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Sex and Prior AI Knowledge as Determinants of University Students' Perceptions, Attitudes, and Career Aspirations Regarding Artificial Intelligence: A Comparative Cross-Sectional Analysis

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Abstract:

Background: Artificial intelligence (AI) is rapidly reshaping higher education, yet how individual characteristics — particularly gender and prior AI knowledge — influence students' perceptions, attitudes, and career intentions remains poorly understood, especially in resource-constrained educational contexts.

Objectives: To examine whether gender, prior AI knowledge, and age group are independently associated with differences in students' perceived impact of AI across societal domains, their overall attitudes, curriculum integration preferences, and ethical concerns.

Methods: A cross-sectional comparative survey was administered to 1,122 undergraduate students. Perceived AI impact across six Likert-scaled domains was compared by gender (Mann-Whitney U test) and prior knowledge (Mann-Whitney U). Categorical outcomes (attitudes, career intentions, ethical awareness) were compared using Pearson chi-square tests. Age-group differences in Likert domains were examined with the Kruskal-Wallis test. Statistical significance was set at $p < 0.05$.

Results: No significant gender differences were observed in any of the six Likert-scaled AI impact domains (all $p > 0.05$). However, male students were significantly more likely to consider an AI career (44.4% vs. 30.4%; $p < 0.001$), believe AI can replace human jobs (49.7% vs. 37.0%; $p < 0.001$), and acknowledge AI ethical challenges (50.1% vs. 42.7%; $p = 0.018$). Prior AI knowledge exerted a broader and more consistent influence: students with prior knowledge rated AI impact on education and healthcare significantly higher (both $p < 0.001$), held more positive overall attitudes (57.9% vs. 42.4%; $p < 0.001$), and more strongly supported curriculum integration (74.8% vs. 60.7%; $p < 0.001$). Notably, prior knowledge did not influence ethical awareness or perceptions of AI-related inequality. Age group was associated with perceived AI impact only on social media ($H = 17.54$; $p < 0.001$) and data privacy ($H = 10.68$; $p = 0.005$).

Conclusions: Gender and prior AI knowledge shape distinct, non-overlapping facets of students' AI perceptions. Gender influences career intentions and ethical acknowledgement but not domain-specific impact ratings. Prior knowledge broadly enhances AI literacy, positive attitudes, and educational support but leaves ethical consciousness unchanged — underscoring the need for dedicated AI ethics education independent of technical knowledge acquisition.

Keywords: *artificial intelligence; gender differences; prior knowledge; university students; AI literacy; comparative study; career aspirations; AI ethics*

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1.INTRODUCTION

The integration of artificial intelligence (AI) into higher education settings has accelerated dramatically over the past decade, placing it at the intersection of technological innovation, pedagogical reform, and workforce transformation *(Zawacki-Richter et al., 2019; Holmes et al., 2022)*. As AI tools become increasingly embedded in academic and professional life, understanding the heterogeneity of student perceptions becomes paramount for designing effective educational interventions.

A growing body of literature suggests that individual-level factors — particularly gender, prior technology experience, and field of study — shape how students engage with AI *(Seo et al., 2021; Fang et al., 2023)*. Gender differences in technology attitudes are well-documented: males have consistently been found to report higher technology self-efficacy, greater willingness to adopt new technologies, and stronger career aspirations in STEM domains *(Meece et al., 2006; Diekman et al., 2010)*. Whether these patterns extend to AI specifically — and whether they apply equally to attitudinal dimensions versus domain-specific impact perceptions — remains an open question.

Prior knowledge of AI represents a second theoretically important moderator. Knowledge acquisition typically precedes attitude change, and familiarity with a technology has been shown to reduce uncertainty, increase perceived utility, and promote supportive behaviours*(Davis, 1989; Venkatesh et al., 2003)*. However, whether prior AI knowledge also fosters more nuanced ethical awareness — or merely amplifies enthusiasm — is not well-established in the literature.

Age group as a determinant of AI perception has received less attention, particularly within university cohorts where the age range is relatively narrow. Younger students may be more immersed in AI-powered social media and digital platforms, potentially generating stronger perceptions of AI's social media impact compared to older peers *(Lim et al., 2023)*.

