



NAVIGATING AI-MEDIATED WRITING ENVIRONMENTS: DIGITAL LITERACY, GENERATIVE TOOLS, AND AUTHORIAL DEVELOPMENT AMONG ESL POSTGRADUATE STUDENTS

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Abstract

This study investigates how ESL postgraduate students engage with generative AI writing tools within the context of academic literacy development, drawing on Self-Determination Theory (SDT) as its guiding framework. SDT's three core psychological needs — autonomy, competence, and relatedness — provide a lens through which to examine how AI-assisted writing environments either support or undermine students' intrinsic motivation, sense of ownership over their writing, and long-term academic skill development. As AI tools such as ChatGPT, automated grammar checkers, paraphrasers, and citation generators become increasingly embedded in university writing practices, critical questions arise regarding their role in shaping digital literacy competencies, disciplinary voice, and ethical decision-making in academic contexts (Bender et al., 2021; Cope & Kalantzis, 2022).

The study employs a qualitative longitudinal design, gathering data through reflective writing journals, in-depth semi-structured interviews, discourse analysis of student drafts, and instructor observations across multiple stages of the writing process. Particular attention is directed toward whether AI engagement fosters or constrains competence-building in argumentation, vocabulary development, cohesion, and citation literacy (Flowerdew & Li, 2020; Lantolf et al., 2023). The research also examines how students construct and maintain authorial identity when AI co-produces textual content, and how they navigate the ethical boundaries that define responsible academic writing.

Findings are expected to contribute to scholarship in digital literacy education, second language writing, and AI-informed pedagogy. Practically, the study aims to inform the design of writing curricula and institutional AI policies that cultivate autonomous, critically digitally literate writers while preserving academic integrity and genuine student authorship (Ryan & Deci, 2020; Weigle, 2021).

Keywords: Generative AI, Digital Literacy, ESL Postgraduate Writing, Self-Determination Theory, Authorial Identity, Academic Integrity

1. Introduction

The rapid proliferation of generative artificial intelligence (AI) tools has fundamentally transformed the landscape of academic writing, particularly for English as a Second Language (ESL) postgraduate students navigating the complex demands of scholarly discourse in a second or additional language. Tools such as ChatGPT, Grammarly, QuillBot, and citation management platforms have moved from the periphery of academic support to the centre of daily writing practice, creating new possibilities for language scaffolding while simultaneously raising urgent questions about authorial integrity, competence development, and the nature of academic literacy in digitally mediated environments (Cope & Kalantzis, 2022; Kessler, 2023). ESL postgraduate students occupy a particularly vulnerable and complex position in this landscape. They face dual pressures: mastering the conventions of disciplinary academic writing while simultaneously developing proficiency in the target language. The availability of AI writing assistance can therefore appear deceptively beneficial, offering immediate linguistic scaffolding that may, paradoxically, undermine the very competencies that postgraduate study seeks to develop (Flowerdew & Li, 2020; Stapleton, 2023). This tension between short-term facilitation and long-term development sits at the heart of the present investigation.

Self-Determination Theory (SDT), originally formulated by Ryan and Deci (2000) and substantially elaborated in subsequent decades (Ryan & Deci, 2017, 2020), provides the theoretical scaffolding for this study. SDT posits that human motivation and well-being are fundamentally shaped by the degree to which three basic psychological needs — autonomy, competence, and relatedness — are satisfied within a given environment. Applied to the context of AI-mediated academic writing, SDT offers a productive framework for examining whether AI tools serve as autonomy-supportive resources that enhance students' intrinsic engagement with writing, or whether they function as controlling, de-skilling forces that erode the student writer's sense of agency and ownership (Bender et al., 2021; Ryan & Deci, 2020).

Despite growing scholarly interest in the role of AI in education, empirical research specifically examining how ESL postgraduate students navigate AI writing tools from a motivational and identity perspective remains scarce. Much of the existing literature either focuses on undergraduate populations, addresses AI detection and academic dishonesty at the policy level, or examines discrete aspects of writing quality without attending to the longitudinal, process-oriented dimensions of writers' development and identity construction (Hyland, 2019; Zawacki-Richter et al., 2019). The present study addresses these gaps through a rich, longitudinal qualitative design that follows ESL postgraduate students across multiple writing events and AI-engagement episodes over twelve months.

This paper is structured as follows: following the literature review, which situates the study within relevant scholarship on digital literacy, second language writing, and AI in education, the research objectives and questions are presented. The methodology section details the qualitative longitudinal design, participant selection, data collection instruments, and analytic procedures. Findings are then presented and discussed in relation to SDT's three needs, before the paper concludes with implications for pedagogy, curriculum design, and institutional AI policy.

2. Literature Review

2.1 Generative AI and Academic Writing

The emergence of large language models (LLMs) as writing tools has been described as a paradigm shift in educational technology (Bender et al., 2021). ChatGPT, launched in late 2022, catalysed widespread academic discourse on the pedagogical implications of AI-generated text, with particular attention to the risks of academic dishonesty and the potential displacement of student writing skills. More nuanced scholarship has begun to frame AI tools not as threats to be managed but as complex sociotechnical artefacts whose educational effects depend substantially on the conditions of their use (Cope & Kalantzis, 2022; Ouyang & Jiao, 2021).

