Received: 7 November 2024 | Revised: 28 February 2025 | Accepted: 4 June 2025 | Published online: 23 June 2025

RESEARCH ARTICLE

International Journal of Changes in Education
2025, Vol. 00(00) 1–13
DOI: 10.47852/bonviewIJCE52024756

BON VIEW PUBLISHING

Beyond Performance: AI Psychological Empowerment in Cross-Cultural Education

Yingnan Shi[1,*] and Astrid Tong Xu[2]

[1]*Business School, University of Western Australia, Australia*

[2]*Deloitte Beijing, China*

Abstract: This study investigates artificial intelligence (AI) psychological empowerment in education, examining how AI tools enhance students' sense of competence, autonomy, and engagement beyond the effects of material empowerment (e.g., task performance improvements). Using a quasi-experimental design, we compared Chinese domestic students in China and Chinese international students in Australia to assess whether AI psychological empowerment is both tangible and more impactful than material empowerment. We highlight several nuanced ways AI fosters personal growth and self-perception. Our findings reveal that, while AI material empowerment is beneficial, psychological empowerment has a stronger influence on motivation and self-perception, particularly for international students compared to local students, despite both groups completing the same English writing task. These results suggest that AI's role in education extends beyond traditional material support, offering transformative psychological empowerment that enhances students' confidence in academic contexts. This empowerment reasonably translates into greater personal adaptability and, ultimately, personal growth. The study contributes to the growing literature on AI in education, providing insights for scholars, educators, and policymakers seeking to leverage AI for holistic student development. Notably, generative AI (GAI) emerges as a critical tool for cultural and linguistic adaptation, particularly for immigrant students navigating foreign academic systems. Furthermore, the psychological empowerment effects of GAI appear to be context-dependent, with stronger impacts observed in students facing greater cultural or linguistic barriers. These findings emphasize AI's potential to foster personal growth and resilience across diverse learning contexts. Finally, we recommend that educational policies and practices be tailored to leverage GAI for immigrant populations, paving the way for more equitable educational opportunities.

Keywords: AI psychological empowerment, learning performance, educational technology, cross-cultural education, student motivation, student self-perception

1. Introduction

The integration of artificial intelligence (AI) in education has sparked extensive discussions about its transformative potential, with research examining its impact on learning efficacy [1], emotional support [1], digital engagement strategies [2], and critical ethical issues such as trust and mistrust [3, 4], algorithmic bias [5], and privacy and cybersecurity issues [6]. However, one important area remains underexplored: AI's role in fostering students' psychological empowerment. AI psychological empowerment refers to the ways AI can enhance students' sense of competence, self-determination, meaning, and impact—factors essential for meaningful and engaged learning. This concept, adapted from Spreitzer [7], uniquely emphasizes the motivational and personal growth aspects of AI's impact on individuals [8], beyond the material empowerment and enhancement effect, which primarily involves efficiency gains and task performance improvements facilitated by AI, such as streamlined workflows and enhanced task accuracy [9], which current research often focuses on.

Separating psychological empowerment and material empowerment in the context of AI-enabled learning for university students is essential. Previous studies have often grouped these dimensions under the umbrella term of "empowerment," but the two operate on distinct levels—psychological empowerment influences students' self-perception and engagement, while material empowerment affects performance and efficiency. While generative AI (GAI) tools can enhance both dimensions, these forms of empowerment are sometimes misaligned. For instance, GAI tools may significantly enhance psychological empowerment while only minimally improving material empowerment.

The mechanisms underlying this misalignment have been partially explored in previous research. For example, GAI tools are good at providing continuous and instant feedback and support [10], which, from a psychological perspective, can boost students' confidence and sense of competence, has been observed across various educational contexts, including in-person, online, and blended learning environments [2, 11]. However, it remains unclear whether psychological empowerment can consistently translate into material empowerment. As Cash and Oppenheimer [12] have noted, GAI tools lack the depth and structural organization of human knowledge. While they can simulate expertise by generating

***Corresponding author:** Yingnan Shi, Business School, University of Western Australia, Australia. Email: yingnan.shi@uwa.edu.au

convincing responses, they are prone to (1) errors in fundamental tasks due to their reliance on shallow, associative knowledge structures rather than deep understanding; and (2) inability to adapt or intuitively address novel or unexpected tasks, which is essential for material empowerment. This also suggests that while GAI tools might give users the perception of being supported (psychological empowerment), they often fail to deliver consistent, tangible improvements in actual task performance (material empowerment). Moreover, as identified by Zhang and Xu [13], GAI tools can create a sense of competence and autonomy in users, but this confidence often exceeds actual improvements in learning outcomes. For students, this misalignment may lead to (1) overconfidence in abilities (i.e., psychological empowerment creates the illusion of mastery without corresponding improvements in writing quality or critical skills) and (2) stagnation of skill development (i.e., students may perceive progress due to high psychological empowerment, but their actual learning outcomes remain stagnant. This phenomenon, often referred to as the illusion of learning, highlights the discrepancy between perceived progress and measurable outcomes). We argue that, for international students, psychological empowerment through AI tools can help address language barriers, cultural differences, and academic anxiety, offering a unique form of support less relevant to material empowerment. In contrast, domestic students may rely more heavily on material empowerment for task completion, as they do not face the same external challenges. Therefore, a comparative study on these cohorts of students can be a good starting point to address the gaps in understanding AI's contribution to the two dimensions of empowerment (i.e., how AI-facilitated psychological empowerment varies across these two student cohorts, which share similarities yet differ in their educational and cultural experiences), the primary research objective of this study.

To study this, our study adopts a distinctive approach. Drawing from the methodology of Li et al. [14], we investigated AI psychological empowerment among Chinese students in two educational contexts: Chinese domestic students studying in China and Chinese international students studying in Australia. Both groups completed identical English writing tasks (adapted from the Graduate Management Admission Test (GMAT)) under similar conditions, with the domestic group completing the task in Chinese (back-translated for validity) and the international group completing it in English. This design minimizes cultural confounding variables and focuses on contextual differences, providing a robust framework for assessing the nuanced impacts of AI psychological empowerment. By including evaluations of AI empowerment, material empowerment, and demographic factors, this study captures a comprehensive view of how AI influences learning outcomes across diverse settings. We believe this cross-sectional approach that our research adopted offers not only valuable insights into how AI psychological empowerment varies across educational settings but also suggestions for achieving theoretical alignment between psychological and material empowerment. This study contributes to the nuanced understanding of AI's role in education and offers actionable recommendations for creating inclusive and effective learning environments: By examining empowerment dimensions—competence, impact, meaning, and self-determination—this study specifically explores how Chinese international students in Australia and domestic students in China uniquely engage with AI in their academic pursuits. Thus, our research provides clearer insights for educators and policymakers to design AI-supported interventions that balance both forms of empowerment. Our study provides clearer insights for educators and policymakers to design AI-supported interventions that balance both forms of empowerment. That is, we need to leverage AI tools to foster long-term personal growth, adaptability, and resilience, particularly for students facing cultural or linguistic challenges. Moreover, we also need to develop strategies to avoid overreliance on AI for task performance, ensuring students continue to build critical skills independently. Ultimately, this research aims to enhance understanding of how AI can be implemented to foster psychological, rather than merely material, empowerment in diverse educational contexts, promoting greater student engagement and autonomy.

2. Literature Review

2.1. The dual impact of generative AI on modern education

A significant body of research has emerged highlighting its dual impact on academic performance. Numerous studies indicate a positive association between GAI usage and enhanced learning outcomes, suggesting that its incorporation into educational practices can facilitate personalized learning experiences tailored to individual student needs. However, the findings are not without complexity; methodological limitations in existing research, such as inadequate power analysis and variability in results, raise questions about the reliability of these positive effects [15]. Furthermore, the directionality of the relationship between GAI agents' use and academic performance remains ambiguous, necessitating further experimental studies to establish causality, even though some researchers claim a positive effect of ChatGPT-like robots on learning performance based solely on cross-sectional evidence [16–18]. As Crawford et al. [19] noted, AI inadvertently reduces meaningful human connections, leading to increased feelings of isolation among students, which could negatively impact student engagement, academic performance, and overall retention rates. As such, while the potential of GAI to improve academic performance is evident, a nuanced study is needed [15].