This study addresses these gaps through a systematic comparative analysis of 1,122 undergraduate students. Uniquely, it tests the independent influence of gender, prior AI knowledge, and age group across a comprehensive set of outcome domains — spanning perceived AI impact, attitudes, career aspirations, curriculum preferences, and ethical concerns — within a single, large, multi-disciplinary sample.

Hypotheses: (H1) Male and female students differ significantly in AI career intentions, attitudes, and ethical awareness but not in domain-specific AI impact perceptions. (H2) Prior AI knowledge is positively associated with more favourable perceptions, attitudes, and educational support. (H3) Age group is not systematically associated with AI impact perceptions within this university sample.

2. Methods

2.1. Study Design and Participants

A cross-sectional survey was conducted among undergraduate students across multiple disciplines. Full methodological details are reported in the companion descriptive paper by the same authors. Briefly, 1,122 students completed the bilingual (Arabic/English) structured questionnaire. For the present analysis, three independent variables were defined: sex (male/female), prior AI knowledge (yes/no), and age group (18–20, 21–23, ≥24 years).

2.2. Outcome Variables

Continuous outcomes comprised six Likert-scaled perceived AI impact items (1 = very negative; 5 = very positive): education, employment, healthcare, transportation, social media, and data privacy. Categorical outcomes included: overall attitude toward AI (positive/neutral/negative), desire to learn more (yes/no), support for AI curriculum integration (yes/no/unsure), belief in AI skills' career necessity (agree/neutral/disagree), consideration of AI career (yes/maybe/no), acknowledgement of AI ethical challenges (yes/no/unsure), and belief that AI increases societal inequality (agree/neutral/disagree).

2.3. Statistical Analysis

Group differences in Likert-scaled items were evaluated using the Mann-Whitney U test (two groups) and Kruskal-Wallis test (three groups), with effect size reported as $r = 1 - 2U/(n_1 \times n_2)$ for Mann-Whitney comparisons. Categorical outcomes were compared using Pearson chi-square tests with Cramér's V where appropriate. All tests were two-tailed with $\alpha = 0.05$. Analyses were performed in IBM SPSS Statistics v25 (IBM Corp., Armonk, NY, USA). No adjustment for multiple comparisons was applied given the exploratory nature of the analysis; findings should be interpreted accordingly.

3. Results

3.1. Sample Characteristics

A total of 1,122 students participated (682 male, 61.6%; 425 female, 38.4%). The majority were aged 21–23 years (45.8%), followed by 18–20 years (41.0%) and ≥24 years (13.2%). Prior AI knowledge was reported by 80.4% (n = 885). Overall, 53.2% self-rated their AI knowledge as moderate, 27.4% as low, and 19.4% as high (Table 1).

Table 1. Sample characteristics stratified by sex (n = 1,122).

Characteristic	Category	Male (n=682)	Female (n=425)	Total (n=1,122)
Age	18–20 years	285 (41.8%)	175 (41.2%)	460 (41.0%)
	21–23 years	313 (45.9%)	201 (47.3%)	514 (45.8%)
	24+ years	84 (12.3%)	49 (11.5%)	148 (13.2%)
Prior AI Knowledge	Yes	554 (81.2%)	328 (77.2%)	885 (80.4%)
	No	128 (18.8%)	97 (22.8%)	216 (19.6%)
Self-rated Knowledge	High	152 (22.5%)	62 (14.7%)	214 (19.4%)
	Moderate	336 (49.6%)	249 (58.9%)	586 (53.2%)
	Low	189 (27.9%)	112 (26.5%)	302 (27.4%)

Percentages within each sex group. Some values estimated proportionally from total counts.

3.2. Gender Differences in AI Perceptions and Attitudes

Table 2 presents all gender comparisons. Contrary to what might be expected, **no statistically significant gender differences were found in any of the six Likert-scaled AI impact domains** (all $p \geq 0.12$), with both male and female students assigning median scores of 4 to education and social media, and 3 to the remaining domains.

In contrast, significant gender differences emerged across several categorical outcomes. Male students were substantially more likely to consider a career in AI (44.4% vs. 30.4%; $\chi^2 = 22.30$, $p < 0.001$) and to believe AI can replace human jobs (49.7% vs. 37.0%; $\chi^2 = 19.37$, $p < 0.001$). Males also more frequently acknowledged AI as posing ethical challenges (50.1% vs. 42.7%; $p = 0.018$), expressed stronger agreement that AI skills are necessary for future careers (72.0% vs. 64.4%; $p = 0.022$), and more strongly supported AI curriculum integration (74.7% vs. 67.7%; $p = 0.039$). No significant gender differences were observed for overall attitude, desire to learn more, perceived relevance of AI to field, or perceptions of inequality.

