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'A double-edged tool': A psychological needs perspective of generative AI and postgraduate international students' engagement in UK higher education

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Abstract

The integration of generative artificial intelligence (generative AI) in higher education is reshaping student engagement, yet its impact on postgraduate international students remains underexplored. This study examines how generative AI shapes postgraduate international students' engagement through a psychological needs perspective. Drawing on qualitative interviews with 27 participants, this research explores how generative AI facilitates autonomy, competence and relatedness, shaping engagement across behavioural, cognitive, emotional, social and agentic dimensions. The findings, divided into three main themes—'navigating autonomy and adaptation', 'augmented competence and AI-Halo effect' and 'fostering relatedness and emotional resilience'—reveal that generative AI enhances self-directed learning, academic confidence and inclusivity, particularly by bridging linguistic and cultural barriers. However, challenges such as over-reliance and ethical uncertainties underscore the need for institutional and external support mechanisms to balance AI-driven engagement. Ultimately, this study advances the digital technology and student engagement literature by exploring the intersection of technology and education and proposes a

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psychological needs framework of generative AI that offers critical insights into its evolving role in higher education.

KEYWORDS

generative AI, higher education, postgraduate international students, psychological needs, self-determination theory, student engagement

Key insights

What is the main issue that the paper addresses?

This paper examines how generative AI shapes the engagement of Black and Asian postgraduate international students in UK higher education, focusing on how AI influences their psychological needs (autonomy, competence and relatedness) amid the cultural, linguistic and academic challenges they face.

What are the main insights that the paper provides?

The study reveals that generative AI both supports and complicates student engagement, given that it enhances autonomy, strengthens academic competence and fosters emotional resilience, yet may also reinforce isolation and over-reliance. The proposed Psychological Needs Framework demonstrates how AI intersects with self-determination theory to shape multidimensional student engagement.

INTRODUCTION

Generative AI is transforming higher education, with over 1200 UK students surveyed revealing that more than half use it for academic assessments (HEPI, 2024). The technology employs deep learning models to produce content that closely mimics human expression and existing datasets when presented with complex and varied prompts (Chan & Hu, 2023; Weng, 2023). Research in higher education has shown that students utilise generative AI technology for various purposes, including but not limited to generating ideas and task outlines and assisting research and language editing (Essien et al., 2024). However, its adoption raises ethical concerns, including plagiarism, academic integrity and the potential decline in critical thinking and creativity (Johnston et al., 2024; Kramm & McKenna, 2023; Lim et al., 2023).

Amidst the debate in the academic community, research has shown that generative AI has the potential to enhance student engagement and motivation by providing personalised learning support, tailored feedback and interactive learning experiences (Chiu, 2024a; Yilmaz & Yilmaz, 2023). Student engagement, a key predictor of academic success, is defined as a student's active involvement, commitment and dedication to learning activities (Wilson et al., 2019), which is essential for achieving learning outcomes and fostering knowledge acquisition (Kahu, 2013). However, what remains unclear and forms the core problem this study aims to address is how generative AI reshapes the everyday learning experience

of postgraduate international students, whose engagement is already precarious due to cultural, linguistic and structural challenges (Igwe et al., 2020; Zhao & Xue, 2023). Engagement is the focus because it is one of the strongest behavioural indicators of academic success (Reeve et al., 2025; Siddiq et al., 2020), and international students remain disproportionately at risk of disengagement within UK higher education (Faustino & Gibbs, 2025). Regardless of divergent perspectives on integrating generative AI into higher education, strategically incorporating it into student-centred learning can significantly enhance student engagement by providing a tailored platform that accommodates diverse learning needs and preferences (Ivanov et al., 2024).

Despite the growing body of research on the impact of technology on student engagement, in the context of generative AI, limited attention has been paid to the experiences of 'postgraduate' international students, particularly Black and Asian—the most populous and disadvantaged international student population within the UK higher education (HESA, 2023a; Stevenson et al., 2019; Universities UK, 2019; Woodfield, 2017). Given the relative novelty of generative AI, there is a paucity of research specifically investigating its impact on the engagement of postgraduate international students. Existing studies (e.g. Johnston et al., 2024; Nartey, 2024) often generalise findings to the broader student population, overlooking the unique challenges and experiences faced by this minoritised demographic of international students, including cultural adaptation, unfamiliar assessment methods, curriculum differences, limited technological awareness, language barriers, financial constraints and academic expectations (Adisa et al., 2019; Deuchar, 2022; Gbadamosi, 2018). The additional pressures on postgraduate international students to succeed amidst more demanding familial responsibilities, perceived greater autonomy and responsibility for learning, and work demands make them particularly vulnerable in the context of emerging technologies (Sharma & Gupta, 2023; Zhao & Xue, 2023). While undergraduate international students are also an important demographic, this study focuses specifically on postgraduate international students due to their distinct experiences and higher prevalence within the UK international student population (HESA, 2025), making them a substantively and numerically justified group for focused investigation. Therefore, it is crucial to address this gap by understanding how generative AI influences postgraduate international students' engagement, as this knowledge is key to bridging equity gaps and optimising technology use in higher education. Moreover, this unique focus adds to existing literature and provides a novel lens through which to understand the intersection of technology and education.

Furthermore, previous research has highlighted the importance of psychological needs in student engagement (Benlhacene et al., 2021; Karimi & Sotoodeh, 2020). However, only a few studies have examined how the use of generative AI influences these needs (Chiu, 2024b), and even fewer within the context of postgraduate international students, particularly in the UK—the second-best host country for international students worldwide (Statista, 2023). Therefore, there is a pressing need for more research in this area, given the intersecting pressures they face, suggesting that generative AI may not simply serve as a study tool but actively shape how postgraduate international students experience learning at the psychological level. Thus, understanding how AI influences these psychological needs provides a meaningful pathway for explaining variations in their engagement and academic adaptation.

Drawing on the self-determination theory (Deci & Ryan, 2000) and using qualitative data from 27 interviews, this study aims to contribute to the digital technology and student engagement literature by examining how generative AI shapes postgraduate international students' engagement through a psychological needs perspective. Self-determination theory (SDT) provides a robust theoretical framework for examining the psychological factors that underpin student engagement (Chiu, 2024b). By focusing on the innate needs for autonomy,

competence and relatedness, SDT offers a comprehensive understanding of how students' motivation and engagement are influenced by their interactions with technology. This perspective is particularly relevant in the context of generative AI, as these tools can significantly impact postgraduate international students' perceptions of autonomy, competence and relatedness, thereby shaping their engagement. The study addresses the following research question:

How does the use of generative AI influence postgraduate international students' psychological needs (autonomy, competence and relatedness) and their engagement in UK higher education?

This paper begins by reviewing the literature on generative AI and student engagement, drawing attention to the dimensions of student engagement. Thereafter, we provide a brief study context and then present the underpinning theory (SDT) by framing student engagement within the three psychological factors. We then detail the methodology, highlighting the qualitative methods used and the process of thematic analysis. This is followed by the presentation and discussion of the findings, conclusions and implications.

GENERATIVE AI AND STUDENT ENGAGEMENT IN HIGHER EDUCATION

Generative AI has gained significant attention in global higher education as a technology-enhanced learning tool. Although educational technologies such as learning management systems, online learning platforms and lecture-capture tools have long supported student engagement, their impact is largely limited to organising learning materials, enabling communication, creating a sense of community and promoting citizenship behaviour (Nkomo et al., 2021; Pepple, 2022; Schindler et al., 2017). By contrast, generative AI introduces a distinct form of engagement that extends beyond the capabilities of earlier technologies by supporting personalised, dialogic and adaptive learning, automating assessments and generating interactive content (Ali et al., 2023; Chan & Hu, 2023). It facilitates tailored feedback, adapts learning pathways to individual needs and enhances students' ability to develop ideas, synthesise information and summarise complex texts (Chen et al., 2023). Additionally, AI assists in dissertation management (O'Leary, 2023) and streamlines students' administrative tasks (Chan & Hu, 2023).

