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SCIENTIFIC KNOWLEDGE STRUCTURES: PROBLEMATISING AI-POWERED TRANSLATION TOOLS IN EFL ACADEMIC WRITING

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Abstract
Artificial intelligence (AI), particularly machine translation (MT), is transforming English language education, especially for English as a Foreign Language (EFL) learners. While research has explored this shift, uncertainties remain about MT's impact on language development in academic writing. This paper examines pedagogical practices in a teacher education program in Indonesia through the lens of Bernstein's theory of knowledge structures. It draws on reflective research conducted by Author 1, using data generated from fieldnotes of EFL academic writing sessions in which nine pre-service teachers actively participated as learners. The analysis reveals that while MT supports various language tasks, its unregulated use may hinder students' development of foundational skills such as sentence construction and paragraph organisation. Teacher intervention proved crucial in mitigating these challenges and fostering more effective academic writing. The findings emphasize the dual role of MT as both a support tool and a potential barrier, and offer empirical insights into how educators can balance AI use with essential language instruction. This study highlights practical implications for curriculum design and policy, reinforcing the indispensable role of teachers in integrating AI tools without compromising core language competencies.

Keywords: English as a foreign language, knowledge structure, machine translation, teaching writing

Introduction
The rise of artificial intelligence (AI) has seen a proliferation of automatic translation tools, such as Google Translate, Bing Microsoft Translator, DeepL, and Reverso Translation. These machine translation (MT) tools have become popular aids for students in academic assignment writing, allowing the translation of text, documents, and websites across languages. Google Translate, introduced in 2006, now supports 133 languages, with 24 added in 2022. In EFL contexts, students indicate a positive attitude towards MT in writing classes, with significant improvements observed in their work when using MT as a teaching tool (Chung & Ahn, 2022). In translation courses, MT tools have evolved into indispensable

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learning tools, playing a crucial role in familiarising students with the tools' functionality (Yang & Wang, 2019). Likewise, research into the use of MT in EFL writing classes advocates for teachers to actively adopt and integrate this application into their teaching practices (Bowker, 2020; Loyet, 2017). Research shows that more than 65% of EFL learners integrate online translation tools into their learning process daily (Kukulska-Hulme, 2024). The high rate of adoption of these tools emphasises the need to investigate their effects on language learning and teaching.

However, the widespread adoption of MT in writing classes may leave teachers grappling with ethical dilemmas, as students may present machine-generated drafts as their own work (Garcia & Pena, 2011). For this study, MT is defined as the use of machines to automate part or all of the translation process without human intervention (Li, 2022). Similarly, an ethical dilemma denotes a complex situation in which competing moral values create challenges in determining the right course of action. Since MT-generated text closely resembles human writing, teachers often struggle to identify student submissions created by an MT system (Stapleton & Kin, 2019). This situation poses a challenge, as teachers, aware of evaluating English text directly from MT, may lack motivation to offer constructive feedback. The assessment dilemma has led some schools and universities to prohibit essay submissions containing AI-generated paragraphs, anticipating potential ethical issues (Ibrahim, 2023).

In addition to ethical concerns, teachers may experience dilemmas about the relevance of MT to the learning objectives of academic writing. MT use in EFL classes may at times conflict with the core aim of academic writing courses—to help novice students develop foundational skills in English sentence and paragraph construction. Teachers may see these tools as hindrances that reduce students' motivation to grasp English sentence structure. Frequently, students employ MT as a shortcut, translating first-language text directly into the target language (Crossley, 2018). This practice has been associated with decreased motivation among students to construct sentences or articulate their ideas in the target language (Garcia & Pena, 2011). In essence, the use of MT may prove counterproductive for first year university EFL students, particularly when students passing MT-generated drafts as original work. This study aims to fill in the existing research gap by exploring how MT affects novice writers' motivation and skill development, using reflective field observations and classroom practice analysis. It provides insights into the constraints and opportunities of MT integration in EFL writing instruction. In doing so, our research extends previous studies by demonstrating the negative effects of unregulated MT implementation while providing an essential connection between classroom difficulties and Bernstein's (2018, 2000) knowledge structure theory.