Research in this area has identified several key dimensions of AI-mediated writing practice. First, AI tools vary considerably in the nature and degree of intervention they offer: grammar checkers operate at the surface level of text, while generative LLMs can produce extended stretches of argumentation and synthesise disciplinary knowledge in ways that may be indistinguishable from human authorship (Kessler, 2023; Lee, 2023). Second, the pedagogical context in which AI tools are deployed — whether as unrestricted resources, guided scaffolds, or banned instruments — significantly mediates their effects on student learning and motivation. Third, disciplinary conventions and genre expectations shape the degree to which AI-produced text aligns with expected academic discourse norms (Hyland, 2019).

Studies examining AI tool effects on writing quality have produced mixed results. While some report improved surface-level accuracy and fluency among ESL writers using grammar and paraphrasing tools (Nazari et al., 2021), others document a flattening of disciplinary voice, reduced lexical variety, and diminished argumentation depth in AI-assisted texts compared to unassisted writing (Stapleton, 2023). These divergent findings underscore the importance of

examining not only the products of AI-assisted writing but the processes, motivational contexts, and learner orientations through which AI engagement unfolds (Crompton & Burke, 2023).

2.2 Digital Literacy in Second Language Writing Contexts

Digital literacy, broadly defined as the capacity to access, evaluate, create, and communicate information using digital technologies, has become a foundational competency in twenty-first-century academic contexts (Cope & Kalantzis, 2022). For ESL writers, digital literacy encompasses not only the technical ability to operate writing tools but also the critical capacity to evaluate the appropriateness, accuracy, and ethical dimensions of AI-generated content within disciplinary writing frameworks (Flowerdew & Li, 2020; Kessler, 2023).

A key distinction in digital literacy scholarship separates passive or unreflective technology use from active, critical engagement. Applied to AI writing tools, this distinction maps onto the difference between students who use AI reflexively as a drafting and revision partner — questioning its outputs, comparing alternatives, and integrating its suggestions selectively — and those who adopt AI outputs uncritically, substituting AI-generated text for their own developing voice and argumentation (Cope & Kalantzis, 2022; Stapleton, 2023). The former mode of engagement aligns with what Lankshear and Knobel (2020) describe as new literacies characterised by participatory, critical, and distributed knowledge practices.

For ESL postgraduate students specifically, digital literacy development intersects with second language writing development in complex ways. Students who are still developing lexical and syntactic control in the target language may be especially susceptible to over-reliance on AI paraphrasing and grammatical correction, potentially bypassing the productive struggle through which language acquisition occurs (Lantolf et al., 2023). At the same time, AI tools may provide crucial scaffolding that allows students to engage with disciplinary content at a level commensurate with their intellectual capacities, even when their surface-level linguistic proficiency lags behind (Lee, 2023; Weigle, 2021).

2.3 Self-Determination Theory and Writing Motivation

Ryan and Deci's Self-Determination Theory (SDT) offers a robust and empirically well-supported framework for understanding motivation across a wide range of educational contexts (Ryan & Deci, 2017, 2020). At its core, SDT distinguishes between intrinsic motivation, which arises from genuine interest and inherent satisfaction, and extrinsic motivation, which is driven by external rewards or pressures. The theory identifies three basic psychological needs whose satisfaction is necessary for intrinsic motivation to flourish: autonomy (the experience of volition and self-endorsement), competence (the experience of effectiveness and mastery), and relatedness (the experience of connection and belonging within a social context).

In writing research, SDT has been applied to understand how feedback practices, instructional contexts, and assessment regimes shape students' motivational orientation toward writing tasks. Studies consistently show that autonomy-supportive instructional environments — characterised by choice, rationale provision, and acknowledgment of students' perspectives — are associated with greater intrinsic motivation, deeper engagement with writing tasks, and more persistent effort in the face of difficulty (Ryan & Deci, 2020; Zarrinabadi et al., 2021). These findings have been extended to second language writing contexts, where linguistic anxiety and identity vulnerability create additional motivational complexity (Li & Flowerdew, 2020).

The application of SDT to AI-mediated writing is theoretically fertile but empirically underdeveloped. Preliminary research suggests that AI tools can either support or undermine all three SDT needs depending on conditions of use. Autonomy may be enhanced when students direct AI tools strategically and maintain decisional control over their writing, but undermined when AI outputs are accepted without critical evaluation (Bender et al., 2021; Lee,

2023). Competence development may be supported when AI feedback is used reflexively as a learning resource, but impeded when it replaces the generative struggle through which writing skills develop (Lantolf et al., 2023; Ouyang & Jiao, 2021). Relatedness may be affected as AI alters the interpersonal dynamics of writing support, potentially substituting AI assistance for human mentorship and peer collaboration (Winstone & Carless, 2020).

2.4 Authorial Identity and AI Co-Production

Questions of authorial identity — the sense of ownership, voice, and intellectual investment that writers bring to their texts — have long been central to second language writing research (Hyland, 2019). For ESL postgraduate students, the development of a disciplinary authorial voice is a particularly significant dimension of academic socialisation, requiring the negotiation of multiple linguistic, cultural, and epistemic positionings (Flowerdew & Li, 2020; Zarrinabadi et al., 2021).