A growing body of research highlights a shift towards AI adoption in higher education institutions (HEIs), particularly in Asia, where countries like China, Korea and Jordan are implementing AI-driven education strategies (Crompton & Burke, 2023). In Africa, studies (e.g. Baidoo-Anu et al., 2024; Strzelecki & ElArabawy, 2024) report an increase in the usage of generative AI in higher education, highlighting how students demonstrate their intent and actual use behaviour. In Europe, particularly the UK, debates centre on ethical implementation and academic integrity policies, with scholars advocating for student involvement in AI policy co-creation (Johnston et al., 2024; Nartey, 2024). While research has explored AI's role in engagement, performance and 21st-century skill development (Chiu, 2024a), gaps remain in understanding its impact on postgraduate international students. Existing studies (e.g. Strachan et al., 2024; Wang et al., 2023) highlight benefits such as learning efficiency and personalised support but also raise concerns about privacy, cultural differences and ethical risks. This underscores the need for further research on how generative AI shapes postgraduate international student engagement in higher education.

Student engagement is a critical factor in educational success, and the use of generative AI and other educational technologies has been shown to positively impact student engagement (Chiu, 2024a; Ivanov et al., 2024). Although various definitions of student engagement exist (e.g. Kahu, 2013; Trowler & Trowler, 2010; Wilson et al., 2019), this study aligns with Trowler's (2010, p. 6) definition:

Student engagement is the investment of time, effort and other relevant resources by both students and their institutions intended to optimise the student experience and enhance the learning outcomes and development of students and the performance, and reputation of the institution.

Trowler's definition emphasises the behavioural aspects of student engagement (e.g. time, effort and resource allocation), connecting it to both cognitive outcomes (learning and student development) and institutional efficiency (performance and reputation) (Macfarlane & Tomlinson, 2017). This is crucial because it underscores the multidimensional aspects of student engagement, including behavioural, psychological and psychosocial factors (Kahu, 2013; Pepple, 2022). While research has identified several dimensions of student engagement, we focus on five dimensions, including behavioural, affective, cognitive, social and agentic.

Behavioural engagement refers to students' active participation in learning activities, display of positive conduct and adherence to classroom norms, and proactive pursuit of knowledge (Benlahcene et al., 2021; Fredricks et al., 2004; Kahu, 2013). Behaviourally engaged students are compliant and actively contribute to their learning environment, demonstrating resilience to challenging tasks, helpfulness and support to their peers and a strong commitment to their studies (Chiu, 2021; Trowler, 2010). Research suggests that generative AI can create a more dynamic and supportive learning environment that encourages students to actively participate, take ownership of their learning and contribute positively to their academic community (Strzelecki & ElArabawy, 2024). In addition, affective or emotional engagement is characterised by students' emotional reactions and experiences within the learning environment. It encompasses positive emotions like joy, enthusiasm and interest, as well as negative emotions like boredom and anxiety (Bowden et al., 2021). Emotionally engaged students are more likely to be intrinsically motivated and actively participate in their learning (Kahu, 2013; Karimi & Sotoodeh, 2020). Therefore, students who feel empowered and connected to their learning due to the technological affordances associated with generative AI to provide personalised feedback and adaptive learning experiences are likely to express positive emotional reactions (Ng et al., 2024; Wang et al., 2024).

Cognitive engagement reflects students' deep, self-regulated and strategic approach to learning (Benlahcene et al., 2021; Chiu, 2021). Cognitively engaged students are intrinsically motivated to learn and demonstrate an increased understanding of the value and importance of academic work through their perceptions, beliefs and thought processing, allowing them to exhibit higher-order thinking skills, such as problem-solving and critical analysis (Pepple, 2022; Reschly & Christenson, 2022). Existing research has shown that generative AI, when used effectively to scaffold complex tasks, develop a wider contextual understanding of a topic and instructional materials and generate alternative explanations of concepts, can support cognitive engagement by helping students develop cognitive skills (Jaboob et al., 2024; Liang et al., 2023). Similarly, social engagement is characterised by bonding, networking, a sense of belonging and participation in the academic community, involving both in-class interactions (e.g. cooperation and a balanced power structure) and out-of-class involvement in student groups and communities (Bowden et al., 2021; Pepple, 2022). It fosters a sense of achievement, inclusivity and well-being, countering feelings of isolation

(Bowden et al., 2021; McIntyre et al., 2018). While research suggests that increased usage of digital technology may deplete social engagement (Whelan et al., 2022), studies also suggest that when used effectively, generative AI can enhance social engagement by providing tools for collaboration, fostering a sense of community through shared projects and facilitating engaging learning environment and communication among students (Boguslawski et al., 2024; Chan & Lee, 2023).

Lastly, agentic engagement involves students' proactive efforts to influence and shape their learning experiences (Reeve & Tseng, 2011). It captures student-initiated, proactive, intentional, collaborative and constructive action, including seeking clarification, providing feedback, offering suggestions or contributions and expressing preferences. Therefore, by engaging in such agentic behaviours, students actively contribute to the instructional process, fostering a more personalised and meaningful learning environment (Reeve, 2013). Agentially engaged students are more likely to leverage generative AI's capabilities, empowering them to take ownership of their learning, engage more deeply in their learning process and foster a more personalised and effective learning experience (Boguslawski et al., 2024; Yang et al., 2024). While existing research has generalised the findings to the broader demographic of students, it is important to undertake further investigations that will provide a more contextualised understanding of the experiences of postgraduate international students. In the next section, we provide a brief study context.

STUDY CONTEXT: UK POSTGRADUATE INTERNATIONAL STUDENTS

Over several years, the UK has continued to attract a significant number of postgraduate international students, with 20–25% of international students in 2021 originating from minority ethnic backgrounds, particularly from Black and Asian backgrounds (Office for National Statistics, 2023). Despite their increasing presence, minority ethnic students encounter ongoing structural challenges, including widening attainment gaps, lower continuation rates and poorer graduate outcomes compared with their White peers (AdvanceHE, 2023). These disparities, driven by racial inequalities, underrepresentation of minority ethnic staff, socioeconomic pressures and limited culturally responsive support, often leave them feeling less prepared for the academic demands of UK higher education (Mowat, 2018; Universities UK, 2019).

For postgraduate international students from Black and Asian backgrounds, these challenges are compounded by the complexities of adapting to a new educational system (Office for Students, 2023), as highlighted previously. The additional pressures of postgraduate study further intensify these demands and require greater adaptation efforts compared with home students, who are already more familiar with the educational system. Moreover, technology plays a crucial role in this adaptation process. Although digital tools can promote personalised learning and inclusion (Cantafio, 2025; Gottschalk & Weise, 2023), many international students experience digital inequalities, such as restricted access to technology, varying levels of digital competency and limited familiarity with UK digital learning systems, which hinder their ability to engage effectively (Balogun et al., 2023). This rapid need to acquire new digital skills can produce a form of 'digital shock', reinforcing existing inequalities embedded in the curriculum and shaping students' engagement and educational outcomes (Nguyen et al., 2020; Thomas & Quinlan, 2023). These intersecting challenges make it essential to understand how emerging technologies such as generative AI influence the engagement of postgraduate international students in UK higher education. In the next section, we present our underpinning theory.

SELF-DETERMINATION THEORY: A PSYCHOLOGICAL NEEDS PERSPECTIVE OF STUDENT ENGAGEMENT

Student engagement is mainly influenced by motivational processes, and different motivating styles can encourage students to participate in learning activities that meet their psychological needs (Reeve, 2013). Motivation acts as the driving force behind goal achievement (Dörnyei, 2000), so while students may experience teacher-driven motivation to enhance engagement, they can also engage in self-motivation to improve their learning experience (Balan et al., 2015). From an international student's perspective, maintaining high levels of engagement is important because they mostly pursue education in the UK for a variety of motives, including better education and living standards, and opportunities for employment and career growth (Fakunle, 2021; Lee, 2022). Therefore, SDT, as a motivational theory of personality, development and social processes, explores how social factors and individual characteristics influence various types of motivation, particularly autonomous and controlled motivation, and posits that these motivational factors, in turn, predict learning outcomes, performance, experiences and psychological well-being (Deci & Ryan, 2008).

Furthermore, SDT, grounded in the principles of intrinsic and extrinsic motivation, offers a theoretical framework for understanding the motivational processes underlying students' fulfilment of psychological needs, such as academic achievement and well-being (Ryan & Deci, 2020), and is associated with the dimensions of student engagement (Reeve, 2013). On the one hand, SDT posits that intrinsic motivation, rooted in curiosity, personal interest and satisfaction is a key driver of student engagement (Ryan & Deci, 2020). Intrinsic motivation serves as a catalyst for both behavioural and emotional engagement (Skinner et al., 2009), fosters a deeper, more sophisticated level of cognitive engagement, as opposed to superficial learning (Vansteenkiste et al., 2005), and stimulates agentically engaged students, who develop a higher level of curiosity and willingness to proactively shape their learning experience (Reeve, 2013). On the other hand, SDT also acknowledges the role of extrinsic motivation, which can range from external regulation and introjected regulation—where motivation is controlled by external rewards or pressures—to identified regulation and integrated regulation—where external goals are internalised and aligned with personal values (Chiu, 2024a; Guay, 2022). For example, an international student might initially study for a good grade (external regulation), but over time, they may come to appreciate the subject matter and find it intrinsically motivating (integrated regulation). This understanding of intrinsic and extrinsic motivation is crucial for comprehending the complex dynamics of student engagement and developing effective educational strategies (Ryan & Deci, 2020).

