhance test preparation methods by developing AI-driven tools tailored to aid students effectively in preparing for exams. Secondly, it's imperative to ensure ethical standards in AI-driven career guidance tools, supplementing rather than replacing human involvement in long-term career planning. Additionally, recognizing the variability in individual responses to AI's motivational benefits, tailored approaches should be developed to effectively leverage AI in enhancing student motivation. Moreover, a balanced integration of AI in education should be promoted, fostering autonomy, critical thinking, and equitable access to AI resources. Device preferences should also be considered, ensuring AI-enabled educational materials are accessible and optimized for various devices. Furthermore, tailored interventions are needed to promote inclusive social environments, addressing observed gender differences in the impact of AI on social interaction. Integrating AI education into curricula across diverse fields and emphasizing inclusivity across economic backgrounds are also crucial steps. Future studies should prioritize user-centered design for accessibility, investigate global viewpoints, advocate for policy initiatives ensuring equitable access, develop ethical frameworks, collaborate interdisciplinary to address a range of needs, integrate AI literacy into teacher training, and track the long-term effects of AI on education. These efforts will advance AI in education responsibly, addressing emerging challenges. By implementing these recommendations, educators and policymakers can effectively harness the transformative potential of AI in education while ensuring a balanced and inclusive approach to its integration.

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Declaration of Interest

The authors declare no competing interest.

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