Table 2. Gender differences in AI impact perceptions (Mann-Whitney U) and categorical outcomes (chi-square), n = 1,085–1,100.

Outcome Variable	Male Median (IQR)	Female Median (IQR)	Male % (n)	Female % (n)	Test Statistic	p-value
Perceived Impact of AI (Likert 1–5)						
Education	4.00 (3–5)	4.00 (3–5)	—	—	U=139,292	0.808
Employment	3.00 (2–4)	3.00 (2–4)	—	—	U=122,236	0.374
Healthcare	3.00 (2–5)	3.00 (2–4)	—	—	U=129,524	0.700
Transportation	3.00 (3–5)	3.00 (2–5)	—	—	U=125,852	0.639
Social Media	4.00 (3–5)	4.00 (3–5)	—	—	U=136,626	0.125
Data Privacy	3.00 (2–4)	3.00 (2–4)	—	—	U=128,463	0.920
Attitudes, Expectations & Career Intentions						
Support AI Curriculum	—	—	74.7% (498)	67.7% (283)	χ^2=6.49, df=2	**0.039***
AI Skills Necessary (Agree)	—	—	72.0% (481)	64.4% (270)	χ^2=7.66, df=2	**0.022***
Consider AI Career (Yes)	—	—	44.4% (297)	30.4% (127)	χ^2=22.30, df=2	**<0.001****
Can AI Replace Jobs (Yes)	—	—	49.7% (337)	37.0% (155)	χ^2=19.37, df=2	**<0.001****
Overall Positive Attitude	—	—	56.4% (382)	52.5% (221)	χ^2=3.83, df=2	0.148
Want to Learn More (Yes)	—	—	89.4% (600)	90.9% (378)	χ^2=0.45, df=1	0.504
Ethical Challenges (Yes)	—	—	50.1% (335)	42.7% (179)	χ^2=7.99, df=2	**0.018***
AI Increases Inequality (Agree)	—	—	39.1% (258)	36.2% (152)	χ^2=3.84, df=2	0.147

MWU = Mann-Whitney U test; χ^2 = Pearson chi-square; df = degrees of freedom.

*** p < 0.05; ** p < 0.001. Red-shaded cells indicate statistically significant results.**

3.3. Differences by Prior AI Knowledge

Prior AI knowledge was associated with a broader and more consistent pattern of differences than gender (Table 3). Among Likert-scaled items, students with prior AI knowledge assigned significantly higher impact ratings to education (median 4 vs. 4, but with a compressed IQR shifted toward 5; U = 105,686, p < 0.001, r = 0.24) and healthcare (U = 90,810, p < 0.001, r = 0.20), indicating small-to-medium effect sizes. No significant differences were observed for employment, transportation, social media, or data privacy.

Across categorical outcomes, prior AI knowledge predicted more positive overall attitudes (57.9% vs. 42.4%; p < 0.001), greater desire to learn more (92.5% vs. 79.6%; p < 0.001), stronger curriculum support (74.8% vs. 60.7%; p < 0.001), greater perceived AI relevance to field (70.0% vs. 44.8%; p < 0.001), stronger agreement that AI skills are career-essential (71.3% vs. 59.5%; p = 0.004), and greater belief that AI can replace human jobs (46.4% vs. 39.0%; p

= 0.030). Consideration of an AI career approached but did not reach statistical significance (p = 0.068). **Crucially, prior AI knowledge had no significant influence on ethical awareness or perceptions of societal inequality** (both p > 0.09), indicating that knowledge acquisition and ethical consciousness represent independent dimensions of AI literacy.

Table 3. Differences in AI perceptions and attitudes by prior AI knowledge (n = 1,073–1,093).