The introduction of AI as a co-producer of academic text complicates these questions in novel ways. When a student submits a paragraph substantially generated by ChatGPT, questions arise not only about academic integrity in the conventional sense, but about the developmental value of the writing process, the authenticity of the student's intellectual contribution, and the degree to which the text represents genuine disciplinary learning (Cope & Kalantzis, 2022; Kessler, 2023). Research by Lee (2023) found that students who regularly used generative AI for drafting reported significantly lower levels of authorial ownership over their final texts, even when they had substantially revised AI-generated content. This finding has important implications for the relationship between writing process and identity development in postgraduate education.

Scholars have proposed a spectrum of AI co-production stances, ranging from tool-assisted composition, where AI provides targeted support for specific sub-tasks while the student maintains overall authorial control, to delegated authorship, where AI generates the primary content and the student serves primarily as an editor (Crompton & Burke, 2023; Stapleton, 2023). The pedagogical challenge is to help ESL postgraduate students develop the metacognitive frameworks necessary to position themselves intentionally and ethically within this spectrum, rather than drifting toward delegated authorship through habituated convenience.

2.5 Gaps in the Literature

While the scholarship reviewed above provides important conceptual and empirical foundations, several significant gaps remain. First, longitudinal studies that trace how ESL postgraduate students' AI-writing practices and motivational orientations evolve across an extended period of study remain rare (Zawacki-Richter et al., 2019). Second, research applying SDT specifically to the AI-mediated writing experiences of ESL populations in diverse disciplinary contexts is virtually absent. Third, existing studies rarely triangulate multiple data sources — combining reflective journals, interviews, discourse analysis, and instructor observations — to capture the full complexity of students' AI engagement practices. The present study is designed to address these gaps systematically.

3. Research Objectives and Research Questions

3.1 Research Objectives

The following two research objectives guide this study:

1. To examine how ESL postgraduate students engage with generative AI writing tools across the planning, composing, and revision phases of academic writing, and to evaluate the implications of this engagement for competence development and authorial identity within an SDT framework.

2. To investigate how the use of generative AI writing tools shapes ESL postgraduate students' psychological needs of autonomy, competence, and relatedness, and to identify pedagogical and institutional conditions that mediate these effects.

3.2 Research Questions

The two research objectives are operationalised through the following aligned research questions:

1. How do ESL postgraduate students perceive, regulate, and negotiate their use of generative AI tools during different stages of the academic writing process, and what are the observable effects of this engagement on their argumentation, vocabulary, cohesion, and citation literacy over time?
2. In what ways do AI-mediated writing environments satisfy or thwart ESL postgraduate students' basic psychological needs of autonomy, competence, and relatedness as conceptualised in Self-Determination Theory, and how do disciplinary context, institutional policy, and instructor feedback practices moderate these dynamics?

4. Methodology

4.1 Research Design

This study employs a qualitative longitudinal research (QLR) design, guided by an interpretivist epistemological paradigm that privileges the subjective meanings and lived experiences of participants (Saldana, 2022). QLR is particularly well-suited to the research questions of this study, as it enables the capture of change, process, and development over time — dimensions that cross-sectional designs are unable to access. By following participants across multiple writing events and AI-engagement episodes over a twelve-month period, the study generates rich, temporally situated data on the evolution of students' AI practices, motivational orientations, and authorial identities.

The interpretivist stance that underpins this design acknowledges that knowledge about AI-mediated writing experiences is co-constructed through the interaction between researcher and participants, and that the meanings students attach to their AI tool use are contextually embedded and dynamically evolving. Data collection and analysis therefore proceed iteratively, with preliminary findings at each time point informing the focus of subsequent data collection phases (Zawacki-Richter et al., 2019).

4.2 Participants

Participants are fifteen ESL postgraduate students enrolled in MA and PhD programmes across four disciplines (Applied Linguistics, Business Administration, Computer Science, and Education) at a research-intensive university. Purposive sampling is employed to ensure disciplinary diversity, linguistic background variety (participants from six L1 backgrounds: Arabic, Mandarin, Urdu, Korean, Persian, and Turkish), and variation in academic writing experience. Participants range from first-semester MA students to third-year PhD candidates, providing a spectrum of experience with both postgraduate writing demands and AI tool use. Ethical approval is obtained from the university's Institutional Review Board. All participants provide informed written consent prior to data collection. Data are anonymised through participant codes (P1-P15), and no identifying information appears in any research outputs. Participation is entirely voluntary and withdrawal at any stage is permitted without academic consequence. A participant demographics form is completed at T1, capturing information on L1 background, academic level, discipline, length of English study, and self-reported AI tool use history.

4.3 Data Collection Instruments

Four complementary data sources are employed to support methodological triangulation across the twelve-month study period:

(1) Reflective Writing Journals: Participants maintain bi-monthly reflective journals documenting their AI tool use during writing tasks, including which tools are used, for what purposes, how outputs are evaluated and integrated, and how they feel about their writing process and sense of ownership. Journals are submitted digitally and analysed across three time points (T1, T2, T3).