Existing studies recommend using MT primarily for final checks rather than translating entire paragraphs. This approach helps students identify errors and improves accuracy in the target text (Chung & Ahn, 2022; Lee, 2020). In this case, teachers permit students to employ MT in the final stages, comparing their manually drafted work with the translated version for analysis. Despite ongoing debates about MT's impact on academic integrity, little research has examined its influence on students' language development beyond producing polished written products. This study addressed the gap by presenting a reflective investigation by instructors on classroom activities and the application of knowledge structure theory in an

academic writing course for EFL students. This article explores the impact of AI-powered translation tools on EFL academic writing, framed through the lens of disciplinary knowledge structures. This study is guided by the following question: How do beginner EFL students engage with machine translation tools during different stages of academic writing instruction?, and what pedagogical strategies can teachers implement to mitigate its negative effects while supporting language learning?

Knowledge structure and pedagogic tools of EFL academic writing course

Teaching how to write argumentative text in EFL context demands the deployment of suitable pedagogic methods to meet both teaching objectives and students' needs. To meet these needs, teachers often adopt diverse strategies—developing metacognitive instruction, enabling collaboration, and offering individualised writing support (Teng & Huang, 2021), giving constructive feedback as well as introducing students to writing tools (Hsiao & Chang, 2023). To address students' needs effectively, teachers must assess students' English language proficiency to anticipate challenges, plan accordingly, and choose appropriate tools to support the writing process. This needs assessment informs the selection, sequencing, and pacing of instructional materials in the curriculum (Synekop & Lytovchenko, 2024). Building on this foundation, recent post-2020 studies (Brown & Lee, 2025; Lee et al., 2023; Zhai & Wibowo, 2023) demonstrate how AI rapidly transformed language education while highlighting both its beneficial potential and its new challenges to established teaching methods.

It is also important to note that teaching in EFL context covers a wide range of knowledge areas. In this case, English has been used for basic literacy, studying literature, personal development, and cultural analysis. It has also been a way for students from non-English speaking countries to connect with the Western world. The wide range of knowledge areas in English can challenge teachers and students to prioritise and grasp the knowledge (Macken-Horarik, 2011).

Regarding the knowledge embedded in school subject, Bernstein's (2018, 1961) theory of the knowledge structure can be used to identify the knowledge embedded in EFL writing teaching. Clark (2005) also explains how this theory works in English/literacy classrooms and how it can help us understand the relationship between pedagogic discourse and educational policy. Knowledge structure concept proves valuable in understanding the connection between teachers' curriculum design and students' knowledge base. He distinguished two types of knowledge, namely vertical and horizontal knowledge that represent scientific knowledge and everyday knowledge respectively (see also Ivinson, 2020). Bernstein particularly directs his attention to the logics formulated by scholars within universities, portraying the structure of scientific knowledge as lucid, cohesive, systematically principled, and hierarchically organised. Meanwhile, horizontal knowledge structures are context-specific and exhibit intriguing contradictions across different contexts but remain consistent within a singular context. The relationship between these knowledge types is dynamic and evolves over time and may be different for different groups of students.

Given that scientific EFL academic knowledge is specialised, teachers must be adept at determining how to structure and organise the curriculum to meet students' educational needs. Consequently, teachers must ensure that students

possess foundational knowledge in academic English before introducing higher order concepts. These considerations naturally lead us to examine threshold concepts (Moodie, 2019), key understandings that prompt significant shifts in learners' perspectives and form the foundation for acquiring specialist knowledge in scientific English and academic writing. Connecting these threshold concepts with the structured use of AI-powered MT tools reveals how traditional pedagogical approaches can effectively support and guide the integration of emerging technologies.