2.1.1. Strengths

Specifically, on the light side, for instance, one prominent advantage of GAI in education is its ability to create personalized learning experiences, enabling a more tailored approach that can cater to various learning paces and styles. According to Chen and Lin [20], the application of GAI, when guided by established ethical principles, can maximize the positive impact of AI tools by providing an adaptive learning environment that meets diverse student needs. Additionally, GAI tools can simplify administrative tasks and assessment processes, allowing educators to allocate more time to direct teaching efforts, enhancing overall instructional quality. For instance, Wood and Moss [21] find that, although many GAI applications in higher education are still in their early stages, learners generally report increased comfort and receptiveness to using AI tools in their studies. Tools like ChatGPT can assist students in improving their writing skills by providing feedback on coherence, grammar, and lexical range, thereby fostering better writing performance [22, 23]. The interactive nature of GAI can make learning more engaging and enjoyable for students, as teaching and learning are prime areas for disruption by this technology [24, 25]. Prior literature also introduces other benefits from the recent boom of GAI agents, such as its potential to lower barriers for students who may struggle with traditional learning methods, providing support for diverse learning styles and needs [26]. Similarly, AI tools can be scaled to accommodate large numbers of students, providing consistent support and resources across diverse educational settings [27].

2.1.2. Concerns

Conversely, a significant concern surrounding GAI in education is the potential for these tools to inadvertently undermine essential skills, such as creativity and critical thinking. Among the most prominent and widely discussed issues is academic dishonesty. The use of GAI tools can lead to increased instances of plagiarism, as students may submit AI-generated content as their own work [28]. However, cheating is merely a surface-level problem; the deeper issue lies in the quality of learning. As Liang [29] notes, while AI-assisted tools offer valuable learning support, excessive reliance on them may suppress students' creative abilities and weaken their problem-solving skills. This presents a complex challenge for educators, who must strike a balance between leveraging AI's advantages and preserving core academic skills through traditional teaching methods. Similarly, Yilmaz and Yilmaz [30] argue that overreliance on AI for tasks such as writing and problem-solving may hinder the development of critical thinking and self-reliance, as students may default to AI assistance rather than cultivating their own abilities. Additionally, the widespread use of GAI complicates the assessment of students' authentic contributions. AI-generated content complicates the assessment of students' original contributions, as it can be difficult to distinguish between authentic student work and AI-assisted outputs [31]. This can fundamentally alter the traditional roles of educators, as one of the cornerstones of education is the ability of teachers to observe students' genuine progress over time and evaluate how well they meet learning objectives. With AI's growing involvement, this goal becomes harder to achieve, which can have corresponding negative effects on students' learning outcomes [22]. In this context, Yilmaz and Yilmaz [30]'s concern over students developing a long-term dependency on AI tools, which could impair their ability to think independently and solve problems without external assistance, is becoming more vital than ever. In fact, this concern might not even require waiting for the long-term effects to manifest. As Wang [32] critically observed, "Reading a paper written by ChatGPT is like eating junk food—it's smooth but lacks nourishment," underscoring the superficiality often associated with AI-produced content. In this regard, it appears that, while GAI is celebrated for its productivity benefits, critics argue that it often lacks the depth, originality, and contextual sensitivity crucial for real-world application, particularly in complex professional tasks. Although AI can generate well-structured content, it frequently falls short in cultivating nuanced understanding—an essential factor for meaningful learning and effective workplace integration. This limitation is especially relevant in supporting the diverse psychological and cultural needs of students from marginalized backgrounds, who may require more than just efficient task completion to feel included and empowered within their educational journeys.

Therefore, it is crucial to understand GAI not merely as a productivity tool but as a means to contribute to the holistic development of learners. This includes fostering essential skills such as critical thinking, creativity, and adaptability, which prepare students for complex, real-world challenges.

2.2. From material empowerment to psychological empowerment

The integration of GAI in education introduces a nuanced blend of material empowerment—where AI tools actively enhance tangible learning outcomes—and psychological empowerment, which enriches students' perceptions of their own efficacy, self-determination, and anticipated impact on learning objectives. Wood and Moss [21], along with Ouyang and Jiao [33], propose that the empowerment brought by GAI is a fusion of material and psychological dimensions. This empowerment exists as a hybrid of two modes: AI-directed learning (where AI takes the lead, with students passively receiving information from AI-driven systems) and AI-supported learning (where AI enriches the learning experience, allowing students to collaborate with AI as a tool that aids their educational journey). On a foundational level, GAI tools materially empower students by offering real-time feedback, adaptive learning paths, and diverse resources, which extend their capabilities in educational contexts, as Liu et al. [34] suggest.

2.2.1. The dual impact of AI and the two types of empowerment

Particularly, recent studies reveal a dual impact of AI-provided feedback, a phenomenon Tong et al. [35] call the Janus Face of AI feedback. On the one hand, AI's deployment effect—where AI feedback demonstrably boosts performance—often exceeds the benefits of human feedback. On the other hand, the disclosure effect, where users are made aware that feedback is AI-generated, can provoke negative reactions, ultimately reducing performance. Despite these concerns, recent findings from the education sector—particularly in language instruction—highlight the positive reception of AI's deployment effect. For instance, Mahapatra [36] identified a significant improvement in students' academic writing skills, with many participants expressing overwhelmingly positive perceptions of ChatGPT's utility. Similarly, Polakova and Ivenz [37] observed that ChatGPT had a beneficial effect on students' writing development, with the majority recognizing it as an effective tool for improvement, which aligns with the findings of Gozali et al. [38]. However, broader studies from both academia and real-world settings indicate some challenges. For example, students tasked with correcting ChatGPT-generated answers performed significantly worse—by approximately 28%—compared to those who answered questions independently [39]. In math practice, students using ChatGPT scored 17% lower on subsequent tests than those who practiced without it, despite initially solving 48% more practice problems correctly [40]. Nevertheless, student usage of AI assistants continues to rise. AlGhamdi [1] observes that AI engagement often triggers emotional and psychological responses, with positive emotions, once activated, enhancing students' confidence and enthusiasm, which in turn encourages deeper engagement with their assignments.

These observations point to the focus of this research: beyond tangible support, GAI fosters psychological empowerment by encouraging higher-order thinking skills, including critical analysis, creative exploration, and ethical reasoning [15, 41]. This shift from AI-directed to AI-empowered paradigms represents a transition from passive reception to collaborative, self-guided interaction with AI. Wood and Moss [21] emphasize that reflective tasks within GAI-driven courses empower students to critically assess AI's role in their learning, promoting both technical proficiency and ethical mindfulness. Engaging in AI-supported co-creation in projects or assignments strengthens students' sense of agency, transforming them from passive consumers of AI-generated content to active participants in a cognitively enriching process.

2.2.2. Toward AI empowerment

The development and construction of AI psychological empowerment trace back to the foundational concept of psychological empowerment, first proposed by Spreitzer [7], which describes an individual's experienced state within their work role. Psychological empowerment is a motivational construct that comprises four key dimensions: meaning, competence, self-determination, and impact. Together, these dimensions shape an individual's overall

sense of empowerment within their role. For instance, meaning refers to the value an individual perceives in their tasks, competence reflects confidence in one's ability to perform well, self-determination captures the autonomy experienced in completing tasks, and impact involves the sense of influence over outcomes.