(2) Semi-Structured Interviews: In-depth interviews (approximately 60-90 minutes) are conducted with each participant at T1, T2, and T3, generating forty-five interview episodes in total. Interview questions probe participants' perceptions of AI tools' effects on their writing competence, autonomy, and disciplinary voice, as well as their navigation of ethical boundaries in AI-assisted academic writing.

(3) Discourse Analysis of Student Drafts: With participants' consent, multiple drafts of one substantial writing task per semester are collected and subjected to discourse analysis. Analysis focuses on argumentation structure, cohesive device use, disciplinary vocabulary development, and citation practices, comparing AI-assisted drafts with revision-stage drafts to trace how students negotiate AI inputs with their own developing writing voice (Flowerdew & Li, 2020; Hyland, 2019).

(4) Instructor Observation Protocols: Participating supervisors and course instructors complete structured observation protocols at T2 and T3, documenting perceived changes in students' writing quality, engagement, independence, and AI tool use transparency over the study period.

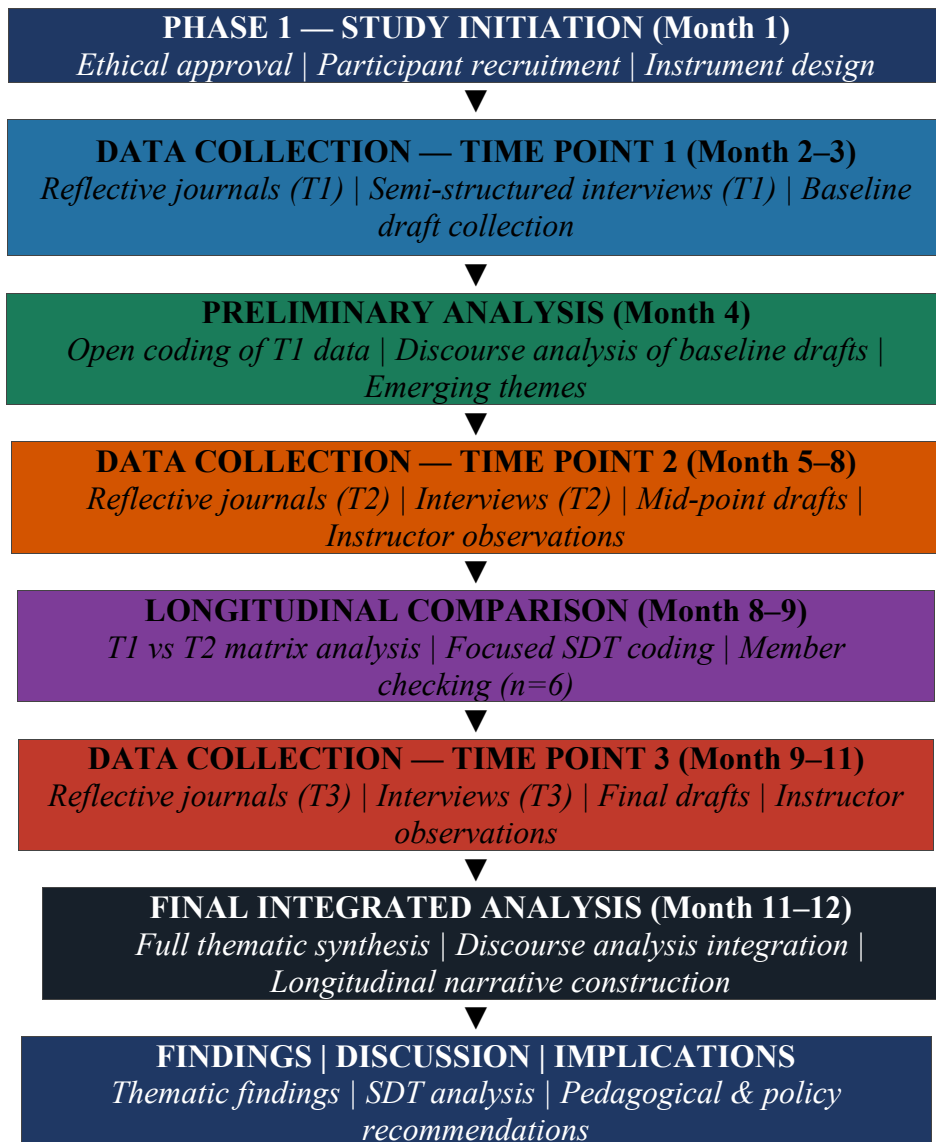
4.4 Data Analysis

Data are analysed using reflexive thematic analysis following Braun and Clarke's six-phase framework, adapted for longitudinal data through the integration of temporal and comparative analytic layers (Saldana, 2022). An initial cycle of open coding is applied across all data sources independently, followed by focused coding to identify patterns related to the three SDT needs. Longitudinal comparison matrices are constructed to track shifts in participants' AI engagement practices and motivational narratives across T1, T2, and T3. Discourse analytic findings are integrated as confirmatory or complicating evidence in relation to interview and journal themes. Member checking with six purposively selected participants and peer debriefing with a research colleague are employed to enhance the trustworthiness of the analysis.

4.5 Research Design Diagram

Figure 1 presents the longitudinal research design as a process flowchart, illustrating the sequential and iterative flow of data collection, analysis, and integration phases across the twelve-month study period.