Threshold knowledge in English academic writing pedagogy includes aspects such as academic essay generic structure, language features of academic text, and notably, English sentence structure. Christie and Macken-Horarik (2011) refer to these components as 'knowledge about language'. For example, in the realm of teaching academic writing, educators focusing on a text genre and its structure may find it necessary to employ iterative approach by which teachers revisit students' proficiency in sentence structure. Based on students' threshold competencies in sentence structure, teachers may then introduce higher order knowledge about paragraph writing, and generic structures of academic writing. In this regard, students are also taught how to write the introduction and the conclusion of argumentative texts.

By linking these knowledge structures with MT usage, this research evaluates the negative impact of excessive reliance on these tools in the vertical transmission of academic language. The horizontal language learning aspects provide potential countermeasures against these negative effects. Limiting AI use in writing classes allows students to build essential foundational skills. This perspective aligns with the approach taken by universities which address the anticipated use of AI-powered writing tools by implementing more intensive writing tutorials (Bloomberg, 2023). Moreover, the use of MT in EFL writing raises ethical concerns as students often rely on MTs to convert their first language (L1) text into the target language. This dependence on MT, particularly among students with limited English proficiency, may impair their ability to analyse and synthesise the English language they are attempting to use (Chen, 2021). Permitting students to use MT tools in the early stages may undermine their language learning process as it contradicts the core objective of academic writing instruction, developing students' ability to construct argumentative texts in English.

In English academic writing, therefore, teachers play a crucial role such as by guiding students in structuring sentences into paragraphs. This involves direct drafting of ideas in the target language, necessitating a comprehensive understanding of MT tools. It is vital for both teachers and students to discern when and how MTs should be incorporated into English academic writing class activities. Research currently available gives important insights about pedagogic methods and MT tools but most studies present individual findings without combining multiple perspectives to evaluate both advantages and disadvantages. Our research study fills this knowledge gap through a balanced literature synthesis which reveals previous research limitations about teacher-technology interaction and demonstrates how our classroom practice analysis enhances field understanding. Our research combines findings from various studies with our empirical observations to show how teacher interventions with structured guidance enable optimal AI tool integration for developing critical academic writing skills.

The literature review establishes our research within existing AI language education studies while it conducts an analytical evaluation of the conflicting research results from recent studies. Research studies demonstrate two opposing views about MT tools because they either praise their ability to enhance reading comprehension and writing fluency or warn against unregulated use that could negatively affect basic language development. The conflicting research results demonstrate why researchers need to develop integrated theory-based methods which combine Bernstein's knowledge structures with threshold concepts. Our review establishes the necessity of managing technology advantages against potential disadvantages to create pedagogical approaches that combine innovation with well-established theoretical principles.

Method

This study employed a qualitative research design to capture rich, contextualized insights into classroom practices, with a focus on teacher-student interactions and the integration of MT tools. Its data collection is rooted in the authenticity of classroom experiences and ensures that teacher-student relationships and AI-based translation tool integration are documented systematically and ethically. More specifically, it gathered data from fieldnotes of EFL writing classes in which nine pre-service teachers participated as students. The objective of these writing classes was to equip the students with the skills to produce argumentative academic texts.

The nine students were involved based on their English proficiency. To assess the students' language proficiency, a TOEFL equivalent test was administered, revealing the majority as 'beginners' with scores below 450. These scores provided valuable insight into their learning backgrounds and informed a regulated approach to MT tool use. To guide the teaching practice, particularly in the context of diverse language abilities, Author 1 adopted the genre-based cycle. This instructional framework encompasses key phases such as Building Context, Text Modelling, Joint Construction, and Individual Construction.