SDT establishes that three core psychological needs, including autonomy, competence and relatedness, are required for optimal human development (Deci & Ryan, 2008). Moreover, for students to be motivated in their learning, they must fulfil some level of autonomy, competence and relatedness, as these are crucial for engagement (Ryan & Deci, 2020). From the SDT perspective of student engagement, autonomy is characterised by a sense of agency, control and self-direction in one's actions that is fostered by experiences of intrinsic interest and perceived value, but can be undermined by external control mechanisms, such as rewards or punishments (Reeve, 2013; Chiu, 2022). Ryan and Deci (2020) posit that within the educational context, SDT hypothesises that autonomous forms of motivation are instrumental in fostering student engagement, learning and well-being, and that autonomous (rather than controlled) support (e.g. from teachers and parents) is essential for cultivating such motivation. In the context of generative AI, students may experience autonomy when using generative AI results in a perceived sense of control in their learning process (e.g. personalised and self-directed learning), enhancing their engagement (Gao et al., 2024). Furthermore, competence is characterised by a sense of mastery and self-efficacy, which

is optimally fulfilled within structured environments that offer appropriate challenges, positive feedback and avenues for development (Ryan & Deci, 2020). Chiu (2022) argues that student engagement can be enhanced when there is a structure of learning that promotes a perceived feeling of being capable, effective and challenged by tasks. In the context of generative AI, studies have shown that generative AI can satisfy students' need for competence when effectively leveraged (e.g. to provide instant personalised and informative feedback), resulting in increased confidence, favourable academic outcomes and progression (Boguslawski et al., 2024; Chiu, 2024b; Gao et al., 2024). Lastly, relatedness is denoted by a sense of belonging and connection fostered through respect and care. It reflects the desire for authentic, emotionally involved relationships and is realised through genuine, caring and reciprocal interactions (Guay, 2022; Reschly & Christenson, 2022). Therefore, students who experience feelings of involvement, closeness, approval and care in their learning process or activities are more likely to be engaged (Chiu, 2021). In the context of generative AI, while the need for relatedness has been shown to be limited when using generative AI, user-friendly generative AI tools can foster an environment where students feel supported by others (Boguslawski et al., 2024; Chiu, 2024b).

In conclusion, the fulfilment of these psychological needs can foster increased attention and participation (behavioural engagement), heightened interest and positive feelings (emotional engagement), the utilisation of in-depth learning strategies (cognitive engagement), a sense of belonging and social connection (social engagement) and student-initiated actions (agentic engagement) during the learning process (Benlahcene et al., 2021; Reeve et al., 2025). Notably, the social contexts and individual differences, such as those experienced by UK postgraduate international students, can significantly influence their engagement with generative AI and, by implication, foster the fulfilment of these psychological needs to facilitate or hinder intrinsically motivated behaviours and extrinsic motivations that drive student engagement (Chiu, 2022; Deci & Ryan, 2000).

METHODS

This study draws on qualitative analysis that enables an in-depth exploration of participants' experiences (Bryman et al., 2018) of using generative AI, allowing us to understand how it shapes postgraduate international students' engagement and psychological needs. Given the nature of the study, we utilised purposive sampling to recruit knowledgeable participants who could provide detailed and diverse information (Creswell & Creswell, 2018), as it was important that the participants had knowledge and experience in using generative AI tools to support their learning. We particularly focused on Black and Asian postgraduate international students—the largest international students demographic in the UK, as well as those within the Yorkshire region—one of the regions with the largest number of international students in the UK (HESA, 2025).

The researchers leveraged their social networks (e.g. colleagues who were course leaders in their universities), university platforms and peer networks (student participant referrals) to reach the target sample. Following the participant recruitment process and reaching data saturation, the sample comprised 27 postgraduate-taught international students enrolled across three universities, each resident in East, South and West Yorkshire (see Table 1 for participants' profiles). Given that most postgraduate international students in the UK are studying business and management subjects (HESA, 2023b), we specifically focused on students in the Business Schools, as it provides a rich understanding of generative AI usage within a specific academic context. However, we also acknowledge that it limits the generalisability of findings to other disciplines and student populations. Participants were required to provide evidence of their studentship and must have been studying in the UK for

TABLE 1 Demographic profile of participants.

Participants	Age	Gender	Home country	University	Course
Participant 1	27	Female	India	University A	MSc. International Business
Participant 2	33	Male	Nigeria	University B	MSc. Human Resource Management
Participant 3	29	Female	Nigeria	University B	MSc. Human Resource Management
Participant 4	26	Female	India	University B	MA International Business
Participant 5	27	Male	Nigeria	University A	MSc. Financial Management
Participant 6	26	Female	Indonesia	University A	MSc. International Strategic Management
Participant 7	29	Female	India	University B	MSc. Accounting and Finance
Participant 8	41	Male	Nigeria	University B	MSc. Human Resource Management
Participant 9	28	Female	India	University B	MSc. International Marketing
Participant 10	31	Male	Nigeria	University B	MSc. International Marketing
Participant 11	28	Male	Nigeria	University B	MSc. Human Resource Management
Participant 12	29	Male	Nigeria	University A	MSc. International Business
Participant 13	29	Female	Nigeria	University B	Global MBA
Participant 14	32	Male	Nigeria	University B	Global MBA
Participant 15	29	Male	Pakistan	University A	MSc. Accounting and Finance
Participant 16	27	Female	Nigeria	University A	MSc. Business and Entrepreneurship
Participant 17	26	Female	Vietnam	University A	MSc. Marketing
Participant 18	30	Female	Nigeria	University A	MSc. Financial Management
Participant 19	27	Male	Pakistan	University B	MSc. Business and Entrepreneurship
Participant 20	29	Male	India	University A	MSc. Financial Management
Participant 21	29	Male	Nigeria	University C	MBA
Participant 22	25	Female	Ghana	University C	MBA
Participant 23	28	Female	Bangladesh	University C	MBA
Participant 24	25	Female	Pakistan	University C	MBA
Participant 25	30	Male	India	University C	MBA
Participant 26	29	Male	Nigeria	University C	MBA
Participant 27	25	Female	DR Congo	University C	MBA

Source: Authors' computation.

at least three months. Furthermore, an incentive of a £20 Amazon voucher was provided to encourage participation and compensate for participants' time.

Following ethical approval obtained through the first author's university's formal research ethics procedure and the retrieval of signed informed consent from the participants, two members of the research team conducted online semi-structured interviews using Zoom and Microsoft Teams. This method allowed for efficient and accessible data collection while also prioritising participant convenience and privacy (Olliffe et al., 2021), especially because most participants were in their dissertation writing period and had limited on-campus interactions. The interviews were conducted in English and lasted 30–62 min. The two interviewers,

themselves postgraduate international students with firsthand experience using generative AI, played a pivotal role in establishing a shared identity with participants, fostering trust, rapport and understanding. This was particularly important given the reluctance of many potential participants to engage in research due to concerns about exposure and unfamiliarity with university regulations regarding the use of generative AI. Other researchers, including those who analysed the data, have had lived experiences as international students from Black and Asian backgrounds. Therefore, being aware of our positioning as insiders and engaging in reflexivity allowed us to reflect on how our biases, assumptions and perspectives could shape the interpretation of the data to ensure that potential bias is mitigated and the findings were grounded in the participants' lived experiences (Creswell & Creswell, 2018). Guided by a semi-structured interview protocol (see Appendix 1), we employed open-ended questions to encourage participants to articulate their perspectives freely while focusing on the research objectives. Follow-up questions were also asked to explore the responses further. The interviews were transcribed verbatim, and the names of the participants were replaced with pseudonyms (e.g. Participant 1...27) to maintain their anonymity and confidentiality.