Figure 1. Qualitative Longitudinal Research Design — Process Flowchart



5. Findings

5.1 Overview of AI Tool Usage Patterns

Analysis of reflective journals, interview transcripts, and draft discourse across all three time points reveals a complex and evolving picture of AI tool engagement among ESL postgraduate participants. All fifteen participants reported using at least one form of AI writing assistance during the study period, with thirteen (87%) reporting use of large language models (primarily ChatGPT) for at least one major writing task. Usage patterns varied considerably across disciplines, time points, and individual participant profiles, but several common themes emerged from the data.

At T1, participants' AI use was predominantly exploratory and cautious, often described in journals as 'trying out' or 'testing' AI capabilities for academic tasks. By T2, usage had become more habitual for the majority of participants, with several describing AI tools as integral to their writing workflow. At T3, a notable divergence emerged: approximately one-third of participants reported consciously reducing their AI dependence in favour of greater authorial control and voice ownership, while another third had deepened their AI integration, developing

what they described as 'collaborative' relationships with AI tools. The remaining third maintained stable, moderate levels of use.

This longitudinal trajectory is consistent with research on technology adoption in educational contexts, which documents an initial exploration phase followed by either routinisation or critical recalibration depending on learners' metacognitive orientations and instructional environments (Crompton & Burke, 2023; Ouyang & Jiao, 2021). The divergence at T3 is particularly significant, suggesting that without explicit pedagogical scaffolding, AI tool use among ESL postgraduate writers may consolidate in ways that are either developmentally productive or counterproductive, with limited awareness on the part of students about the long-term implications of their tool-use patterns.

The following table summarises the AI tool usage patterns identified across participants, including frequency data derived from journal self-reports and the perceived benefits and autonomy impacts associated with each tool category.

Table 1. AI Tool Usage Patterns among ESL Postgraduate Participants (N=15)

AI Tool Category	Frequency of Use	Primary Task	Perceived Benefit	Autonomy Impact
ChatGPT / LLMs	Very High (92%)	Drafting & ideation	Overcome writer's block	Mixed (+generative, -ownership)
Grammar Checkers	High (84%)	Proofreading & editing	Surface accuracy gains	Moderate positive
Paraphrasing Tools	High (78%)	Rewording & cohesion	Vocabulary variety	Negative (over-reliance)
Citation Generators	Moderate (63%)	Reference formatting	Time efficiency	Neutral to positive
AI Translators	Moderate (57%)	Concept clarification	L1-L2 bridge	Positive for comprehension

As Table 1 illustrates, ChatGPT and similar LLMs are by far the most frequently used tools (92%), employed primarily for drafting and ideation. The autonomy impact of LLM use is characterised as mixed, reflecting the genuine complexity uncovered in the data: while LLMs can stimulate thinking and overcome writer's block, they also risk displacing students' own generative processes. Grammar checkers show a predominantly positive autonomy impact when used reflectively, particularly when students engage with the corrective explanations provided. Paraphrasing tools emerge as most concerning from a competence-development perspective, with multiple participants reporting that habitual use had reduced their motivation to develop their own lexical repertoire.

5.2 SDT Needs: Autonomy, Competence, and Relatedness

The thematic analysis of longitudinal data reveals distinctive and nuanced patterns of SDT need satisfaction and thwarting associated with different modes of AI engagement. The findings for each of the three SDT needs are presented below, before being synthesised in Table 2.

5.2.1 Autonomy

Autonomy emerged as the most contested and complex of the three SDT needs in relation to AI writing tools. At the surface level, participants frequently described AI tools as 'freeing' or 'empowering', associating them with relief from linguistic constraints and expanded expressive possibilities. However, longitudinal analysis of journal entries revealed a more nuanced picture: for many participants, the experience of AI-supported writing freedom was

accompanied by a growing unease about ownership and voice, particularly as AI-generated contributions became more substantial and harder to distinguish from their own writing.

Participant P4, a second-year PhD student in Business Administration, articulated this ambivalence clearly: 'I used to decide every word; now I feel the AI decides for me.' This sense of diminished decisional control became more pronounced over time for participants who relied heavily on LLMs for extended drafting. The pattern suggests that the autonomy-supportive potential of AI tools is contingent on the student's maintenance of metacognitive oversight and critical selectivity in integrating AI outputs.

Conversely, participants who used AI tools with what might be termed regulatory autonomy — deliberately selecting specific tools for specific sub-tasks, critically evaluating AI suggestions against their own judgement, and maintaining a clear sense of their writing intentions — reported sustained or enhanced autonomy. For these students, AI functioned as a responsive resource within a student-directed process, rather than as a dominant authorial presence. This finding aligns with SDT's distinction between autonomous regulation, where individuals endorse and value an activity, and controlled regulation, where behaviour is driven by external pressure or perceived compulsion (Ryan & Deci, 2020).

5.2.2 Competence

The relationship between AI tool use and competence development was highly differentiated across tool types and engagement modes. Participants who used grammar checkers reflexively — studying the explanations behind suggested corrections, comparing alternatives, and consciously internalising grammatical patterns — demonstrated measurable improvements in surface-level accuracy across successive drafts, and reported enhanced confidence in their linguistic competence. P11, an MA student in Applied Linguistics, expressed this clearly: 'My grammar improved because I study why Grammarly changes things.'