Drawing from this theoretical framework, psychological empowerment has evolved as a concept to capture the unique enhancements learners experience when engaging with AI tools in higher education [42]. Besides, the four dimensions of AI empowerment align closely with those in psychological empowerment and yet adapt to the specific requirements of AI-supported learning environments [43]: For instance, "meaning" in AI empowerment denotes the perceived relevance and significance of AI-driven insights to students' learning tasks, while "competence" reflects learners' confidence in leveraging AI tools to solve complex problems. "Self-determination" refers to the degree of control learners have over how they integrate AI into their studies, and "impact" captures the influence AI has on the students' academic outcomes.

AI empowerment brings distinctive characteristics compared to traditional psychological empowerment. Through real-time processing and data analysis, AI can provide students with advanced insights and decision-support capabilities, transforming empowerment from a solely internal psychological state to one augmented by external, technology-driven resources [44]. This unique blend creates a dynamic partnership between the learner and AI, enabling students to tackle more sophisticated tasks within shorter timeframes [45]. Unlike traditional psychological empowerment constructs that rely on individual cognitive appraisal, AI psychological empowerment is shaped by continuous, interactive learning between students and AI systems, allowing for an evolving and multifaceted empowerment experience.

AI psychological empowerment shares similarities with, yet differs significantly from, related AI constructs, such as AI collaboration, AI transformation, self-AI integration, and basic AI use/adoption. Each construct focuses on leveraging AI to enhance individual or organizational capacities but differs in scope and application. Unlike AI collaboration, which emphasizes the interactive nature and task division between humans and AI [46, 47], AI psychological empowerment centers on students' intrinsic motivation and autonomy, highlighting the personal sense of meaning, competence, self-determination, and impact fostered by AI support. Moreover, while AI transformation typically addresses organizational-level systemic changes driven by AI adoption [48], AI empowerment remains focused on the individual learner's experience, underscoring the personal empowerment felt through AI-assisted learning. Similarly, self-AI integration pertains to the extent to which learners may view AI as an extension of themselves, blending AI capabilities with their identity [49]. This concept differs from AI empowerment, as it involves learners internalizing AI as part of their self-concept, potentially forming close, relational bonds with AI systems. In contrast, AI empowerment does not entail the integration of AI into the self; rather, it emphasizes the motivational and autonomy-boosting effects AI provides to students' learning processes. Finally, while basic AI use or adoption considers the initial acceptance of AI tools [50][1], AI psychological empowerment expands on this, examining how students derive deeper psychological and motivational benefits from AI use, affecting both their learning outcomes and engagement in a higher education context.

2.2.3. Cultural nuances in perception

Prior literature has suggested cultural nuances in the perception of GAI empowerment effects. For instance, Yusuf et al. [26] examined how Hofstede's cultural dimensions—such as power distance, individualism versus collectivism, uncertainty avoidance, and long-term orientation—influence the perception and adoption of GAI in higher education. Their study revealed that cultures with high uncertainty avoidance are more likely to view students' use of GAI as academic dishonesty. Similarly, nations with a strong long-term orientation also tend to classify the use of GAI by students as cheating. These findings, together with Yilmaz and Yilmaz's [30] paper, suggest that cultural attitudes toward technology significantly shape perceptions of GAI's empowerment, with some cultures embracing it more readily than others.

In a different research stream, scholars have emphasized the need to leverage AI tools to foster long-term personal growth, adaptability, and resilience, particularly for both teachers and students facing cultural or linguistic challenges [53, 54]. Recent GAI tools provide immigrant students with opportunities to practice language skills in safe and controlled environments. These tools offer immediate feedback and are accessible at any time, facilitating continuous learning and linguistic improvement. Adaptive learning platforms utilize AI to tailor educational content to individual student needs, accommodating diverse learning styles and paces. This personalization is crucial for international students who may face unique academic challenges due to varying educational and cultural backgrounds [55, 56]. Thus, as Suliman et al. [57] call, GAI can be used to create authentic and contextualized narratives that appeal to the experiences of our students to improve linguistic diversity and inclusivity; in this regard, addressing the psychological empowerment needs (e.g., fostering a sense of competence, autonomy, and belonging among these students) of international students, as Xu et al. [58] suggest, is paramount, particularly given the cultural and linguistic challenges they often face in new academic environments.

In summary, AI psychological empowerment uniquely emphasizes the motivational and personal growth aspects of AI's impact on individuals. Unlike broader AI applications focused on collaboration or integration, this concept highlights how AI fosters intrinsic motivation, autonomy, and positive psychological experiences, offering a distinct lens for understanding how AI can enhance personal development and learning at an individual level.

3. Research Methodology

3.1. Sample

In total, we collected data from 171 students (122 domestic and 49 international). Note that the domestic group contains students from a Chinese public university's summer schools and the international group contains counterparts who are already international Chinese students whose base is also in Australia (details are in Table 1).

An independent samples *t*-test examined demographic differences between international and domestic students across age ($t(166) = -0.96$, $p = 0.34$), gender ($t(170) = 0.40$, $p = 0.69$), and education background ($t(128) = 0.67$, $p = 0.51$), indicating no significant demographic differences between the domestic and international groups in this study.

[1]Nonetheless, as in McElheran et al. [51] and Wong et al. [52], AI use in some research can be more broadly understood as the practical application of AI technologies within firms. AI use can vary in intensity and scope, from basic, exploratory use to more advanced and widespread integration across different aspects of the business.

Table 1
Sample summary

Category	Subclass	Count
Student Cohort	International	122
	Domestic	49
Age Range	18–24 years	82
	25–30 years	48
	Others/not disclosed	41
Gender Distribution	Female	77
	Male	93
	Other/not disclosed	1
Education Background	Bachelor's degree	91
	Master's degree	37
	Other/not disclosed	43

3.2. Procedure

The study comprised the following six sections:

1) Initial Task: Students were asked to voluntarily complete an additional question-answering (Q-A) style question online outside their regular coursework. A flat reimbursement was provided according to standard rates in their respective countries. To ensure standardization, the question was adapted from the GMAT writing section to prevent additional intrinsic motivation. During the online survey, students were encouraged to use their preferred AI assistant to help with their writing. They were informed that their responses would be scored, although these scores would not impact their course grades. Most students chose ChatGPT, which was accessible to them, and all participants acknowledged this information by signing an information sheet and consent form.
2) Introduction to Environment: Participants were introduced to the online Q-A environment, and a sample Q-A pair was provided to familiarize them with the format.
3) Familiarization Exercises: Participants completed exercises designed to help them become comfortable with the experimental setup.
4) Formal Tests: Participants proceeded with the main experimental tasks.
5) AI Psychological Empowerment, Material Empowerment (Efficiency Improvements), and Demographic Questions: Participants completed a questionnaire covering AI empowerment, material empowerment (efficiency improvements), and demographic details.
6) Follow-Up Session: In the following week, participants were invited to a second round of activities (see "After the Formal Study" section for details).

3.2.1. During the formal study

We asked the participants to answer the Q-A pair in an interactive environment developed using Qualtrics, and the participants were asked to use their most familiar devices. The question was presented in two versions: Chinese for the domestic group and English (the original form) for the international group. The question was the same one, and the back translation process was ensured by utilizing the methods proposed by Douglas and Craig [59], which used a *"Direct and Back Approach"* to ensure translation validity, which is generally a well-received translation method in social sciences [60].

After that, AI psychological empowerment and material empowerment questions were asked. In particular, the AI empowerment scale was referenced to Shi and Ma [8] as well as Shi [43], and the material empowerment scale was referenced to Koopmans et al. [61]. These items were measured using seven items on a 7-point Likert scale, as prescribed in the original literature.