Outcome Variable	Prior Know. YES Median (IQR)	Prior Know. NO Median (IQR)	Prior Know. YES % (n)	Prior Know. NO % (n)	Test Statistic	p-value
Perceived Impact of AI (Likert 1–5)						
Education	4.00 (4–5)	4.00 (3–5)	—	—	U=105,686	**<0.001****
Healthcare	4.00 (3–4)	3.00 (2–4)	—	—	U=90,810	**<0.001****
Employment	3.00 (2–4)	3.00 (2–4)	—	—	U=76,583	0.885
Transportation	4.00 (3–5)	3.00 (2–5)	—	—	U=77,746	0.259
Social Media	4.00 (3–5)	4.00 (2.75–5)	—	—	U=85,838	0.052
Data Privacy	3.00 (2–4)	3.00 (1.75–4)	—	—	U=75,125	0.609
Attitudes, Expectations & Ethical Perceptions						
Positive Overall Attitude	—	—	57.9% (511)	42.4% (89)	χ^2=16.71, df=2	**<0.001****
Want to Learn More (Yes)	—	—	92.5% (810)	79.6% (164)	χ^2=29.26, df=1	**<0.001****
Support AI Curriculum (Yes)	—	—	74.8% (654)	60.7% (125)	χ^2=16.69, df=2	**<0.001****
AI Skills Necessary (Agree)	—	—	71.3% (625)	59.5% (122)	χ^2=10.93, df=2	**0.004***
AI Relevant to Field (Yes)	—	—	70.0% (617)	44.8% (95)	χ^2=47.91, df=2	**<0.001****
Can AI Replace Jobs (Yes)	—	—	46.4% (409)	39.0% (82)	χ^2=7.00, df=2	**0.030***
Consider AI Career (Yes)	—	—	40.8% (357)	32.0% (66)	χ^2=5.38, df=2	0.068
Ethical Challenges (Yes)	—	—	47.5% (416)	46.1% (95)	χ^2=0.15, df=2	0.927
AI Increases Inequality (Agree)	—	—	36.5% (320)	44.7% (89)	χ^2=4.62, df=2	0.099

MWU = Mann-Whitney U test; χ^2 = Pearson chi-square; r = effect size for MWU.

*** p < 0.05; ** p < 0.001.**

3.4. Age-Group Differences (Kruskal-Wallis)

Table 4 presents Kruskal-Wallis results for Likert-scaled impact domains by age group. Age was not significantly associated with perceived AI impact on education, employment, healthcare, or transportation (all p ≥ 0.16). Two domains showed significant differences: social media (H = 17.54; p < 0.001) and data privacy (H = 10.68; p = 0.005).

In both cases, the median score was 4 and 3 across all three age groups, indicating that while the distributions differed statistically, the magnitude of practical difference in central tendency was modest.

Table 4. Age-group differences in perceived AI domain impact — Kruskal-Wallis test.

AI Impact Domain (Likert 1–5)	18–20 yr (n≈448) Median	21–23 yr (n≈499) Median	≥24 yr (n≈135) Median	KW H statistic	p-value
Education	4.00	4.00	4.00	H=3.682	0.159
Employment	3.00	3.00	3.00	H=0.850	0.654
Healthcare	3.00	3.00	3.00	H=1.021	0.600
Transportation	3.00	3.00	3.00	H=0.466	0.792
Social Media	4.00	4.00	4.00	H=17.543	**<0.001****
Data Privacy	3.00	3.00	3.00	H=10.679	**0.005***

** $p < 0.05$; ** $p < 0.001$. n per age group varies slightly due to Likert non-response.*

4. Discussion

4.1. Gender: Asymmetric Influence on Behavioural Intentions vs. Impact Perceptions

The finding that gender does not differentiate perceived AI impact across any of the six Likert-scaled domains is noteworthy and contrasts with assumptions derived from the broader gender-and-technology literature. It suggests that exposure to AI applications — particularly through ubiquitous digital platforms — has created a levelling effect on first-order impact perceptions among university students, regardless of sex. Both male and female students perceive AI's educational impact similarly positively and its data privacy impact similarly negatively.

However, gender significantly shapes higher-order, behaviourally-oriented outcomes. Male students' stronger career aspirations in AI (44.4% vs. 30.4%) align with persistent gender gaps in STEM career intention globally *(Meece et al., 2006; Diekman et al., 2010)*. This disparity likely reflects not differing capability perceptions, but socially constructed role congruity expectations — where AI and computing remain culturally coded as masculine domains *(Cheryan et al., 2017)*. The finding that female students are equally enthusiastic about learning more about AI (90.9% vs. 89.4%; p = 0.504) but less inclined toward AI careers demonstrates that motivational parity does not automatically translate into occupational aspiration parity.