By utilising the process-genre approach (Rahimi & Zhang, 2022), the emphasis was on cultivating students' grasp of argumentative texts' generic structure, its language features, paragraph development, and how English works. We secured the students' voluntary participation through proper informed consent procedures for maintaining ethical research standards. They agreed to participate in this study after learning its purpose, which was to understand student learning needs and developing effective writing skill improvement methods rather than evaluating personal student performance. In this regard, we made it clear to them that the primary purpose of the research was to comprehend their learning needs and pinpoint effective methods to improve their argumentative writing skills. To maintain confidentiality, alphabetical pseudonyms were allocated to the participants and used in our data reporting.

Data analysis: Reflexivity and diffraction

The analysis employed reflective and innovative interpretive strategies to gain deep understanding of classroom experiences. This lens grounds our inquiry in established paradigms while opening space to explore how teacher practices and student interactions co-create dynamic learning environments. As part of this

approach, the analysis incorporated both reflexivity and diffraction to deepen insight into the relational and material dimensions of the research process. Building on these foundations, the authors used critical collaborative reflexivity practice as their second research method which included Schön's (1983) reflection-on-action approach. The research questions receive direct attention through this method which delivers detailed insights about teacher practice development alongside student interaction changes throughout the study period. This practice involves retrospective contemplation on experiences and Barad's (2014) attention to the entanglements between the researcher, the observed phenomena, and the methods of observation. Reflection on both action and inaction enables teachers to engage in the process of continuous learning, thus enhancing the quality of professional practice (Philp-Clark & Grieshaber, 2023). Reflexive researchers acknowledge the significant influence of their personal history, experiences, and beliefs on the processes and outcomes of 'heartful autoethnography' (Du Perez, 2008, p. 516).

By contrast, the concept of diffraction is used metaphorically to describe how knowledge is produced through the entanglement of different perspectives, discourses, and material practices (Barad, 2014). According to Barad (2014), this goes beyond a simple acknowledgment of the researcher's subjectivity, emphasising the active role of the researcher in the co-creation of knowledge. This involves an awareness of how researcher observations, instruments, and interventions shape the materiality of the research process and practice. Reflexivity acknowledges the researcher's entanglement with the study, while diffraction pushes beyond simple reflection, encouraging an exploration of how multiple perspectives interact to generate new meaning. It encourages the consideration of how different viewpoints interact and produce a unique pattern of understanding. Diffraction highlights the specificity and uniqueness of each entangled encounter, challenging the idea of a universal, fixed truth. Serra Undurraga (2023) argues that diffraction "is about understanding ourselves as continuously defined by, and defining, the world that we are studying" (p. 1118). Researchers using this method find themselves needing to grasp, represent, categorise, and pin down complex ideas.

Reflexivity and diffraction operate in tandem, recognising the intertwined nature of the research process. Researchers engage reflexively with their involvement, acknowledging how their perspectives and interventions are intricately woven into the research fabric. Diffraction, on the other hand, underscores the dynamic interactions among diverse elements, both human and non-human, throughout the research journey. Through reflexivity, researchers actively contribute to the co-creation of knowledge. Diffraction accentuates that knowledge does not merely mirror an external reflexivity; rather, it arises from the dynamic interplay of various elements. The researcher's reflexivity, and in this case, collective researcher reflexivity, plays a crucial role in shaping the specific diffraction pattern that emerges in and through the research process. Serra Undurraga (2023, pp. 1119-1120) asserts that focusing on the combined use of reflexivity and diffraction as concepts "can yield more diversity and nuance. Furthermore, an attention to how these … intra-act (with) each other brings about new conceptualisations and possibilities."

The first reflexive method adopted for data collection by Author 1 was the use of a personal reflexive research diary for class observation the participants

selected and recruited based on their English proficiency. In doing so, the English Language Department at the host university conducted a TOEFL prediction test to evaluate student English proficiency before program commencement. Students received placement into two groups according to their test results: Advanced learners achieved scores of 450 or higher and Novice learners received scores below 450. The department required Author 1 to organise instruction through this grouping structure to create lesson plans which addressed their specific needs. The nine research participants received their placement as novice learners. These participants, aged 18-20, had different learning experience since they attended different schools. Their previous schools were mostly located in rural areas.