Then, all the participants received a block of demographic questions. The demographic questions were referenced to previous work in Information Systems (IS) artifact design field. For instance, Adomavicius et al. [62] include demographic variables, such as age, gender, and education level (note that in this research, education level roughly equals the students' current education level). All participants could drop out of the study at any time, which we reiterated in the information sheet as they began the study. In addition, we did not allow participants to go back to a previous session to edit the writings that they had previously submitted to answer the questions.

3.2.2. After the formal study

In this study, a teacher and two tutors (i.e., supervisors) were tasked with evaluating the quality of the responses provided by participants. Additionally, in the week following their participation, each participant was asked to assess both their own response and that of a peer without knowing their rating from the supervisors. All evaluators were instructed to base their judgments on four key criteria:

1) Accuracy: This refers to the extent to which a response is credible, contains valid and reliable factual information and credible sources for references, and directly addresses the question at hand [63]. It also pertains to the question [63] and is as complete and objective as possible [64].
2) Helpfulness: A response should have value in use and be perceived as helpful and being polite [64].
3) Richness and informativeness: A response should provide many details and should be presented in a diversified manner and reflect diverse perspectives [65].
4) Readability and Presentation: A response should be understandable and clear, and the logic of the response should be coherent and easy to follow [66].

The range of the writing scores was from 0 to 5.

3.3. Evaluations

The correlation table, including mean and standard deviation values, is presented in Table 2. During the calculation of task duration, 24 cases were excluded using the interquartile range (IQR) method, defining outliers as values below 1.5 times the IQR below the first quartile or above 1.5 times the IQR above the third quartile. These high values likely resulted from participants forgetting to log out of the online study session after enrolling and completing the study.

To assess internal consistency, Cronbach's alpha was calculated for both the AI empowerment and task performance constructs. The AI empowerment factor demonstrated excellent reliability (α = 0.96), while task performance showed good reliability (α = 0.84), indicating both constructs were measured reliably [67].

Mean scores for supervisor-rating, peer-rating, and self-rating, as well as participants' self-reported levels of AI psychological empowerment and material empowerment (i.e., task performance), were compared between international and domestic groups (see Table 3 and Figure 1). A notable discrepancy was observed in writing scores: although supervisor ratings showed no

Table 2
Mean, standard deviation (SD),and correlation for the core variables

Factor	Mean	SD	Task duration	Age	Gender	Level of education	Supervisor-rating	Peer-rating	Self-rating	AI empowerment
Task duration	656.16	338.52								
Age	2.18	0.77	0.08							
Gender	1.55	0.50	0.12	–0.14						
Level of education	2.29	0.46	0.05	0.14	–0.04					
Supervisor-rating	3.86	0.89	0.07	0.01	–0.01	–0.01				
Writing score										
Peer-rating	3.20	1.03	0.01	–0.12	–0.02	–0.02	0.16			
self-rating	4.36	0.96	–0.03	0.06	0.00	–0.08	0.56	0.23		
AI empowerment	4.21	1.20	0.03	0.00	–0.01	–0.03	0.38	0.24	0.29	
Task performance	5.77	1.22	0.00	0.06	–0.08	–0.07	0.26	–0.02	0.25	0.59

Table 3
ANOVA table for core measurements

	International		Domestic			
Measure	M	SD	M	SD	F	P-value
Supervisor-rating	3.67	0.95	3.93	0.86	3.13	0.078
Peer-rating	3.53	1.02	3.07	1.01	7.36	0.007
Self-rating	3.71	1.22	4.61	0.69	37.17	<0.001
AI empowerment	4.9	1.49	3.93	0.94	25.84	<0.001
Task performance	5.73	1.1	5.78	1.27	0.04	0.832

significant differences between groups, international students consistently rated their own writing performance higher than domestic students, suggesting a divergence between self-perceived and externally assessed performance across groups. Overall, participants reported high levels of material empowerment (i.e., task performance) when collaborating with the AI robot. International students tended to rate this type of empowerment slightly higher than their domestic counterparts in China, although the difference was not statistically significant. By contrast, Chinese international students in Australia reported a greater sense of psychological empowerment in their interactions with the AI robot compared to domestic students, indicating potentially significant variations in perceived impact and confidence fostered by the AI system in a psychological, rather than purely material, manner.

3.4. Post hoc analysis

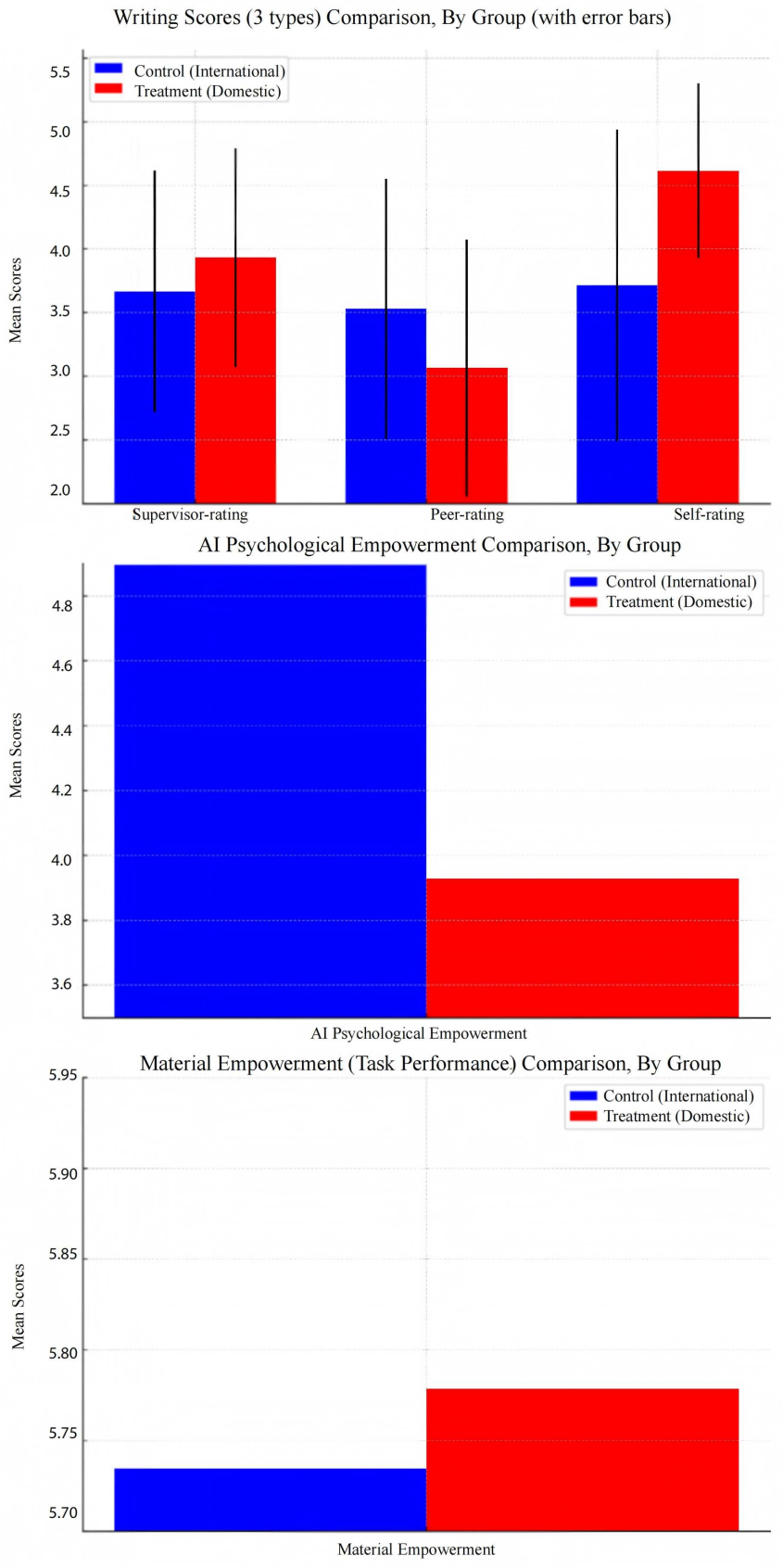
We conducted a multivariate analysis of variance (MANOVA) to validate the previous findings and minimize the risk of Type I error. The results generally indicate no significant differences, except that task duration appears to have a significant effect on supervisor-rated writing scores ($t(142) = 35.92$, $p = 0.01$). This finding is plausible, as longer task durations likely reflect more thorough curation and editing, which teachers may value in student submissions. Interestingly, peer and self-ratings did not show the same effect. This discrepancy could be attributed to differences in the mindsets of grading assignments versus evaluating regular writing, with supervisors (teachers and tutors) perhaps placing greater emphasis on the quality of refinement than peers or the students themselves.