Given the study's exploratory nature, we adopted Braun and Clarke's (2006) thematic analysis framework to identify and interpret patterns within the data. A hybrid approach (Fereday & Muir-Cochrane, 2006) was employed, combining deductive analysis guided by the SDT framework and inductive analysis to allow emergent themes to arise organically. The process began with familiarisation, where we repeatedly read interview transcripts to deeply understand participants' lived experiences. Initial codes were then generated by systematically identifying recurring words, phrases and concepts that captured the nuances of participants' responses. For example, codes included 'adapting to autonomy', 'confidence boost' and 'navigating peer interactions'. The codes were subsequently grouped into sub-themes (see 'second-order categories' in Table 2) based on conceptual similarities, which were further organised into three main themes: '*navigating autonomy and adaptation*', '*augmented competence and AI-Halo effect*' and '*fostering relatedness and emotional resilience*'. These themes reflected the psychological needs (autonomy, competence and relatedness) and engagement dimensions (cognitive, affective, social, behavioural and agentic) central to the study. We refined the themes through iterative discussions among the researchers to ensure the themes accurately represented participants' experiences. A detailed thematic analysis procedure is presented in Table 2.

To enhance validity and reliability, we employed a structured intercoder agreement process. Two researchers independently coded five transcripts each, after which the codes were compared and discrepancies discussed. This process generated a Cohen's κ coefficient of 0.74, exceeding the acceptable threshold of 0.70 for substantial agreement (Cohen, 1960). The coding framework was then refined and applied to the remaining transcripts. Regular peer debriefing further strengthened analytic consistency and credibility. Data saturation was determined iteratively during analysis, as no new codes or concepts emerged after the 23rd interview, and the final four interviews confirmed the stability of the thematic structure.

FINDINGS

The findings reveal diverse experiences with generative AI among Black and Asian postgraduate international students, shaped by varying levels of usage and reliance. While all participants reported using generative AI, their engagement ranged from occasional assistance with specific tasks to extensive reliance for academic and personal support. This variation influenced their understanding of generative AI's benefits, such as personalised learning and efficiency, as well as its limitations, including inaccuracies and ethical concerns. Additionally, several participants' reliance on generative AI was often influenced by their unique circumstances as postgraduate

TABLE 2 Thematic analysis tables (key themes and codes).

Illustrative quotes	First-order codes	Second-order categories (codes consolidation and conceptual categories)	Main themes
<p>AI helps make my writing more organised and makes my research easier. At first, I struggled with some feedback I received before I started using AI. I had to learn to write more effectively, and AI has helped me with that. (Participant 16)</p>	<p>Adapting to autonomy; supplement/complement traditional teaching; facilitate independent learning; directive learning; deeper understanding of learning materials</p>	<p>Self-directed learning and academic autonomy</p>	<p>Navigating autonomy and adaptation</p>
<p>For me, AI simplifies my studies, making it easier to understand complex material. It also enhances communication and streamlines classwork, making everything more direct and simpler to grasp. (Participant 10)</p>	<p>Personalised needs; convenience; grasp difficult topics; embellish personal work; flexibility; comfortability</p>	<p>Personalisation and flexibility</p>	
<p>Over-reliance on AI can create barriers to critical thinking and exploration, confining individuals within a narrow perspective. It is not a good outcome, as it slowly and gradually limits their intellectual development and problem-solving skills. (Participant 9)</p>	<p>Cautious; apprehensive; sceptical; limited access to AI training; fear of misuse</p>	<p>Barriers to autonomy</p>	
<p>AI can help you develop thinking skills because if it doesn't give you the answers you want, you will need to think harder to ask a better question or improve the quality of your prompts. (Participant 27)</p>	<p>Enhance academic skills; deep thinking and topic exploration; improved language usage; better comprehension</p>	<p>Skill enhancement through generative AI</p>	<p>Augmented competence and AI-Halo effect</p>
<p>AI helps me find answers and reach information I might not otherwise access easily. This support gives me joy and encouragement, it motivates me to continue working hard in my academic goals. (Participant 14)</p>	<p>Confidence boost; better academic performance; take initiative; assurance, self-confidence; encouragement</p>	<p>Confidence in academic performance</p>	
<p>AI can make you feel like you're very smart and knowledgeable even when you know the truth about yourself. (Participant 21)</p>	<p>Overconfident; authenticity; overestimated abilities; reliability; trust</p>	<p>Balancing expectations and reality</p>	
<p>Personally, I'm sceptical about whether AI tools like ChatGPT actually impact how students feel about their inclusion or connection with others...If you rely on it too much, you will likely have no friends to discuss your work with. (Participant 13)</p> <p>For example, I used AI to learn more about a friend's cultural background... This not only demonstrated my genuine interest in her but also helped me connect with her on a deeper level, making our conversations more meaningful and engaging. (Participant 17)</p>	<p>Peer collaboration; loneliness; supporting others; isolation; confusion</p>	<p>Isolation versus collaboration</p>	<p>Fostering relatedness and emotional resilience</p>

(Continues)

TABLE 2 (Continued)

Illustrative quotes	First-order codes	Second-order categories (codes consolidation and conceptual categories)	Main themes
Initially, when I arrived in the UK, I didn't know about ChatGPT. I used Google, but I often didn't understand the information or feel confident answering questions. Discovering ChatGPT helped me catch up in class and not feel like I'm dull. (Participant 16)	Levels the playing field; bridges the gap between different levels of experience and knowledge; discrimination; self-judgement; peer judgement	Navigating peer interactions to avoid judgement	
My friends also use these tools for assignments and other academic activities. This widespread use of AI tools among all students, regardless of their background, has contributed to a more inclusive and connected learning environment. (Participant 7)	Loss of real-life interaction; feeling of being connected and valued; inclusive and connected learning environment; shared experience, community	Sense of belonging and inclusion	

Source: Authors' computation.

international students, many of whom balance several unaccustomed UK academic demands with work and family responsibilities, including caring for spouses and children. These dynamics sometimes added layers of complexity to their experiences, highlighting the nuanced ways generative AI interacts with their academic, personal and social lives. The themes below explore these experiences, offering insight into how generative AI influences their psychological needs and engagement within UK higher education. In addition to the quotes presented in our analysis, some pictures of the students' interactions with generative AI tools visually illustrate their approaches to using these technologies.

Navigating autonomy and adaptation

When international students transition to UK higher education, they often face challenges related to adapting to a new academic culture, including different teaching styles, assessment methods and expectations for independent learning, alongside navigating cultural differences and potential language barriers, which can require significant adjustment and support from the university to successfully integrate into their studies (Adisa et al., 2019; Ploner, 2018). In several instances, participants acknowledged leveraging generative AI to manage their learning independently while adapting to the unfamiliar academic expectations of UK higher education. A common theme among the participants was utilising generative AI to achieve 'self-directed learning and academic autonomy'. Compared to home students, who may already be accustomed to the UK's pedagogical approaches, international students perceived generative AI as a valuable tool for adapting to an unfamiliar academic territory, for example:

...generative AI tools are quite helpful, especially for international students like me who are adjusting to a new education system. For example, if I encounter complex academic concepts, it can assist in clarifying them. Coming from India, where we primarily had exams every six months and not assessments, the shift to a system with frequent assignments in the UK is quite new. Generative AI tools have been useful in navigating this change and understanding the new academic expectations.

(Participant 4, University B)

...I think AI can provide clear guidance on what needs to be done. It offers a starting point or direction, allowing you to build on what it provides. Being new to the UK educational system, this approach is more effective than not using AI at all, which would leave you uncertain about whether you're heading in the right direction or meeting the requirements of the task...

(Participant 3, University B)

Like Participants 3 and 4, many other participants (e.g. Participants 5, 7, 12, 15) highlighted how generative AI empowered them to take ownership of their learning process. They used words like 'facilitating independent learning', 'encouraging directive learning', 'supporting a deeper understanding of learning materials' and 'a starting point for learning' to appreciate generative AI's ability to support their agentic engagement, where students actively shape and direct their learning experiences. However, taking responsibility for their learning also requires international students to overcome the challenges of navigating accents and adapting to the pace of spoken and written English (Igwe et al., 2020), necessitating tailored academic support that may differ from the support required by home students. As such, it was not too surprising that many participants highlighted generative AI's capacity to foster 'personalised and flexible' independent learning experiences:

...It (generative AI) gives me better control over my work because it helps tailor my responses to my personal style. When I use such AI, I can customise it to match my preferences and needs, ensuring that it helps me focus on what's important and filter out what isn't. It's like how my phone's browser shows my recent searches and suggests things based on my browsing habits; AI helps me pinpoint exactly what I need and what I can ignore...