The researcher maintained a personal reflexive diary throughout the study to document critical interpersonal insights impacting on the students and their data, record decisions and capture moments of analytic insight about practice. These instruments, appropriate for qualitative research, increase validity and trustworthiness by capturing the richness and complexity of lived classroom experiences while providing a reliable, systematic record of reflective processes over time (Yoon & Uliassi, 2022). Its use is consistent with the inherent nature of qualitative inquiry, where depth, context, and researcher subjectivity—central tenets of reflexivity—are crucial for generating rich, meaningful data, a practice also endorsed by Silverman (2021).

Thus, employing reflexivity and diffraction both as concepts and methods within our approach, we sought to thoroughly examine and analyse Author 1's practice of teaching English as a Foreign Language (EFL). As both educators with experience in Indonesian and Australian universities, we engaged in theoretical discussions about EFL teaching while developing this paper, drawing on our substantial experience in teaching and supervising non-English speaking students.

The first author organised diary fieldnotes based on the process-genre approach (PGA) cycle, a variant of genre-based pedagogy, to depict sequential and causal events in the academic writing classrooms (Rahimi & Zhang, 2022). PGA emphasises not only students' awareness of the interconnectedness of text components and their social functions but also their understanding of how English works. The four key phases of PGA cycle include Building Knowledge of the Field, Text Modelling/Deconstruction, Joint Construction (Process-stage: planning, drafting, editing), and Independent Construction (Rahimi & Zhang, 2022). Using this pedagogical cycle, this study examined teacher interactions with EFL students. The teacher-student interaction was analysed qualitatively with a focus on distinct attributes including teacher actions and students' attitudes toward MT tools. The process of critical reflection entailed discussions with the co-author of this paper, focusing on the approach in guiding students in constructing argumentative texts.

We started our data analysis by sorting fieldnotes and reflective diaries according to the PGA cycle to trace sequential and causal events in the academic writing classrooms. We then applied a combined reflexivity and diffraction approach, drawing on Schön's (1983) reflection-on-action and Barad's (2014) concept of diffraction, to examine how teacher practices and student interactions dynamically co-create knowledge. Bernstein's theory of knowledge structures provided a lens to interpret the interplay between curriculum design and students' learning processes in the context of EFL academic writing. This multi-layered

analytical framework is well-suited to our study as it captures the complex, dynamic, and subjective nature of the classroom experiences observed.

Findings and Discussion

Findings

The results of this study are presented in this section according to the stages of the PGA cycle and our reflective methodological approach. The findings are drawn from fieldnotes, reflective diaries, and classroom observations and offer a detailed picture of students' attitudes toward MT tools and the corresponding teacher interventions. These findings are examined through the lens of Bernstein's theory of knowledge structures, particularly the distinction between vertical and horizontal knowledge transmission.

Text modelling phase: Understanding genre and the risks of overreliance on MT

The teaching cycle began with efforts to build students' background knowledge on the topic of corporal punishment. To support this, the teacher provided supplementary materials, including videos and reading texts, to scaffold students' understanding from multiple perspectives. However, during follow-up discussions, most students admitted they had not reviewed these resources. Instead, they anticipated relying on MT tools such as Google Translate or DeepL to help them understand texts later.

This early overreliance on MT signalled a disruption in vertical knowledge development. Rather than engaging with English texts directly, students positioned MT as a primary rather than supplementary tool. From the perspective of Bernstein's vertical knowledge transmission, this reflected a bypassing of foundational linguistic development in favour of horizontal, context-dependent translation shortcuts.

This phase aligns with the Text Modelling stage of the PGA cycle. During this stage, the students were introduced to a model argumentative text to explore genre structure, paragraph organisation, and key linguistic features. They were guided to identify the thesis, analyse generic staging, and focus on sentence-level organisation and specific argumentative expressions.