4. Conclusion and Recommendations

The adoption of AI-assisted tools in writing is one of the most prominent applications within the current surge of large language model-enabled AI technologies [36]. Utilizing both a newly developed scale for measuring AI psychological empowerment [43] and a validated efficacy scale for material empowerment [61], our research demonstrates that while material empowerment through AI exists, it is notably differently impactful compared to psychological empowerment when learners engage with their preferred AI assistant for writing. These findings confirm measurable variations in how the two groups perceive their performance when engaging with AI tools. Thus, our research demonstrates that while material empowerment through AI exists, it is notably less impactful compared to psychological empowerment when learners engage with their preferred AI assistant for writing. Specifically, international students reported significantly higher levels of psychological empowerment compared to domestic students, reflecting the unique value AI tools offer in helping these students navigate linguistic and cultural barriers. This difference underscores that the psychological support that AI provides is distinct from the tangible outputs of material empowerment.

The mean scores for material empowerment were relatively similar across the two groups—international and domestic students. This minimal difference suggests that while AI tools provide task efficiency and accuracy, these material benefits remain largely consistent regardless of students' contexts. More importantly, we believe this finding highlights not only a divergence but also a potential misperception regarding international students. For instance, international students may derive a sense of inclusion and autonomy from AI tools, leveraging these benefits to mitigate challenges associated with

Figure 1
Comparison among writing scores, AI psychological empowerment, and material empowerment



studying in a foreign academic environment. However, the material empowerment effect is smaller than it appears to be.

This discrepancy may lead to overreliance and blind receptivity, as Tully et al. [68] and Deng et al. [15] suggested. AI tools can create a false sense of inclusion and autonomy for people, leading them to believe they are more empowered than they actually are. This overestimation of their capabilities may result in increased reliance on these tools without corresponding improvements in academic performance or independent learning skills. While AI tools provide a sense of psychological support and autonomy, their actual material empowerment effect may be limited, leaving students vulnerable to the illusion of empowerment that does not translate into tangible academic gains.

This divergence may also point to an important shift in modern education: the rising dependence—and, in some cases, overreliance—on AI tools in academic settings. This finding aligns with concerns raised by prior researchers who warn that overconfidence induced by AI can hinder critical skill development and lead to stagnation in actual learning outcomes [45, 69]. Practically speaking, this shift underscores the need for educators to balance the advantages of AI tools with strategies that promote independent critical thinking and skill acquisition. While AI can serve as a valuable companion in learning, its role should complement—not replace—traditional pedagogical approaches. This entails fostering environments where students can engage meaningfully with both AI and human feedback, ensuring that psychological empowerment translates into real-world competencies. Moreover, these findings call for a reevaluation of how AI is integrated into educational systems. As the reliance on AI grows, so too must our commitment to leveraging its strengths while addressing its limitations. This means designing AI-assisted learning strategies that not only enhance productivity but also support holistic development, ensuring that students are equipped to tackle complex challenges in academic and professional contexts.

Our research also offers insights for both practitioners and scholars into the unique aspects of AI-driven psychological empowerment. Tong et al. [35] have identified the Janus Face of AI feedback: on the one hand, the deployment effect—where AI feedback measurably improves performance—often outperforms traditional human feedback. On the other hand, the disclosure effect, wherein users become aware that the feedback is AI-generated, can trigger negative perceptions that ultimately hinder performance. Furthermore, despite reports of AI leading to suboptimal outcomes [39, 70], students continue to depend on it, often developing a sense of overreliance.

We, along with previous research, recognize that language barriers and cultural differences can hinder international students' confidence in academic contexts [71]. AI tools, however, can support these students by enhancing language proficiency, helping them understand cultural nuances, and facilitating adaptation to academic norms in countries like Australia. This rationale underlies the quasi-experimental design of this study, which suggests that AI-driven psychological empowerment can foster students' confidence, reduce anxiety, and enable fuller participation in academic activities. Importantly, AI empowerment has applications beyond international students, potentially benefiting other populations—such as immigrant workers facing invisible barriers—and extending to tasks beyond academic writing. These findings suggest that future research should carefully consider this "immigration" factor, particularly as individuals (especially students) who choose to use AI tools like ChatGPT may systematically differ from those who do not. Such individuals might be more prone to overreliance on GAI tools, potentially decreasing their effort and skewing results. This factor, along with others identified in Deng et al. [15]'s work, is crucial for avoiding biased conclusions about the impact of ChatGPT and other AI tools.

AI's provision of instant feedback can work as an effective educational nudge [2] and is especially beneficial for students who may feel hesitant to seek assistance in person due to cultural or language barriers [72]. This real-time feedback offers clarity on challenging topics and reinforces a sense of control over the learning process, thus directly enhancing psychological empowerment. Finding the optimal balance of AI feedback is crucial; as Shi and Deng [73] suggest, effective feedback must consider multiple factors in human-computer interaction, such as AI anthropomorphism and perceived efficacy.

Moreover, older research has underscored that AI can create a private, judgment-free learning environment [74]. With recent advancements, AI has become an even more robust, accessible, and economically viable tool, providing a safe space where students can build self-confidence and pursue learning without fear of judgment. This environment helps alleviate psychological stress related to academic challenges, making AI a supportive companion in learning. The resulting reduction in feelings of isolation is particularly beneficial for students studying abroad, as it helps them build resilience to manage stress and adapt to new environments. Future studies should explore these dynamics further through NeuroIS-based research, as Knierim and del Puppo [75] outlined, though substantial work remains in this domain.

One limitation of this study is the potential influence of contextual differences between the learning environments in China and Australia, despite our efforts to minimize them. For instance, the perception of AI tools and their empowerment effects can vary significantly across cultures, influencing how international students engage with these technologies. Some may view AI as a valuable resource, while others may be more skeptical, as Yusuf et al. [26] indicated, due to cultural nuances. Our research also joins this line of debates and calls for further cross-cultural research in this regard. Conducting similar studies in non-English-speaking countries, such as Brazil, France, or Japan, could provide valuable insights into how linguistic and cultural factors shape AI's empowerment effects. Moreover, testing AI tools that are tailored to specific languages or regions (e.g., Baidu's ERNIE Bot for Chinese or GPT models fine-tuned for Spanish or Arabic) could add depth to our current findings.

Ethical Statement

This study does not contain any studies with human or animal subjects performed by any of the authors.

Conflicts of Interest

The authors declare that they have no conflicts of interest to this work.

Data Availability Statement

The data that support this work are available upon reasonable request to the corresponding author.

Author Contribution Statement

Yingnan Shi: Conceptualization, Methodology, Formal analysis, Investigation, Writing – original draft, Writing – review &

editing, Visualization. **Astrid Tong Xu:** Validation, Data curation, Writing – review & editing, Visualization.