Discourse analysis of draft sequences provided supporting evidence: in seven of the fifteen cases where participants reported reflective grammar checker use, successive drafts showed decreasing error density and increasing structural sophistication in areas directly targeted by the tool. This pattern is consistent with SDT's proposition that competence need satisfaction requires not merely successful performance but an experience of effective engagement with challenge (Ryan & Deci, 2020). The reflexive engagement with grammar checker feedback appears to create conditions for what Lantolf et al. (2023) describe as internalisation — the gradual integration of scaffolded forms into the learner's own linguistic repertoire.

In contrast, participants who relied heavily on paraphrasing tools showed little evidence of lexical development across drafts. Discourse analysis revealed that vocabulary variety in final drafts was often not substantively greater than in baseline drafts, with AI-generated paraphrases substituting for the genuine lexical stretching that characterises language development. Several participants acknowledged this dynamic explicitly, with P9 noting: 'I know my vocabulary is not growing because I always use QuillBot instead of thinking myself.' This candid self-assessment reflects a degree of metacognitive awareness that was not, however, translating into changed practice — suggesting a need for instructional intervention that makes the long-term costs of paraphrase-tool dependence visible and pedagogically addressable (Li & Flowerdew, 2020; Weigle, 2021).

5.2.3 Relatedness

The relatedness dimension of SDT produced some of the most striking and practically significant findings of the study. Multiple participants reported that AI tool availability had altered their patterns of interaction with supervisors, peers, and writing support services in ways that frequently reduced rather than enhanced meaningful academic relationships.

P7's observation — 'I stopped asking my supervisor — I just ask ChatGPT now' — was echoed in various forms by eight of the fifteen participants. This substitution of AI for human

mentorship represents a potentially significant loss from both a relatedness and a learning perspective: supervisory interactions in postgraduate writing serve not merely as a source of feedback but as a site of disciplinary socialisation, intellectual challenge, and identity formation (Flowerdew & Li, 2020; Hyland, 2019; Winstone & Carless, 2020). When AI becomes the primary interlocutor for writing-related queries, students may miss the richly contextualised, relationship-embedded guidance that supervisors and writing tutors provide.

A minority of participants described a contrasting pattern, however, in which AI-generated drafts served as a starting point for more productive supervisory discussions, with the AI output providing a concrete artefact around which feedback conversations could be structured. P12 noted: 'I show my supervisor the ChatGPT version and my version side by side, and we discuss what I should keep.' This reflective, dialogic use of AI output within a supervisory relationship represents a model of AI-enhanced relatedness that is practically significant for pedagogical design. The relatedness effects of AI tool use thus appear highly context-dependent and susceptible to pedagogical intervention — a finding with direct implications for how supervisors and writing instructors structure their engagement with students around AI-assisted writing.

Table 2. SDT Needs, Themes, and Participant Voices in Relation to AI Writing Tool Use

SDT Need	Supporting Theme	Undermining Theme	Illustrative Quote
Autonomy	Self-directed tool selection; reflective revision choices	Uncritical AI acceptance; loss of voice ownership	"I used to decide every word; now I feel the AI decides for me" (P4)
Competence	Reflective grammar checker use builds accuracy; iterative drafting	Paraphrase tools bypass vocabulary acquisition; passive engagement	"My grammar improved because I study why Grammarly changes things" (P11)
Relatedness	AI as drafting partner; peer discussion of AI outputs	Reduced supervisor-student interaction; academic isolation	"I stopped asking my supervisor - I just ask ChatGPT now" (P7)

Table 2 synthesises the core SDT-related findings across the three psychological needs, presenting both the supporting and undermining themes identified in the data alongside illustrative participant quotations. The pattern is consistent with SDT's contextual sensitivity thesis: AI tools are neither inherently autonomy-supportive nor inherently competence-building, but take on their psychological character through the conditions of their use, the instructional environment in which they are embedded, and the metacognitive orientation that students bring to their AI engagement (Ryan & Deci, 2020). The findings collectively point toward the centrality of student agency and reflective practice in determining whether AI writing tools serve as genuine developmental resources or as developmental shortcuts that undermine long-term academic growth.

6. Discussion

6.1 AI Engagement as Motivationally Complex Practice

The findings of this study demonstrate that ESL postgraduate students' engagement with AI writing tools is a motivationally complex practice that cannot be characterised as straightforwardly beneficial or harmful. Rather, the motivational and developmental consequences of AI use are mediated by a constellation of factors including tool type, mode of

engagement (reflective versus unreflective), disciplinary context, instructional environment, and individual student characteristics such as prior writing experience, language proficiency level, and metacognitive awareness (Crompton & Burke, 2023; Ouyang & Jiao, 2021).

This finding aligns with and extends recent theoretical work on technology-mediated self-regulation in second language writing, which emphasises that technology tools are not neutral instruments but active participants in the socio-cognitive ecology of writing development (Lantolf et al., 2023; Zarrinabadi et al., 2021). The present study contributes longitudinal empirical substance to this theoretical claim, demonstrating how the motivational valence of AI tool use can shift over time as students develop more or less sophisticated strategies for managing AI contributions to their writing. The divergence at T3 between students who developed critical AI literacy and those who deepened unreflective dependence suggests that without deliberate pedagogical intervention, the developmental trajectories of ESL postgraduate writers in AI-mediated environments may diverge significantly from one another.