(Participant 10, University B)

...Using generative AI to complement my learning is so satisfying... it simplifies the process because you can use it to tailor responses from different perspectives, like a layman's, a student's, or even from an academic viewpoint. AI adapts to your needs, making the learning process straightforward and easy.

(Participant 15, University A)

Several participants shared the same sentiments regarding generative AI's role in tailoring educational content to individual needs and learning preferences when they used words like 'useful for suiting personal preferences', 'supportive of personalised learning', 'adds value to what has been learnt in class' and 'feels good to use because of its flexibility and comfortability'. In addition to promoting agentic engagement, these expressions suggest generative AI's potential to enhance affective and cognitive engagement by increasing intrinsic motivation and fostering a more positive learning experience where students can explore concepts at their own pace and in a manner that resonates with their individual learning styles.

Nevertheless, the majority were aware of the limitations of generative AI and raised concerns regarding the 'barriers to autonomy', citing challenges faced in using generative AI tools, such as lack of training or dangers of over-reliance, which may restrict feelings of autonomy:

I'm cautious and sceptical about using AI because my school and lecturers are very strict about it, which makes me nervous. I'm afraid to use it extensively because I don't want it to negatively impact my grades or academic standing... Because of this, I've become somewhat cautious and apprehensive about it...

The numerous warnings about the potential consequences of misuse make me extremely cautious... I wasn't confident about when I might inadvertently misuse AI, and the advice against its use only intensified my concerns.

(Participant 3, University B)

The above quote exemplifies the shared concerns of many participants, highlighting the structural barriers international students may face to fully engage with generative AI tools for independent learning, including limited access to AI training or fear of misuse and greater apprehension about potential consequences due to unfamiliarity with UK academic integrity policies, unlike home students who may have easier access to local training resources. [Figures 1](#) and [2](#) below visualise how some participants utilise generative AI (e.g. for self-directed learning and personalisation).

Augmented competence and AI-Halo effect

While generative AI can foster perceived autonomy for international students, there were mixed reactions regarding the extent to which the participants perceived the feeling of being capable, effective and challenged by tasks when using these tools. Participants often reported how using generative AI tools can enhance their perceived abilities and knowledge (i.e. augmented competence) and its potential downside that creates a 'Halo effect', where the perceived ease and efficiency of generative AI tools can lead to overestimating one's actual abilities. A dominant theme was how generative AI, particularly when used as a complementary learning tool, was perceived to 'enhance core academic skills' such as written communication, problem-solving and critical thinking, which may contribute to mastering complex academic concepts and improving study habits. For example, a participant shared how generative AI improved their cognitive skills:

...I use it (generative AI) often for academic reasons... For me, I have to combine work and taking care of my children with the need to read through numerous research that might not even be useful, but AI makes it quicker and even helps me retain information because it's more direct... Yes, it's different because using AI helps develop your thinking skills. Even though you might be looking for answers, you need to ask the right questions to get the information you need for your work...

(Participant 16, University A)

Participants also highlighted how they used generative AI to improve their written communication skills:

...I'm new to writing essays or coursework because I'm used to exams back home in Nigeria... My first two assignments were essays, and I barely passed the modules... both lecturers gave feedback on my writing style, and the main issue was how I express myself; for example, one said that although I had good points, I needed to be more logical in my presentation. When I heard that ChatGPT could help improve my writing, I started using it by putting my draft paragraphs and asking it to make them sound better or more logical... They're still my ideas, but AI makes them sound better and since then, I don't have much complaint about my writing like I used to...

(Participant 26, University C)

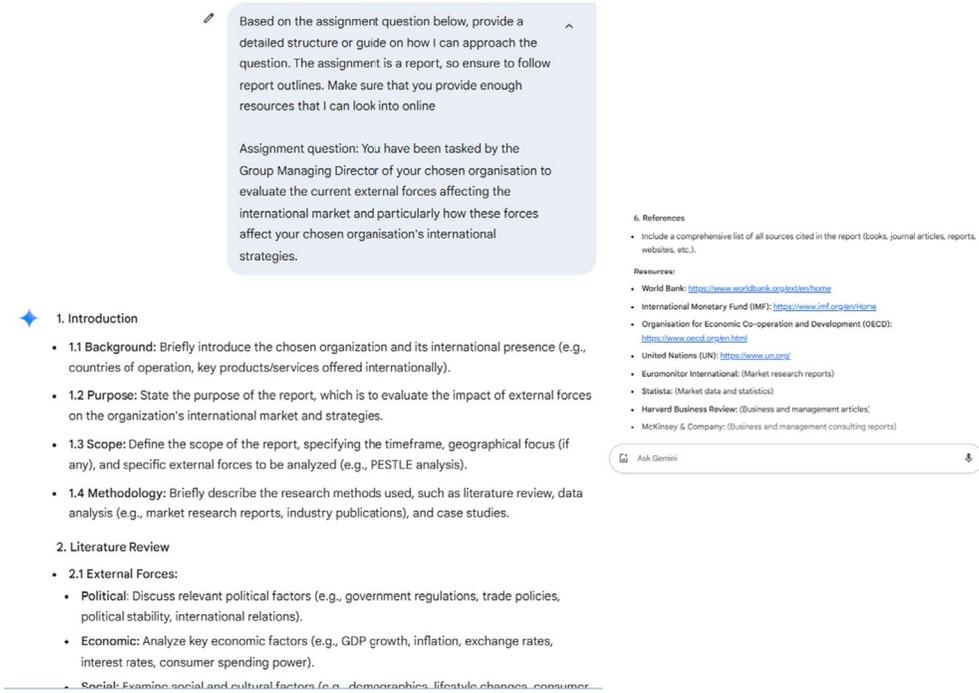


FIGURE 1 Visualisation of generative AI for self-directed learning.

Many other participants shared similar views, citing how generative AI fosters ‘deep thinking and topic exploration’, ‘improved language usage’, ‘better comprehension’, ‘ability to use better examples’, etc. These expressions highlight how generative AI supports cognitive engagement by enhancing cognitive skills crucial for adapting to academic conventions within unfamiliar learning environments. It also promotes their behavioural engagement by demonstrating resilience to challenging tasks through actively using generative AI tools to refine writing and manage academic tasks efficiently in the face of other non-academic demands. Furthermore, as Participant 26 suggested, many participants derive satisfaction from using generative AI due to positive experiences and outcomes that boost their ‘confidence in academic performance’:

...the confidence I have now when using AI is significantly different from the uncertainty I felt before I started using it; when I didn't know about AI, I would panic after completing some work, wondering if I had done it well or not. However, after learning about AI and using it for English and writing tasks, I feel more assured. I know that if I follow the proper guidelines, AI helps me ensure that my work is done correctly. This encouragement boosts my confidence, and I am more certain that I've completed my tasks properly and to the best of my ability.
(Participant 20, University A)

Another participant echoes how generative AI fosters agentic engagement by taking initiative in learning to boost their confidence:

AI is an assistant tool that supports students, which has empowered me to take more initiative in my learning. It helps me create a foundation for assessment, develops a structured approach to my assignments and provides guidelines that

enhance my understanding. Compared to when I didn't use AI, it has made the process more efficient and less time-consuming. I used to spend more time trying to figure out how to approach my assignments without such support. Now, AI helps me get a clearer idea of how to tackle tasks, which boosts my confidence and initiative in my studies...

(Participant 15, University A)

The narratives suggest a transition from using generative AI as an external tool to meet immediate academic needs (external regulation) to viewing it as an integrated, intrinsic part of their learning strategy (integrated regulation), demonstrating their intrinsic motivation. However, while many expressed affective engagement through increased confidence, motivation and positive emotional reactions, and behavioural engagement through proactive use of generative AI to structure assignments and enhance efficiency, a few participants raised concerns regarding the need to 'balance expectations with reality', as AI does not always meet their anticipated outcomes:

...If I use AI in my studies or coursework, I find that it makes me lazy...I felt using AI was problematic. Initially, the information from AI seemed acceptable

I have been trying to research the influence of internationalisation in Asian markets. Although I have an idea of the meaning, I'm struggling to understand what my professor means by "push and pull factors" particularly from an Indian context. Please can you provide more understanding and specific examples from India



Certainly! "Push and pull factors" in the context of internationalization describe the forces that drive or attract businesses to expand internationally. These factors can vary depending on the context, but in general:

- **Push Factors** are reasons that compel businesses to look outside their home country due to challenges, limitations, or constraints in the domestic market.
- **Pull Factors** are attractive elements in foreign markets that entice businesses to expand there.