References

[1] AlGhamdi, R. (2024). Exploring the impact of ChatGPT-generated feedback on technical writing skills of computing students: A blinded study. *Education and Information Technologies*, *29*(14), 18901–18926. https://doi.org/10.1007/s10639-024-12594-2

[2] Shi, Y., Haller, A., Reeson, A., Li, X., & Li, C. (2025). Investigating the effects of nudges to promote knowledge-sharing behaviours on MOOC forums: A mixed method design. *Behaviour & Information Technology*, *44*(2), 289–314. https://doi.org/10.1080/0144929X.2024.2316287

[3] Hutson, J., Plate, D., & Berry, K. (2024). Embracing AI in English composition: Insights and innovations in hybrid pedagogical practices. *International Journal of Changes in Education*, *1*(1), 19–31. https://doi.org/10.47852/bonviewIJCE42022290

[4] Ofosu-Ampong, K., Acheampong, B., Kevor, M.-O., & Amankwah-Sarfo, F. (2023). Acceptance of Artificial Intelligence (ChatGPT) in education: Trust, innovativeness and psychological need of students. *Journal of Information & Knowledge Management*, *13*(4), 37–47. https://doi.org/10.7176/IKM/13-4-03

[5] Dempere, J., Modugu, K., Hesham, A., & Ramasamy, L. K. (2023). The impact of ChatGPT on higher education. *Frontiers in Education*, *8*, 1206936. https://doi.org/10.3389/feduc.2023.1206936

[6] Wu, X., Duan, R., & Ni, J. (2024). Unveiling security, privacy, and ethical concerns of ChatGPT. *Journal of Information and Intelligence*, *2*(2), 102–115. https://doi.org/10.1016/j.jiixd.2023.10.007

[7] Spreitzer, G. M. (1995). Psychological empowerment in the workplace: Dimensions, measurement, and validation. *Academy of management Journal*, *38*(5), 1442–1465. https://doi.org/10.5465/256865

[8] Shi, Y., & Ma, C. (2025). AI empowerment of Asian-Australian migrant workers: Progress, potentials, and patterns. *Australasian Journal of Information Systems*, *29*(1), 1–45. https://doi.org/10.3127/ajis.v29.5189

[9] Xie, G., & Wang, X. (2024). Exploring the impact of AI enhancement on the sports app community: Analyzing human-computer interaction and social factors using a hybrid SEM-ANN approach. *International Journal of Human–Computer Interaction*, 1–22. Advance online publication. https://doi.org/10.1080/10447318.2024.2413306

[10] Liang, J., Wang, L., Luo, J., Yan, Y., & Fan, C. (2023). The relationship between student interaction with generative artificial intelligence and learning achievement: Serial mediating roles of self-efficacy and cognitive engagement. *Frontiers in Psychology*, *14*, 1285392. https://doi.org/10.3389/fpsyg.2023.1285392

[11] Warren, L., Reilly, D., Herdan, A., & Lin, Y. (2021). Self-efficacy, performance and the role of blended learning. *Journal of Applied Research in Higher Education*, *13*(1), 98–111. https://doi.org/10.1108/JARHE-08-2019-0210

[12] Cash, T. N., & Oppenheimer, D. M. (2024). Generative Chatbots ain't experts: Exploring cognitive and metacognitive limitations that hinder expertise in generative Chatbots. *Journal of Applied Research in Memory and Cognition*, *13*(4), 490–494. https://doi.org/10.1037/mac0000202

[13] Zhang, L., & Xu, J. (2025). The paradox of self-efficacy and technological dependence: Unraveling generative AI's impact on university students' task completion. *The Internet and Higher Education*, *65*, 100978. https://doi.org/10.1016/j.iheduc.2024.100978

[14] Li, W., Zhao, S., Lu, Z., Yu, W., & Li, X. (2019). Student migration: Evidence from Chinese students in the US and China. *International Migration*, *57*(3), 334–353. https://doi.org/10.1111/imig.12466

[15] Deng, R., Jiang, M., Yu, X., Lu, Y., & Liu, S. (2024). Does ChatGPT enhance student learning?. A systematic review and meta-analysis of experimental studies. *Computers & Education*, *227*, 105224. https://doi.org/10.1016/j.compedu.2024.105224

[16] Al-Qaysi, N., Al-Emran, M., Al-Sharafi, M. A., Iranmanesh, M., Ahmad, A., & Mahmoud, M. A. (2024). Determinants of ChatGPT use and its impact on learning performance: An integrated model of BRT and TPB. *International Journal of Human–Computer Interaction*, *41*(9), 5462–5474. https://doi.org/10.1080/10447318.2024.2361210

[17] Boubker, O. (2024). From chatting to self-educating: Can AI tools boost student learning outcomes? *Expert Systems with Applications*, *238*, 121820. https://doi.org/10.1016/j.eswa.2023.121820

[18] Dahri, N. A., Yahaya, N., Al-Rahmi, W. M., Almogren, A. S., & Vighio, M. S. (2024). Investigating factors affecting teachers' training through mobile learning: Task technology fit perspective. *Education and Information Technologies*, *29*(12), 14553–14589. https://doi.org/10.1007/s10639-023-12434-9

[19] Crawford, J., Allen, K. A., Pani, B., & Cowling, M. (2024). When artificial intelligence substitutes humans in higher education: The cost of loneliness, student success, and retention. *Studies in Higher Education*, *49*(5), 883–897. https://doi.org/10.1080/03075079.2024.2326956

[20] Chen, J. J., & Lin, J. C. (2024). Artificial intelligence as a double-edged sword: Wielding the POWER principles to maximize its positive effects and minimize its negative effects. *Contemporary Issues in Early Childhood*, *25*(1), 146–153. https://doi.org/10.1177/14639491231169813

[21] Wood, D., & Moss, S. H. (2024). Evaluating the impact of students' generative AI use in educational contexts. *Journal of Research in Innovative Teaching & Learning*, *17*(2), 152–167. https://doi.org/10.1108/JRIT-06-2024-0151

[22] Barrett, A., & Pack, A. (2023). Not quite eye to AI: Student and teacher perspectives on the use of generative artificial intelligence in the writing process. *International Journal of Educational Technology in Higher Education*, *20*(1), 59. https://doi.org/10.1186/s41239-023-00427-0

[23] Yan, D. (2023). Impact of ChatGPT on learners in a L2 writing practicum: An exploratory investigation. *Education and Information Technologies*, *28*(11), 13943–13967. https://doi.org/10.1007/s10639-023-11742-4

[24] Chiarello, F., Giordano, V., Spada, I., Barandoni, S., & Fantoni, G. (2024). Future applications of generative large language models: A data-driven case study on ChatGPT. *Technovation*, *133*, 103002. https://doi.org/10.1016/j.technovation.2024.103002

[25] Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., ... & Williams, M. D. (2021). Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and

policy. *International Journal of Information Management*, *57*, 101994. https://doi.org/10.1016/j.ijinfomgt.2019.08.002

[26] Yusuf, A., Pervin, N., & Román-González, M. (2024). Generative AI and the future of higher education: A threat to academic integrity or reformation? Evidence from multicultural perspectives. *International Journal of Educational Technology in Higher Education*, *21*(1), 21. https://doi.org/10.1186/s41239-024-00453-6

[27] Hamerman, E. J., Aggarwal, A., & Martins, C. (2025). An investigation of generative AI in the classroom and its implications for university policy. *Quality Assurance in Education*, *33*(2), 253–266. https://doi.org/10.1108/QAE-08-2024-0149

[28] Ofem, U. J., Owan, V. J., Iyam, M. A., Udeh, M. I., Anake, P. M., & Ovat, S. V. (2025). Students' perceptions, attitudes and utilisation of ChatGPT for academic dishonesty: Multigroup analyses via PLS–SEM. *Education and Information Technologies*, *30*(1), 159–187. https://doi.org/10.1007/s10639-024-12850-5

[29] Liang, Y. (2023). Balancing: The effects of AI tools in educational context. *Frontiers in Humanities and Social Sciences*, *3*(8), 7–10.