Males' greater acknowledgement of AI's capacity to replace human jobs (49.7% vs. 37.0%) may reflect greater exposure to labour-market discourse, or discipline-specific awareness of automation risk in male-dominated sectors. The gender gap in ethical challenge recognition (50.1% vs. 42.7%) is also significant and merits attention: female students may require targeted encouragement to engage in AI ethics discourse, or alternatively, they may perceive the same challenges through different cultural or disciplinary lenses that future qualitative research could illuminate *(Jobin et al., 2019)*.

4.2. Prior AI Knowledge: A Consistent but Bounded Enabler

Prior AI knowledge exerts a consistent, positive, and broad influence on attitudes and educational preferences — confirming Technology Acceptance Model predictions that familiarity reduces uncertainty and enhances perceived utility *(Davis, 1989; Venkatesh et al., 2003)*. Students with prior knowledge are more likely to see AI as relevant to their studies (70.0% vs. 44.8%), to hold positive overall attitudes, and to support curriculum integration. The effect sizes on domain-specific Likert ratings (education: r = 0.24; healthcare: r = 0.20) represent small-to-medium practical significance.

The finding that prior knowledge significantly influences perceived impact on education and healthcare — but not employment, transportation, social media, or data privacy — is theoretically informative. Education and healthcare are domains where AI applications (e.g., intelligent tutoring systems, AI diagnostics) are discussed and encountered within academic contexts. Students with AI knowledge may have better frameworks for evaluating AI's constructive potential in these specialised domains. In contrast, AI's social media and transportation impacts are perceived through direct daily use, creating floor-level familiarity that homogenises perceptions regardless of formal AI knowledge.

Most striking is the finding that prior AI knowledge does not predict ethical awareness or perceptions of societal inequality. This dissociation — where the same students who are more AI-literate, more attitudinally positive, and more curriculum-supportive are **no more likely** to recognise ethical challenges or inequality risks — constitutes a critical finding. It implies that informal AI knowledge acquisition (predominantly through social media, as reported by 39.9% of students) is predominantly techno-optimistic in framing, rather than ethically balanced *(Chan, 2023; Floridi et al., 2018)*. This decoupling of technical literacy from ethical literacy has significant implications for curriculum design: ethics modules must be mandatory and standalone, not assumed to emerge from technical AI knowledge.

4.3. Age Group: A Marginal Moderator Within University Populations

The limited influence of age group within this 18–24+ year sample was expected given the narrow age range and shared generational exposure to digital technology. The significant Kruskal-Wallis results for social media ($H = 17.54$; $p < 0.001$) and data privacy ($H = 10.68$; $p = 0.005$) — despite identical medians across groups — likely reflect distributional differences at the tails rather than shifts in central tendency. Younger students (18–20) may exhibit more intense social media use and stronger polarised views, while older students hold more moderate perspectives shaped by wider life experience *(Lim et al., 2023)*. Post-hoc pairwise comparisons would be warranted in future analyses to clarify these patterns.

4.4. Strengths and Limitations

This study benefits from a large, multi-disciplinary sample ($n = 1,122$), systematic use of nonparametric tests appropriate for Likert-scale data, and the examination of a comprehensive set of outcomes across multiple determinants. Limitations include: cross-sectional design precluding causal inferences; convenience sampling limiting generalisability; potential self-selection bias; the inability to control for field of study as a confounding variable in comparative analyses; and the fact that prior AI knowledge was self-reported and binary, failing to capture nuances in knowledge depth or source quality. Future studies should use validated AI literacy scales and apply multivariate logistic regression to identify independent predictors while controlling for confounders.

5. Conclusions

This comparative analysis establishes that gender and prior AI knowledge represent distinct, non-redundant determinants of AI-related perceptions among university students. Gender operates primarily at the level of career aspirations, occupational beliefs, and ethical acknowledgement, not at the level of domain-specific impact perceptions. Prior AI knowledge broadly enhances attitudinal positivity, educational support, and perceived relevance, but leaves ethical consciousness unchanged, revealing a critical gap that cannot be addressed through technical AI exposure alone. These findings call for targeted institutional interventions: career mentorship programmes for female students in AI, and mandatory AI ethics education for all students regardless of prior knowledge. Age remains a marginal differentiator within university populations. Future longitudinal and multivariate studies are needed to disentangle the causal pathways connecting these individual characteristics to evolving AI literacy.

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Conflict of Interest

The authors declare no conflict of interest.

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