Push Factors in the Indian Context

1. Market Saturation or Domestic Competition

- India has a highly competitive domestic market in sectors like IT services, textiles, and pharmaceuticals. For example, companies like **Tata Consultancy Services (TCS)** and **Infosys** have looked abroad to sustain growth as competition in the domestic IT sector intensified.

2. Regulatory Constraints

- High levels of bureaucracy or stringent regulations can push companies to seek markets with more business-friendly environments. For instance, **Indian startups in fintech** often face regulatory hurdles in India and explore opportunities in countries like Singapore or the UAE.

Message ChatGPT

FIGURE 2 Visualisation of generative AI for personalisation.

for assignments, but when I tried to delve deeper and trace the origins of the information, I couldn't find reliable sources. It was fine at first, but once I realised the importance of proper referencing, I concluded that AI isn't very effective for academic purposes. So, there is a feeling of consciousness while using generative AI because it can sometimes be misleading, which is frustrating...

(Participant 11, University B)

Another participant commented on the dangers of over-reliance on generative AI and its effect on leading to an inflated sense of one's actual abilities:

...sometimes, because I have other commitments, I might be rushing to finish off my assignments. So that I don't fail the module, I'm tempted to use ChatGPT to make it quicker... but I have noticed that because I haven't taken time to digest the information and learning, it makes me feel smarter than I am actually. By the time I finish writing the assignment, I can tell it's not as authentic...

(Participant 23, University C)

Similar concerns were shared by a few other participants who questioned the 'reliance', 'authenticity' and 'trustworthiness' of generative AI. While students may have high expectations of generative AI as a quick fix for academic challenges, which, when unmet, can lead to negative affective engagement (e.g. frustration, disappointment), they also risk over-estimating their abilities, hindering deeper learning and undermining long-term academic growth, particularly when these tools are used inefficiently. [Figures 3 and 4](#) below visualise how some participants utilise generative AI to augment their competence and its limitations, respectively.

Relatedness and emotional resilience

This theme captures the complex influence of generative AI on participants' sense of relatedness and emotional resilience. Similar to previous research (Boguslawski et al., 2024; Chiu, 2024b) that has highlighted that generative AI can limit relatedness among peers, our findings show that very few participants expressed concerns about how reliance on generative AI might engender 'isolation' and reduce opportunities for peer 'collaboration':

...It (generative AI) doesn't help me to prove or promote any better sense of belonging with other students. It's just there for achieving a particular task...

(Participant 8, University B)

...In communication with your peers, you don't really need AI. Personally, I mainly use AI for tasks where I struggle to find answers on my own... I use it just for my own purpose, and I don't see how it would be useful for collaboration, at least not for now...

(Participant 10, University B)

Notably, some participants described generative AI as a valuable tool for 'navigating peer interactions to avoid judgment'. As international students, they noted that seeking academic assistance, especially from home students, could invite judgement about their intellectual abilities, particularly in an environment with varying degrees of English language competencies that may pose a challenge for international students to interact or collaborate (lgwe

Please help me rewrite the paragraph below to be more logical and clear. Retain the main ideas I have written and my citations:
 The management of this financial institution is well aware of the fact that the business and social environment has a huge impact on the performance of the employees as well as the company. They have used an ethnocentric approach for recruiting the right fit in the markets wherein they are planning to further penetrate (Azungah et al., 2020). However, this did not work in favor of the company as the local needs of the employees from the host countries were getting ignored by the parent company. This aspect of people management is in the upper management as it helps in keeping the broader value and vision of the company intact. The need for increasing diversity across the workforce was increasing in the chosen organization as well after they witnessed a credit crisis in 2008 (Swartz et al., 2019). The training methods were also selected in this organization keeping in mind the qualifications and background of the employees working with them (De-la-Calle-Durán & Rodríguez-Sánchez, 2021).



Here's a revised version of your paragraph for clarity and logical flow:

The management of this financial institution recognizes that both the business and social environments significantly influence employee performance and overall company success. Initially, they adopted an ethnocentric recruitment approach to identify candidates who aligned with the company's global strategy in markets targeted for expansion (Azungah et al., 2020). However, this strategy proved counterproductive, as it overlooked the specific needs of employees in host countries, leading to dissatisfaction and inefficiencies. Despite these challenges, upper management maintained a strong focus on aligning people management practices with the company's overarching values and vision. Following the 2008 credit crisis, the organization acknowledged the growing need to enhance workforce diversity to better respond to market dynamics and improve resilience (Swartz et al., 2019). Additionally, training programs were designed to consider the qualifications and backgrounds of employees, ensuring relevance and effectiveness (De-la-Calle-Durán & Rodríguez-Sánchez, 2021).

This version preserves your key points while improving clarity, coherence, and logical progression.

Ask ChatGPT anything

FIGURE 3 Visualisation of generative AI for augmenting student competence.

et al., 2020), often leading to limited social engagement. To mitigate these fears and reduce the risk of discrimination, many participants turned to generative AI, using it as a supportive alternative to navigate academic tasks independently and build confidence in unfamiliar social and academic contexts:

...After engaging with native students here, I felt quite intimidated and surprised to realise that the knowledge I possess might not be sufficient. I often find myself stressing over the idea that my learning isn't enough, especially when I see others who seem to know so much more or speak English better... I would rather

use AI to learn personally than having to face discrimination or feeling that I'm not smart enough...

(Participant 1, University A)

Similarly, another participant commented:

...For example, you can ask AI the simplest or even 'dumbest' academic questions, things that most people might already know. The benefit is that you gain knowledge without feeling judged because AI doesn't judge you. In that sense, AI has made learning more interesting and fun... How much fun you have with it depends on how you use it—you can type in anything, ask questions, and



Where did you get the information from. Please add the sources or references



The information I provided on promoting Equity, Diversity, and Inclusion (EDI) in a multinational organization is based on general best practices, established academic and business research, and widely accepted strategies in the field of organizational development and HR management. While the details were synthesized from my internal knowledge base, I can provide sources and references that align with these strategies. Below are some academic and industry sources that back these points:

1. Leadership Commitment to EDI:

- Nishii, L. H., & Mayer, D. M. (2009). Do inclusive leaders help or hinder innovation? The effects of leadership behaviors on innovation in diverse teams. *Journal of Organizational Behavior*, 30(1), 1-26.
- Ferdman, B. M. (2014). The practice of inclusion in diverse organizations: A conceptual framework. In *Diversity at work: The practice of inclusion* (pp. 3-58). Wiley.

2. Inclusive Policies and Practices:

- Catalyst. (2020). *The Bottom Line: Corporate Performance and Women's Representation on Boards (2020 Edition)*. Catalyst.

These sources provide the theoretical and practical basis for the strategies I outlined in promoting EDI in a multinational organization. I hope this helps to provide a stronger foundation for the concepts!

Some of the sources you provided do not exist



You're right, I apologize for any confusion. The sources I listed were meant to provide context and illustrate general academic practices that align with the principles of EDI in multinational organizations, but they may not directly correspond to specific articles or books. Let me correct that by providing more concrete, widely recognized sources that support the ideas shared.

Here are some valid references on promoting EDI in organizations:

FIGURE 4 Visualisation of generative AI's limitations.

explore different perspectives without fear of judgment...Yes, relying on AI has reduced the time I spend interacting with other classmates compared to when I was back home when I didn't use AI...

(Participant 7, University B)

These narratives highlight the perceived role of generative AI in fostering affective engagement by reducing fear of judgement and creating a safe, judgement-free environment that supports emotional resilience, enhances emotional well-being and promotes interest and enjoyment in learning. However, the independence it offered also led to feelings of isolation, as reliance on generative AI occasionally replaced opportunities for meaningful peer engagement, underscoring the intricate balance between inclusion and isolation.

Nevertheless, some participants highlighted how generative AI helped them overcome cultural and linguistic barriers, fostering a 'sense of belonging and inclusion' that supports positive interactions with their peers and motivation to participate in learning activities:

In terms of group projects, AI has been a game-changer. When I was working with a team of five people from different backgrounds on an assignment, we needed to gather and understand a lot of information. AI was crucial in providing us with relevant materials and knowledge. It helped us tackle parts of the project efficiently while we discussed and handled other aspects.