[30] Yilmaz, R., & Yilmaz, F. G. K. (2023). The effect of generative artificial intelligence (AI)-based tool use on students' computational thinking skills, programming self-efficacy and motivation. *Computers and Education: Artificial Intelligence*, *4*, 100147. https://doi.org/10.1016/j.caeai.2023.100147

[31] Volante, L., DeLuca, C., & Klinger, D. A. (2023). Leveraging AI to enhance learning. *Phi Delta Kappan*, *105*(1), 40–45. https://doi.org/10.1177/00317217231197475

[32] Wang, S. (2023). *'More like an artificial stupidity': AI runs up against its limits in the humanities*. Retrieved from: https://www.dailycal.org/news/campus/more-like-an-artificial-stupidity-ai-runs-up-against-its-limits-in-the-humanities/article_ce960694-8179-11ef-86cb-2ffb97befb53.html

[33] Ouyang, F., & Jiao, P. (2021). Artificial intelligence in education: The three paradigms. *Computers and Education: Artificial Intelligence*, *2*, 100020. https://doi.org/10.1016/j.caeai.2021.100020

[34] Liu, M., Ren, Y., Nyagoga, L. M., Stonier, F., Wu, Z., & Yu, L. (2023). Future of education in the era of generative artificial intelligence: Consensus among Chinese scholars on applications of ChatGPT in schools. *Future in Educational Research*, *1*(1), 72–101. https://doi.org/10.1002/fer3.10

[35] Tong, S., Jia, N., Luo, X., & Fang, Z. (2021). The Janus face of artificial intelligence feedback: Deployment versus disclosure effects on employee performance. *Strategic Management Journal*, *42*(9), 1600–1631. https://doi.org/10.1002/smj.3322

[36] Mahapatra, S. (2024). Impact of ChatGPT on ESL students' academic writing skills: A mixed methods intervention study. *Smart Learning Environments*, *11*(1), 9. https://doi.org/10.1186/s40561-024-00295-9

[37] Polakova, P., & Ivenz, P. (2024). The impact of ChatGPT feedback on the development of EFL students' writing skills. *Cogent Education*, *11*(1), 2410101. https://doi.org/10.1080/2331186X.2024.2410101

[38] Gozali, I., Wijaya, A. R. T., Lie, A., Cahyono, B. Y., & Suryati, N. (2024). ChatGPT as an automated writing evaluation (AWE) tool: Feedback literacy development and AWE tools' integration framework. *JALT CALL Journal*, *20*(1), n1.

[39] Hill, B. (2023). Taking the help or going alone: ChatGPT and class assignments. *SSRN preprint: 10.2139/ssrn.4465833*

[40] Barshay, J. (2024). *Kids who use ChatGPT as a study assistant do worse on tests*. Retrieved from: https://hechingerreport.org/kids-chatgpt-worse-on-tests/

[41] Ameen, L. T., Yousif, M. R., Alnoori, N. A. J., & Majeed, B. H. (2024). The impact of artificial intelligence on computational thinking in education at university. *International Journal of Engineering Pedagogy*, *(iJEP), 14*(5), 192–203. https://doi.org/10.3991/ijep.v14i5.49995

[42] Feiz, D., Dehghani Soltani, M., & Farsizadeh, H. (2019). The effect of knowledge sharing on the psychological empowerment in higher education mediated by organizational memory. *Studies in Higher Education*, *44*(1), 3–19. https://doi.org/10.1080/03075079.2017.1328595

[43] Shi, Y. (2024). Artificial Intelligence psychological empowerment among Asian Australian immigrant workers: Navigating marginalization and harnessing Artificial Intelligence's power for enhanced workplace agency. In *Proceedings of the 2024 8th International Conference on Computer Science and Artificial Intelligence*, 573–579. https://doi.org/10.1145/3709026.3709100

[44] Chen, L., Hsieh, J. P.-A., & Rai, A. (2022). How does intelligent system knowledge empowerment yield payoffs? Uncovering the adaptation mechanisms and contingency role of work experience. *Information Systems Research*, *33*(3), 1042–1071. https://doi.org/10.1287/isre.2021.1097

[45] Sajja, R., Sermet, Y., Cikmaz, M., Cwiertny, D., & Demir, I. (2024). Artificial intelligence-enabled intelligent assistant for personalized and adaptive learning in higher education. *Information*, *15*(10), 596. https://doi.org/10.3390/info15100596

[46] Davenport, T. H., & Miller, S. M. (2022). *Working with AI: Real stories of human-machine collaboration*. USA: MIT Press.

[47] Sowa, K., Przegalinska, A., & Ciechanowski, L. (2021). Cobots in knowledge work: Human–AI collaboration in managerial professions. *Journal of Business Research*, *125*, 135–142. https://doi.org/10.1016/j.jbusres.2020.11.038

[48] Taherizadeh, A., & Beaudry, C. (2023). An emergent grounded theory of AI-driven digital transformation: Canadian SMEs' perspectives. *Industry and Innovation*, *30*(9), 1244–1273. https://doi.org/10.1080/13662716.2023.2242285

[49] Alabed, A., Javornik, A., & Gregory-Smith, D. (2022). AI anthropomorphism and its effect on users' self-congruence and self–AI integration: A theoretical framework and research agenda. *Technological Forecasting and Social Change*, *182*, 121786. https://doi.org/10.1016/j.techfore.2022.121786

[50] Venkatesh, V. (2022). Adoption and use of AI tools: A research agenda grounded in UTAUT. *Annals of Operations Research*, *308*(1), 641–652. https://doi.org/10.1007/s10479-020-03918-9

[51] McElheran, K., Li, J. F., Brynjolfsson, E., Kroff, Z., Dinlersoz, E., Foster, L., & Zolas, N. (2024). AI adoption in America: Who, what, and where. *Journal of Economics & Management Strategy*, *33*(2), 375–415. https://doi.org/10.1111/jems.12576

[52] Wong, L.-W., Tan, G. W.-H., Ooi, K.-B., & Dwivedi, Y. (2024). The role of institutional and self in the formation of trust in artificial intelligence technologies. *Internet Research*, *34*(2), 343–370. https://doi.org/10.1108/INTR-07-2021-0446

[53] Wang, Y., Derakhshan, A., & Rahimpour, H. (2024). Developing resilience among Chinese and Iranian EFL teachers: A multi-dimensional cross-cultural study. *Journal of Multilingual and Multicultural Development*, *45*(6), 2111–2128. https://doi.org/10.1080/01434632.2022.2042540

[54] Viberg, O., Kizilcec, R. F., Wise, A. F., Jivet, I., & Nixon, N. (2024). Advancing equity and inclusion in educational

practices with AI-powered educational decision support systems (AI-EDSS). *British Journal of Educational Technology*, *55*(5), 1974–1981. https://doi.org/10.1111/bjet.13507

[55] Baskara, F. R. (2023). ChatGPT-assisted English language learning: Theoretical implications for global mobility and cross-cultural communication. In *International Conference on Language and Language Teaching*, 105–120.