Before this, in the Context-Building phase, students had been given access to supplementary materials, including videos and reading texts, to build content knowledge on the topic. These materials were intended to scaffold their understanding from various perspectives. However, most students admitted they had not reviewed the resources, suggesting a lack of motivation or preparedness for the modelling task.

In the Text Modelling phase, the teacher observed that students were not engaging directly with the English text. Instead, many copied entire paragraphs into MT tools such as Google Translate or DeepL and relied on the Bahasa Indonesia output for comprehension. This practice represents a significant deviation from the intended pedagogic method, which aimed to support genre and language awareness through close reading.

> *'Why did you put the entire paragraph into the MT instead of just the difficult vocabulary?' I asked one student.*

> *She replied, 'I hardly understand the meanings of each vocabulary, and it (the method) helps me to understand English texts more easily'.* [Vignette 1]

This illustrates how students bypassed opportunities to acquire foundational skills in sentence structure, vocabulary, and text organisation. Particularly for beginners, overreliance on MT undermined the gradual accumulation of linguistic knowledge that supports vertical development in academic English.

Variation in MT dependence became apparent. Some students selectively used MT to clarify difficult vocabulary, while others used it uncritically to process full texts. From Bernstein's perspective, students who translated whole texts from English to their first language without engaging in meaning-making interrupted the vertical transmission of academic knowledge.

This vignette captures the moment after the first author discovered the massive use of MT during class activities:

> *I thought aloud that I should keep the MT away from my students—I wanted them to learn how to compose English texts. I encouraged them to focus on the model text and asked, "While you are reading, please identify the subject and the verb phrases in each sentence." Then I added, "Underline the subject and circle the verb phrase." I walked around to monitor their work and realised many struggled to distinguish between subjects and verbs. When they could not do this effectively, I paused the lesson to teach basic sentence structures like SV, SVO, and SVC. I knew this foundational knowledge was critical before moving on to composition tasks*. [Vignette 2]

This targeted grammar instruction was necessary to re-establish vertical learning by reinforcing core linguistic structures before advancing to higher-level writing skills. The teacher's intervention marked a shift toward form-focused instruction, tailored to students' observed needs. Author 1 responded to students' reliance on MT by discouraging full-paragraph translation. This shift enabled her to better identify the specific areas where students required support. Recognising their limited grasp of English grammar and sentence structure, she adjusted her approach to focus on form-focused instruction. She aimed to help students build the foundational knowledge necessary for writing in EFL, particularly in contexts where AI-powered translation tools are increasingly used. This targeted intervention helped re-establish the vertical accumulation of academic language, reinforcing the step-by-step learning process outlined in Bernstein's (2018) framework.

These observations marked a turning point in classroom practice, leading to the collaborative drafting stage—the Joint Construction phase.

Joint construction phase: Negotiating MT use in collaborative writing

This transition from guided genre analysis to scaffolded drafting marked the beginning of the Joint Construction phase. Moving beyond model texts, students were now invited to apply their understanding by composing responses to the prompt, 'Do you agree or disagree with corporal punishment at school?' Author 1 instructed learners on draft development and promoted collaborative work. While observing the class, she noticed students composing paragraphs in Bahasa Indonesia and then using MT to translate their Indonesian writing into English. At

this juncture, the first author grappled with the dilemma of whether to permit students to use MT for initiating their writing. This tension is evident in the following diary entry:

> *Again, I saw that most students used MTs to translate their Bahasa Indonesia drafts into English. When students used MTs to complete their writing assignments and submit them to me, it undermines the purpose of my teaching. This approach does not align with my intended goal, which is for students to learn English written expression. In such a scenario, how can I evaluate their learning and provide corrections to their 'so-called' work?* [Diary note 1]

Although the literature on MT and language learning highlights the importance of MT (Bowker, 2020; Loyet, 2017), the first author felt uncomfortable letting the students interact with MT in this phase. Besides ignoring the language learning objectives, she wondered how she would present her feedback on MT's work. Responding to the tensions, the first author decided not to let the students go with the machine and forbade them from accessing the device. However, students seemed disappointed and nervous about her decision. This concern was evident in the following student exchange:

> *The students were quite worried about my rule for prohibiting MT usage. They tried to negotiate with me about how they can access AI powered MTs. Student A spoke, 'if you don't allow me to access Google translate, I don't know how to express my arguments in English'* [Vignette 3]

As illustrated in Vignette 3, the first author instructed students to refrain from using MT tools, despite their appeals for access. Her intention was to encourage students to construct sentences independently, rather than rely on copying machine-generated text. This moment underscored the tension between technological convenience and pedagogical intent, prompting instructional adaptations that reoriented student learning toward the sequential development of linguistic competence, consistent with the demands of vertically structured academic writing (Bernstein, 2000).

This pedagogical turning point set the stage for the Independent Construction phase. As students moved from shared drafting to more autonomous text construction, the teacher's role evolved to support both vocabulary development and grammatical accuracy.

Independent construction phase

In the Independent Construction phase, students were expected to apply their understanding of English academic writing by producing individual drafts. This stage followed the teacher's decision to restrict the use of MT tools, requiring students to rely on their developing language skills. The teacher's role shifted significantly during this phase, evolving into two key pedagogical identities: a linguistic resource and a grammar-focused instructor.

Teacher as 'living dictionary'

With limited access to MT, students struggled to independently produce English sentences and paragraphs. As they began planning their argumentative texts,

the teacher engaged them in one-on-one conversations to help clarify their positions on the topic of corporal punishment. Many students appeared hesitant and frustrated without MT support, unsure of how to express their ideas in English.
To address this stagnation, the teacher offered assistance:

> *'I will assist you in finding English vocabulary and expressions to represent your ideas'.*

This reassurance encouraged students to seek help. Once their argumentative stance was determined, the teacher supported them in outlining thesis statements and supporting points. Frequently asked questions included:

> *"What is … [word in Bahasa] in English?" "How do I say … in English?"*
>
> *The teacher responded to each inquiry, writing new vocabulary and phrases on the whiteboard so all students could learn spelling and meaning together. When students asked about culturally specific terms that were difficult to translate, she encouraged them to consider alternative Bahasa Indonesia expressions more suitable for translation.* [Diary Note 2]

The removal of MT shifted the teacher's role into a more hands-on facilitator of language learning. She supported students simultaneously with vocabulary development, English spelling, and sentence construction. Collaborative learning also emerged organically as students turned to peers for clarification and proofreading, with teacher-student text development occurring through direct engagement and modelling.

Teacher as 'grammar police'

The teacher also assumed responsibility for reinforcing grammatical accuracy as students wrote. She intervened frequently to address issues such as pronoun usage, subject-verb agreement, and verb tense:

> *I could not bear to see any mistake made by students regarding English language rules. In this cycle I taught English pronouns (such as I, me, her, mine/she, her, her, hers/we, us, our, ours); when I saw that a student wrote 'corporal punishment makes we...,' (It should be 'corporal punishment makes us …'). Then I taught subject-verb agreement, especially when I saw that students made mistakes in this considerably basic problem.* [Diary note 3]

Regarding students' voice, we identified students' positive response to this grammar intervention. They expressed appreciation for the clarity it brought to their writing:

> *Thank you. I now understand some English regulations.* – Student A
> *Your explanations about English rules make me aware of my mistakes.* – Student B
>
> *I used to use MT to compose English sentences uncritically, without knowing how the verbs changed in particular context. It wasn't good.* – Student C

Your restriction on using MT makes me learn many new words. – Student E

Restricting access to MT demanded significant instructional effort. The teacher frequently paused class activities to address language errors and assumed the roles of learning facilitator, human translator, and 'grammar police.' Despite the challenges, she found satisfaction in observing her students' gradual improvement in vocabulary, sentence structure, and writing confidence. After this collaborative and scaffolded process, students moved to completing their drafts. Before submission, they were reminded to ensure that each sentence included, at minimum, a subject and a verb, marking an essential step in their journey toward mastering academic English writing.