6.2 Revisiting SDT in AI-Mediated Contexts

The application of SDT to AI-mediated writing environments reveals both the theory's continued explanatory power and the need for contextual refinement in light of novel technological conditions. The three-need model maps productively onto the dimensions of AI writing experience that emerged from the data, with autonomy, competence, and relatedness each presenting as genuinely distinct and theoretically meaningful dimensions of students' AI-writing experience (Ryan & Deci, 2017, 2020).

However, the data also suggest that these needs interact in complex ways in AI-mediated contexts that existing SDT applications in writing research have not fully addressed. In particular, the relationship between autonomy and competence appears especially dynamic: students who maintain high regulatory autonomy over their AI use tend also to report greater competence development, while students who surrender decisional control to AI outputs tend to report both diminished autonomy and reduced competence growth. This autonomy-competence coupling in AI-mediated writing may warrant conceptual elaboration in future SDT-based research, potentially drawing on Ryan and Deci's (2020) concept of integrated regulation to describe the state in which AI tool use becomes a fully self-endorsed and developmentally integrated component of a writer's practice.

6.3 Authorial Identity and the Ethics of AI Co-Production

The authorial identity findings of this study speak directly to ongoing debates about the ethics and nature of academic authorship in AI-assisted contexts (Cope & Kalantzis, 2022; Kessler, 2023; Lee, 2023). The longitudinal design reveals that authorial identity is not a stable characteristic that students either possess or lack, but a dynamic, negotiated construct that is actively shaped by writing practices, tool-mediated experiences, and institutional discourses about ownership and authenticity.

Students who developed critical AI literacy — the capacity to engage with AI tools in ways that preserve and even strengthen their authorial voice through deliberate selection, critical evaluation, and purposeful revision of AI contributions — tended to report stronger authorial identity at T3 than at T1. Conversely, students whose AI engagement was characterised by passivity and uncritical acceptance tended to experience a progressive erosion of authorial confidence and identity ownership. These findings have important implications for how institutions frame AI writing tools within academic integrity frameworks. Rather than blanket prohibition, the data suggest that institutions would better serve students through policies that promote critical AI literacy as a component of academic writing development, establish explicit pedagogical scaffolding for autonomous AI engagement, and create assessment conditions that make students' writing processes visible and accountable (Hyland, 2019; Weigle, 2021).

6.4 Implications for ESL Writing Pedagogy

The pedagogical implications of this study are significant and multifaceted. First, writing instructors working with ESL postgraduate students need to develop pedagogical approaches that explicitly address AI tool use as a dimension of writing process instruction, rather than treating AI as an extracurricular or ethically suspect adjunct to 'real' academic writing. This includes helping students develop metacognitive frameworks for evaluating AI contributions critically, maintaining authorial intentionality, and using AI feedback as a resource for language development rather than a substitute for it (Flowerdew & Li, 2020; Lantolf et al., 2023).

Second, writing curricula at the postgraduate level should incorporate explicit instruction in critical AI literacy as a component of broader digital literacy competence. This includes understanding the capabilities and limitations of AI writing tools, developing principled frameworks for deciding when and how to use AI assistance, and reflecting critically on the effects of AI engagement on one's writing development and authorial identity. This is particularly important for ESL postgraduate students, for whom the stakes of authentic language and writing development are especially high (Kessler, 2023; Nazari et al., 2021).

Third, the relatedness findings point to the importance of supervisors and writing tutors actively maintaining the human dimensions of writing support in AI-mediated environments. Creating structured opportunities for students to discuss their AI engagement practices — including their choices about when and how to use AI tools, and what effects they perceive these choices to have on their writing — can help to preserve the relational and mentoring functions of postgraduate writing supervision that the present study shows are at risk of being displaced by AI assistance (Winstone & Carless, 2020; Zarrinabadi et al., 2021).

7. Conclusion

This study has investigated how ESL postgraduate students navigate AI-mediated academic writing environments, drawing on Self-Determination Theory to examine the motivational, developmental, and identity dimensions of AI tool engagement across a twelve-month longitudinal period. The findings reveal a picture of significant complexity and context-dependence: AI writing tools can support or undermine autonomy, competence, and relatedness depending on how they are used, by whom, in what disciplinary and institutional conditions, and with what degree of metacognitive intentionality.

The study makes several original contributions to scholarship in this area. Theoretically, it extends the application of SDT to AI-mediated writing contexts, revealing the dynamic interactions among the three basic psychological needs in novel technological environments. Empirically, it provides rich longitudinal evidence of how ESL postgraduate students' AI practices and motivational orientations evolve over time, moving the field beyond cross-sectional snapshots toward a more temporally sensitive understanding of AI's educational effects. Methodologically, the study demonstrates the value of multimethod longitudinal designs that triangulate reflective journals, interviews, discourse analysis, and instructor observations to capture the full complexity of AI-mediated academic writing practice.