[56] Mohebi, L. (2024). Empowering learners with ChatGPT: Insights from a systematic literature exploration. *Discover Education*, *3*(1), 36. https://doi.org/10.1007/s44217-024-00120-y

[57] Suliman, Z., Mohale, N. E., Maphoto, K. B., & Sevnarayan, K. (2024). The interconnectedness between Ubuntu principles and generative artificial intelligence in distance higher education institutions. *Discover Education*, *3*(1), 188. https://doi.org/10.1007/s44217-024-00289-2

[58] Xu, S., Chen, P., & Zhang, G. (2024). Exploring the impact of the use of ChatGPT on foreign language self-efficacy among Chinese students studying abroad: The mediating role of foreign language enjoyment. *Heliyon*, *10*(21), e39845. https://doi.org/10.1016/j.heliyon.2024.e39845

[59] Douglas, S. P., & Craig, C. S. (2007). Collaborative and iterative translation: An alternative approach to back translation. *Journal of International Marketing*, *15*(1), 30–43. https://doi.org/10.1509/jimk.15.1.030

[60] Valdez, D., Montenegro, M. S., Crawford, B. L., Turner, R. C., Lo, W.-J., & Jozkowski, K. N. (2021). Translation frameworks and questionnaire design approaches as a component of health research and practice: A discussion and taxonomy of popular translation frameworks and questionnaire design approaches. *Social Science & Medicine*, *278*, 113931. https://doi.org/10.1016/j.socscimed.2021.113931

[61] Koopmans, L., Bernaards, C., Hildebrandt, V., Van Buuren, S., Van der Beek, A. J., & De Vet, H. C. (2012). Development of an individual work performance questionnaire. *International Journal of Productivity and Performance Management*, *62*(1), 6–28. https://doi.org/10.1108/17410401311285273

[62] Adomavicius, G., Bockstedt, J., Curley, S., & Zhang, J. (2019). Reducing recommender systems biases: An investigation of rating display designs. *MIS Quarterly*, *43*(4), 1321–1341.

[63] Jeon, G. Y., Kim, Y. M., & Chen, Y. (2010). Re-examining price as a predictor of answer quality in an online Q&A site. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, 325–328. https://doi.org/10.1145/1753326.1753375

[64] Shah, C., & Pomerantz, J. (2010). Evaluating and predicting answer quality in community QA. In *Proceedings of the 33rd International ACM SIGIR Conference on Research and Development in Information Retrieval*, 411–418. https://doi.org/10.1145/1835449.1835518

[65] Jeon, J., Croft, W. B., Lee, J. H., & Park, S. (2006). A framework to predict the quality of answers with non-textual features. In *Proceedings of the 29th Annual International ACM SIGIR Conference on Research and Development in Information Retrieval*, 228–235. https://doi.org/10.1145/1148170.1148212

[66] Ghose, A., & Ipeirotis, P. G. (2010). Estimating the helpfulness and economic impact of product reviews: Mining text and reviewer characteristics. *IEEE Transactions on Knowledge and Data Engineering*, *23*(10), 1498–1512. https://doi.org/10.1109/TKDE.2010.188

[67] Taber, K. S. (2018). The use of Cronbach's alpha when developing and reporting research instruments in science education. *Research in Science Education*, *48*, 1273–1296. https://doi.org/10.1007/s11165-016-9602-2

[68] Tully, S., Longoni, C., & Appel, G. (2025). Lower artificial intelligence literacy predicts greater AI receptivity. *Journal of Marketing*. https://doi.org/10.1177/00222429251314491

[69] Al-Zahrani, A. M. (2024). Unveiling the shadows: Beyond the hype of AI in education. *Heliyon*, *10*(9), e30696. https://doi.org/10.1016/j.heliyon.2024.e30696

[70] Rieck, B. G. (2023). *Most AI interactions are like junk food*. Retrieved from: https://bastian.rieck.me/blog/2023/junk_food/

[71] Zhao, J., Chapman, E., & O'Neill, M. (2022). Mental health risks for Chinese international students in Australia: Enduring problems, possible solutions. *Education Research and Perspectives*, *49*, 1–28.

[72] Peláez-Sánchez, I. C., Velarde-Camaqui, D., & Glasserman-Morales, L. D. (2024). The impact of large language models on higher education: exploring the connection between AI and Education 4.0. *Frontiers in Education*, *9*, 1392091. https://doi.org/10.3389/feduc.2024.1392091

[73] Shi, Y., & Deng, B. (2024). Finding the sweet spot: Exploring the optimal communication delay for AI feedback tools. *Information Processing & Management*, *61*(2), 103572. https://doi.org/10.1016/j.ipm.2023.103572

[74] Hietala, P., & Niemirepo, T. (1998). The competence of learning companion agents. *International Journal of Artificial Intelligence in Education*, *9*, 178–192.

[75] Knierim, M. T., & del Puppo, L. (2023). Do generative AI tools foster positive experiences in knowledge work? A NeuroIS research proposal. In F. D. Davis, R. Riedl, J. V. Brock, P. M. Léger, A. B. Randolph, & G. R. Müller-Putz (Eds.), *NeuroIS retreat* (pp. 57–65). Springer. https://doi.org/10.1007/978-3-031-58396-4_6

How to Cite: Shi, Y., & Xu, A. T. (2025). Beyond Performance: AI Psychological Empowerment in Cross-Cultural Education. *International Journal of Changes in Education*. https://doi.org/10.47852/bonviewIJCE52024756

Appendix

Block 1

I have read and understood the Information Sheet you have given me about the research project, and I have had any questions and concerns about the project addressed to my satisfaction.

(Please fill in the input box below if any questions)

)

I agree to participate in the project. YES □ NO □

I agree to be identified in the following way within research outputs:

Full name YES □ NO □
Pseudonym YES □ NO □
No attribution YES □ NO □

Signature:. . . . . .

Date:. . . . . .

Did the exercises help you feel comfortable with the experimental setup?

- Agree
- Disagree

Did you complete the formal tasks using your most familiar device?

- Yes
- No

Was the language of the question (Chinese/English) appropriate and clear to you?

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

Were you able to understand the question and provide an answer effectively?

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

Did you use an AI assistant to help with your writing during the Q-A task?

- Yes
- No

If yes, which AI assistant did you use?

- ChatGPT
- Other (please specify):

Block 2

Topics: Rent, housing, city, dormitory, students, school administration. **Question:** Should housing officials reduce the number of available housing units of dormitories on campus when occupancy rates are low? **Question details:** I am a senior resident and one of my university halls. Because occupancy rates for campus housing fell during the last academic year, so did housing revenues. To solve the problem, campus housing officials should reduce the number of available housing units, thereby increasing the occupancy rates. Also, to keep students from

choosing to live on-campus, housing officials should encourage students who are now living off-campus back to on-campus (e.g., rent discount), thereby increasing demand.

The AI empowerment items are listed below (Rating: 7-point Likert scale, ranging from 1 ("Strongly Disagree") to 7 ("Strongly Agree")):

- Meaning1. The knowledge provided by the AI system holds personal significance for me.
- Meaning2. The information delivered by the AI system is crucial for me when I do human–AI collaboration activities at job.
- Meaning3. I find the knowledge shared by the AI system to be highly meaningful for my work.
- Competence1. The AI system's knowledge enhances my confidence in conducting work.
- Competence2. By using the knowledge from the AI system, I feel more self-assured in my ability.
- Competence3. The knowledge delivered by the AI system helps me develop essential skills for effectively doing my job.
- Self-Determination1. The AI system empowers me to independently choose how I approach my work.
- Self-Determination2. I have significant autonomy in determining the methodologies and approaches to do my work, thanks to the AI system.
- Self-Determination3. The AI system provides me with considerable freedom and independence in conducting my work.
- Impact1. The knowledge delivered by the AI system has a substantial impact on understanding the dynamics of my work.
- Impact2. Through AI system, I gain considerable control over analyzing and interpreting data related to my work.
- Impact3. The knowledge provided by the AI system significantly influences the way I perceive and evaluate the impact of my work.

The material empowerment items were listed as below (Rating: 7-point Likert scale, ranging from 1 ("Never") to 7 ("Always")):

- POW (Planning and Organizing Work) I was able to perform my work well with minimal time and effort.
- TMWE (Time Management and Working Efficiency) I managed to plan my work so that it was done on time.

Block 3

What is your biological sex?

- Male
- Female
- Other

What is your age?

- (18, 25)
- (25, 30)
- (30, ∞)

What is your education background?

- Bachelor's degree
- Master's degree
- Other/not disclosed