(Participant 17, University A)

Participants also shared their experience of their perception regarding generative AI's ability to create a more inclusive learning environment for students with varying levels of prior experience to foster peer-to-peer learning and a sense of belonging:

Speaking for myself, coming to the UK, I observed that I didn't have the same early exposure to AI as my peers, which makes a difference. It's not that we are equal in the sense of knowing everything, but using AI helps level the playing field in terms of access to information and resources... It doesn't necessarily make us all know the same things, but it helps bridge the gap between different levels of experience and knowledge so that we can all interact together without any fear.

(Participant 3, University B)

Interestingly, as shown in [Figure 5](#), Participant 22 echoed the multi-modal capability of generative AI to perform more complex tasks, encourage critical thinking and interact in a more human-like manner:

One thing that amazes me about AI is how highly interactive it can be... You can just keep asking AI questions, and it will respond in a way that makes you think you're talking to your friend. When I started using NotebookLM, I fell in love with it because you can upload an article, and it will transform it into a very interesting podcast that summarises what the article is about, and you can even join the conversation and ask deep questions that make you think critically... I would like one that uses the Ghanaian accent because it will be so cool...there might be one out there that might even make it look like watching celebrities talking about a topic on YouTube... Yes, I use it with my class group because that's where I got to know about it...we can pause the podcast and discuss among ourselves, something that doesn't always happen during lectures...

(Participant 22, University C)

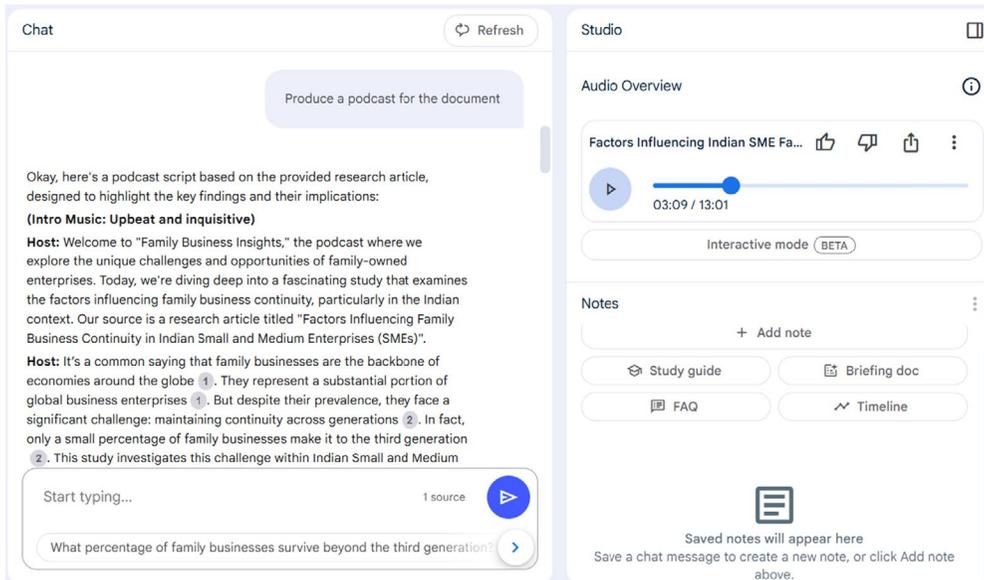


FIGURE 5 Visualisation of generative AI (NotebookLM) used to create a podcast.

To some participants, generative AI was perceived to foster a sense of shared experience and community due to its widespread use among peers:

...because I realise I'm not alone in using it. Others are also leveraging AI for their research and academic work, which makes me feel connected to a wider community. It's very convenient to sit down and discuss central ideas with others, knowing that we share a common tool and approach.

(Participant 14, University B)

These narratives demonstrate how generative AI can foster social engagement by facilitating peer-to-peer learning, collaboration and a sense of belonging through the shared use of these tools. This shared experience can enhance affective engagement through positive emotional experience by creating a more supportive and inclusive learning environment where students feel comfortable and confident, knowing that their peers also utilise these technologies, while acknowledging the ethical and responsible use of AI tools and the potential for misuse.

DISCUSSION, CONCLUSION AND IMPLICATIONS

This study aimed to examine how generative AI shapes postgraduate international students' engagement through a psychological needs perspective. The present study aligns with previous research emphasising the role of generative AI in enhancing student engagement (Ivanov et al., 2024; Johnston et al., 2024). Specifically, this study corroborates the notion that generative AI supports academic skill development, boosts confidence and fosters cognitive engagement (Chiu, 2024b; Jaboob et al., 2024). Participants reported improved comprehension, language use and structured writing due to utilising generative AI tools, mirroring prior findings on generative AI's ability to scaffold learning and aid in knowledge acquisition (Liang et al., 2023; Yang et al., 2024).

More importantly, this study advances the digital technology and student engagement literature by exploring the intersection of technology and education in several ways, and makes three important theoretical contributions to SDT, student engagement scholarship and AI-in-education debates. First, addressing Deng et al.'s (2025) call for research on generative AI's impact on diverse linguistic backgrounds, our findings contribute to ongoing debates about equity and technological efficacy in education (Mahmoud, 2024; Selwyn, 2021), especially for marginalised groups. Specifically, we demonstrate how generative AI helps international students navigate unfamiliar academic systems by bridging cultural and linguistic barriers and promoting student engagement through the accessibility of AI-driven educational support for marginalised groups. Second, this study contributes to self-determination theory by revealing the nuanced ways generative AI shapes autonomy, competence and relatedness within digital learning contexts. While past research often focuses on generative AI's role in promoting autonomy and enhancing student competence, with limited evidence on how it fosters relatedness (Boguslawski et al., 2024; Chan & Lee, 2023; Pan et al., 2025; Shahzad et al., 2025), the participants' experiences highlight how over-reliance on generative AI can reinforce feelings of isolation but also support emotional resilience for those who struggle in new academic environments, for example by providing personalised support. Moreover, several participants also stressed that generative AI can promote a sense of belonging and inclusion when utilised efficiently for such purposes, especially for international students navigating cultural transitions. Third, while recognising the dual impact and the need for a balanced use of generative AI, this study contributes to student engagement theory by demonstrating how generative AI influences all five dimensions, particularly for culturally diverse international students.

Notably, we acknowledge that while several of our findings may also apply to home students and other international student demographics, we demonstrate the context-specific challenges and opportunities generative AI presents for postgraduate international students of Black and Asian backgrounds, particularly in navigating cultural, linguistic and academic transitions within UK higher education. Thus, by incorporating cognitive, social, emotional, agentic and behavioural engagement, this study provides a more holistic perspective on how generative AI influences student engagement, particularly for marginalised groups.

Most importantly, this study offers a conceptual contribution by developing a 'Psychological Needs Framework of Generative AI for Enhancing International Student Engagement' (see Figure 6). Given the likely permanence of generative AI within and beyond the education sector, this framework is crucial for guiding its effective use in supporting international student engagement by addressing their psychological needs. The framework offers key theoretical contributions by demonstrating how the dynamic influence of generative AI interacts with core psychological needs (autonomy, competence and relatedness) to shape student engagement, drawing upon the principles of self-determination theory (Deci & Ryan, 2000). Additionally, it recognises generative AI's capacity to both facilitate and present challenges to these needs. This framework offers new theoretical insights by illustrating three critical features that underscore its significance.

First, generative AI can act as a facilitator of psychological needs in learning. The framework underscores the transformative potential of generative AI in fostering students' autonomy, competence and relatedness, extending SDT into digital learning environments. Our findings suggest that generative AI fosters self-directed learning by providing students with on-demand academic support, reducing anxiety and bridging knowledge gaps. By scaffolding learning processes, it enhances metacognitive awareness and independent learning strategies, aligning with research on AI-driven educational empowerment (Dahri et al., 2024). More significantly, generative AI promotes a sense of competence by aiding academic writing, comprehension and concept mastery, particularly for international students adapting to unfamiliar academic systems. It also fosters relatedness by enabling