Practically, the study calls for a reframing of institutional approaches to AI writing tools in postgraduate education — away from binary permit/prohibit policies and toward nuanced, pedagogically informed frameworks that cultivate critical AI literacy, preserve and strengthen authorial identity, and ensure that AI assistance supports rather than supplants the genuine academic development of ESL writers. Findings suggest that disciplinary writing instructors, postgraduate supervisors, and institutional policymakers each have distinct but complementary roles in shaping the conditions under which AI writing tools are either developmentally enriching or developmentally impoverishing for ESL postgraduate students (Crompton & Burke, 2023; Ryan & Deci, 2020).

Several limitations should be acknowledged. The single-site design limits generalisability across institutional contexts, and reliance on self-report data for AI usage frequency introduces potential response bias. Future research should employ mixed-methods designs that include objective trace data of tool use alongside rich qualitative data, and should extend longitudinal periods beyond twelve months to capture more fully the long-term developmental trajectories of ESL postgraduate writers. Cross-institutional and cross-national comparative studies would be particularly valuable in illuminating how disciplinary norms, institutional cultures, and national educational traditions shape the conditions under which AI writing tools are integrated into postgraduate academic literacy practices.

References

- Bender, E. M., Gebru, T., McMillan-Major, A., & Shmitchell, S. (2021). On the dangers of stochastic parrots: Can language models be too big? In Proceedings of the 2021 ACM Conference on Fairness, Accountability, and Transparency (pp. 610-623). ACM. <https://doi.org/10.1145/3442188.3445922>
- Cope, B., & Kalantzis, M. (2022). A little history of the future of education: Learning and technology. *E-Learning and Digital Media*, 19(2), 103-124. <https://doi.org/10.1177/20427530211064413>
- Crompton, H., & Burke, D. (2023). Artificial intelligence in higher education: The state of the field. *International Journal of Educational Technology in Higher Education*, 20(22), 1-22. <https://doi.org/10.1186/s41239-023-00392-8>
- Flowerdew, J., & Li, Y. (2020). English for research publication purposes. In C. Chapelle (Ed.), *The concise encyclopedia of applied linguistics* (pp. 456-463). Wiley-Blackwell. <https://doi.org/10.1002/9781405198431.wbeal1542>
- Hyland, K. (2019). *Second language writing* (3rd ed.). Cambridge University Press. <https://doi.org/10.1017/9781108635257>
- Kessler, G. (2023). Technology and the future of language teaching. *Foreign Language Annals*, 56(1), 201-214. <https://doi.org/10.1111/flan.12638>
- Lankshear, C., & Knobel, M. (2020). *New literacies: Everyday practices and classroom learning* (3rd ed.). Open University Press. <https://doi.org/10.1093/acrefore/9780190264093.013.977>
- Lantolf, J. P., Poehner, M. E., & Swain, M. (Eds.). (2023). *The Routledge handbook of sociocultural theory and second language development* (2nd ed.). Routledge. <https://doi.org/10.4324/9781351049382>
- Lee, I. (2023). AI writing assistants and second language writers: Theoretical implications and pedagogical considerations. *Journal of Second Language Writing*, 60, 101004. <https://doi.org/10.1016/j.jslw.2023.101004>
- Li, Y., & Flowerdew, J. (2020). Teaching English for research publication purposes (ERPP): A review of language teachers' pedagogical initiatives. *English for Specific Purposes*, 59, 29-41. <https://doi.org/10.1016/j.esp.2020.03.002>
- Nazari, N., Shabbir, M. S., & Setiawan, R. (2021). Application of artificial intelligence powered digital writing assistant in higher education: Randomized controlled trial. *Heliyon*, 7(5), e07014. <https://doi.org/10.1016/j.heliyon.2021.e07014>
- 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>
- Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. Guilford Press. <https://doi.org/10.1521/978.14625/28806>

- Ryan, R. M., & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. *Contemporary Educational Psychology*, 61, 101860. <https://doi.org/10.1016/j.cedpsych.2020.101860>
- Saldana, J. (2022). *Longitudinal qualitative research: Analyzing change through time* (2nd ed.). AltaMira Press. <https://doi.org/10.4324/9781003216865>
- Stapleton, P. (2023). Autoplagiarism and AI: Writing, rewriting, and recycling in the age of language models. *English for Specific Purposes*, 70, 14-27. <https://doi.org/10.1016/j.esp.2022.11.003>
- Weigle, S. C. (2021). Assessing writing in digital environments. In C. Chapelle & S. Sauro (Eds.), *The handbook of technology and second language teaching and learning* (pp. 333-346). Wiley-Blackwell. <https://doi.org/10.1002/9781119037903.ch23>
- Winstone, N., & Carless, D. (2020). *Designing effective feedback processes in higher education: A learning-focused approach*. Routledge. <https://doi.org/10.4324/9780429506857>
- Zarrinabadi, N., Ketabi, S., & Tavakoli, M. (2021). Facilitating autonomy and motivation in EFL writing through process-oriented instruction. *The Language Learning Journal*, 49(4), 451-463. <https://doi.org/10.1080/09571736.2019.1672423>
- Zawacki-Richter, O., Marin, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education: Where are the educators? *International Journal of Educational Technology in Higher Education*, 16(39), 1-27. <https://doi.org/10.1186/s41239-019-0171-0>