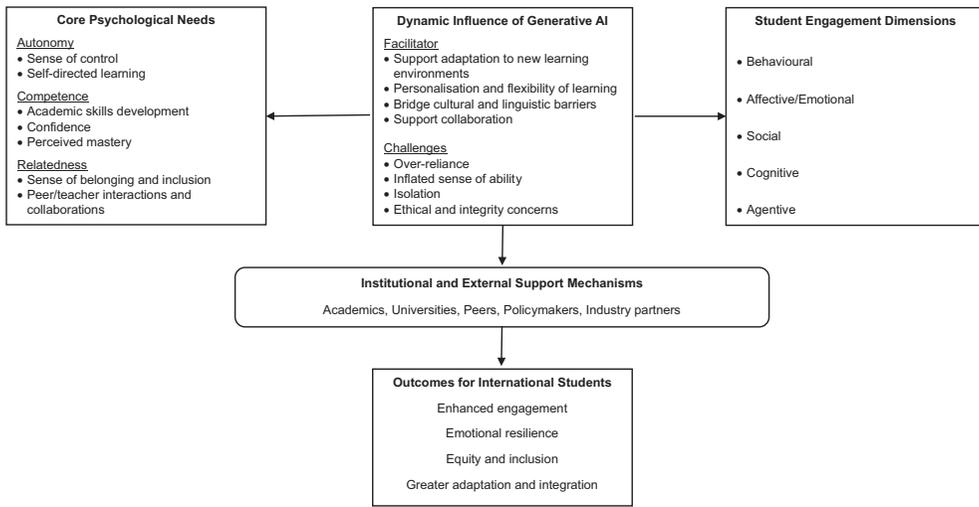


FIGURE 6 Psychological needs framework of generative AI for enhancing international student engagement. *Source:* Authors' computation.

collaboration and supporting peer interactions, helping students from diverse backgrounds overcome linguistic and cultural barriers. However, while generative AI empowers students, inefficient utilisation may lead to diminished self-efficacy and over-reliance, replacing rather than strengthening core academic skills (Chiu, 2024b). Some participants noted feelings of isolation when generative AI was used as a substitute for peer engagement, reinforcing concerns that technology should complement, not replace, human interaction. Thus, while generative AI enriches learning experiences, its effectiveness depends on integrating within broader academic and social ecosystems to maintain a balanced, holistic approach to education.

Second, the framework illustrates that generative AI can facilitate the five dimensions of student engagement by enhancing learning efficiency, fostering emotional resilience and promoting inclusivity. Notably, it positions generative AI as an active enabler of agentive engagement, where students take ownership of their learning by strategically leveraging AI tools for problem-solving, knowledge acquisition and shaping their academic trajectories. Furthermore, generative AI can support behavioural engagement by streamlining research, improving comprehension and enhancing productivity. Cognitive engagement can also be strengthened, as generative AI facilitates deeper exploration of complex topics, making learning more accessible, particularly for students from diverse linguistic backgrounds. Generative AI can also impact social and emotional engagement by acting as a catalyst for social learning (while still recognising potential risks of isolation) and as a resilience-building tool, reducing stress and anxiety associated with academic challenges, particularly for international students adapting to unfamiliar academic environments.

Third, from a practical perspective, this study's findings demonstrate that postgraduate international students often experience uncertainty, fear of accidental misuse and inconsistent messaging from academics regarding the use of generative AI. These concerns, particularly evident in the first and third themes, show how unclear institutional guidance can undermine students' autonomy, competence and sense of belonging. Consequently, the practical implications extend beyond individual student–AI interactions (Crawford et al., 2024; Gao et al., 2024) to consider how universities regulate, guide and integrate generative AI into academic practice. The content of university AI policies has profound consequences, particularly for postgraduate students entering the workforce. With generative AI poised to remain a

key aspect of education and employment, institutions must shift their approach from restriction to guidance, ensuring that students are equipped with the AI literacy necessary for the evolving job market (Herath et al., 2025). Failure to do so risks graduates being unprepared and losing opportunities to those proficient in AI-enhanced workflows. Moreover, it may amplify pre-existing inequalities among students, potentially creating long-term, entrenched disparities (Lim et al., 2023). Crucially, ethical risks such as plagiarism, misinterpretation and misuse of AI-generated content, and over-reliance on opaque systems underscore the need for clear, supportive training rather than punitive messaging. Therefore, universities must reinvigorate their reputation as a citadel of learning and innovation by reshaping curriculum adaptation suited to generative AI (Karataş et al., 2025) and investing in AI explainability for academics and students, ensuring transparency in AI decision-making and ethical use. The perceived fear and caution from academics regarding generative AI use can discourage students from openly engaging with it, even when they do so ethically. This places a burden on academics, who must investigate suspected AI use instead of focusing on students' skill development. Universities should prioritise policies that foster critical AI engagement, guiding students to harness AI responsibly while maintaining academic integrity.

The framework thus underscores that generative AI's effectiveness in education is not simply about its availability but about how institutions shape its role to balance autonomy, competence and relatedness in meaningful ways. Additionally, policymakers play a crucial role in shaping AI's ethical, educational and employment landscape. Policy frameworks, such as the UK National AI Strategy and Generative AI Framework (GOV.UK, 2024), should ensure inclusiveness in implementation. More so, industry collaboration is essential in equipping students with real-world AI skills and preventing a skills gap between graduates and workforce demands. It is essential for AI developers to create tools that cater to international students' diverse needs and ensure that these tools encourage students to develop academic skills rather than instigating their misuse.

Despite offering valuable insights, this study has its limitations. First, while providing depth, the qualitative approach limits the generalisability of findings beyond the specific sample of Black and Asian international postgraduate students in UK higher education. The sample of 27 participants, although appropriate for an in-depth, interpretivist study focused on lived experiences, does not capture the full diversity of postgraduate disciplines, institutional contexts or student trajectories. Consequently, the findings should be understood in terms of their transferability rather than statistical generalisability, offering theoretically informed insights that can inform future research, policy and practice rather than definitive claims about the entire postgraduate international student population. Future research could broaden participant demographics, include a larger and more disciplinary-diverse sample or undertake comparative studies across different postgraduate and undergraduate cohorts to further test and refine the framework developed in this study. Second, the research does not quantitatively measure engagement outcomes, making it challenging to assess the direct impact of AI on academic performance. Future research can adopt mixed methods, longitudinal approaches and multi-stakeholder perspectives to provide a more comprehensive understanding of generative AI's role in student engagement. Additionally, although ethical concerns surrounding generative AI, such as data privacy, authorship integrity, plagiarism and algorithmic bias, feature prominently in broader AI-in-education debates (Johnston et al., 2024; Kramm & McKenna, 2023; Lim et al., 2023), these issues did not emerge strongly as standalone themes in our findings. Participants tended to frame their anxieties in terms of fear of misuse, unfamiliarity with institutional policies and apprehension about being wrongly accused of academic misconduct. This reflects the study's focus on psychological needs and everyday engagement experiences, which shaped how participants interpreted AI-related challenges. Nevertheless, the limited presence of explicit ethical concerns represents a boundary to the study's scope. Future research could more directly examine how ethical considerations

influence international students' engagement with generative AI, especially as institutional policies and AI capabilities continue to evolve.

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CONFLICT OF INTEREST STATEMENT

The authors whose names are listed on the article certify that they have no affiliations with or involvement in any organisation or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study may be made available at the request of the corresponding author due to restrictions on information that could compromise the privacy of research participants.

ETHICS STATEMENT

Ethical approval was obtained from the ethics committee at Sheffield Hallam University.

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APPENDIX 1

INTERVIEW PROTOCOL

Main questions

1. How frequently do you use Generative AI tools in your studies, and for what specific purposes? How is it different from using other traditional learning methods (e.g. lectures, seminars, peer learning, etc.)
2. How do you feel when using Generative AI tools for your academic work? Why do you feel that way?
3. How has the use of Generative AI influenced your study habits and approaches towards coursework?
4. How do you perceive the role of Generative AI in helping you understand complex academic concepts?
5. Can you describe any strategies you employ while using AI?
6. If it's fine with you, I would appreciate it if you could provide some examples of how Generative AI has helped you complete your coursework by sharing your screen and briefly demonstrating how you use GAI.
7. Do you think the use of Generative AI has changed your emotional connection (motivation, interest, etc.) towards studying? If so, how?
8. Do you think using Generative AI in your learning helps to promote a better sense of belonging with other students, including your white peers? If so, how?
9. In what ways has Generative AI empowered you to take more initiative in your learning process? How does this compare to when you didn't use GAI?
10. Imagine using a Generative AI tool that can personalise your learning experience. How do you think such a tool could give you more control over your studies?
11. How confident do you feel about your skills and abilities when using Generative AI tools to achieve your learning goals? How does this compare to when you didn't use GAI?
12. What are your thoughts on specific features of Generative AI that you find particularly beneficial or detrimental to your learning?
13. If any, can you describe any instances where Generative AI did not meet your expectations or caused difficulties in your learning process?
14. What suggestions do you have for improving the design or implementation of Generative AI tools to better support minority group students?