The teacher's iterative adjustments, captured through reflective diary entries and student responses, demonstrate the co-productive nature of knowledge, aligning with our use of diffraction and reflexivity to understand the entanglements between pedagogy, technology, and learner development.

Discussion

The study investigated the effects of AI translation tools on beginner EFL students' language development while studying teacher-led regulation of MT tool usage. Our study highlights that while AI-powered translation tools offer notable benefits for EFL learners, they also present significant challenges, particularly for beginners, in acquiring essential language skills. These challenges necessitate targeted teacher interventions, as revealed through our reflective insights and fieldnotes. Building on these primary results, our discussion now turns to situating our findings within the broader TESOL literature. This transition underscores the delicate balance between leveraging technological advancements and preserving the core processes of language development.

The findings also extend Bernstein's theory of vertical and horizontal knowledge structures by showing how overreliance on MT aligns with horizontal, everyday meaning-making. Teacher interventions, particularly those that focus on sentence-level form and structure, serve to reorient students toward cumulative, vertically integrated academic language development.

AI-powered translation tools have become a focal point in teaching English to Speakers of Other Languages (TESOL) research, with advancements demonstrating their effectiveness in enhancing communication for EFL learners (Lee, 2020). Learners have reported benefits in understanding English texts and completing writing tasks (Kelly & Hou, 2022). Existing studies recommend language teachers embrace and guide learners in the critical use of translation machines (Bowker, 2020; Loyet, 2017). This study adds teachers' perspectives to the discourse, aligning with the literature that underscores MT's significance and critical use (Chung & Ahn, 2022). While acknowledging the positive impact of using MT critically on writing (Lee, 2020), we take a unique stance, emphasising MT's role in students' language development beyond a product-oriented approach.

Drawing from the first author's experience and reflective insights documented in a reflexive diary, the use of AI-powered MT tools by beginner students in the early stages of a writing course proved less effective for language development. Rather than actively composing their own sentences, students tended to rely on MT to complete writing tasks quickly and effortlessly. This dependence

diverted their focus from the essential process of constructing English sentences, an important step in developing vertically structured academic knowledge. As a result, students missed key opportunities to internalise grammar, vocabulary, and sentence patterns, thereby weakening the foundation needed for more complex writing tasks. Similar patterns have been observed in other studies, such as Garcia and Pena (2011), where MT use undermined students' engagement with the writing process.

While teaching students to write in a foreign language without utilising MT seems challenging in the digital era, this study proposes that teachers restrict its use in writing classes for beginners. Before tackling argumentative texts, beginners should focus on acquiring skills in sentence and paragraph development. Limiting MT usage encourages a 'learning while drafting' approach, allowing teachers to identify students' specific learning needs. In this process, teachers can concentrate on enhancing language competencies in identified areas. Despite the Communicative Language Teaching (CLT) principle favouring implicit grammar teaching, we show that explicit instruction in English grammar is indispensable in writing classes for beginners.

The findings support Bernstein's (2018, 2000, 1999) theory of knowledge structures, which distinguishes between vertical (scientific, cumulative) and horizontal (context-dependent) forms of knowledge. Within this framework, the scientific knowledge structure of English academic writing requires teachers to identify and sequence threshold concepts, key ideas that enable students to progress to more advanced knowledge (Moodie, 2019). Foundational competencies such as sentence structure, paragraph development, and genre awareness serve as prerequisites for higher-level academic writing.

These theoretical insights informed the teacher's decision-making in regulating MT use, shaping how the classroom was structured to prioritise foundational knowledge acquisition. In this study, the teacher's interventions, such as explicit instruction in sentence structure and grammar, acted as a means of addressing these threshold concepts. Students needed to master these basics before progressing to higher-order academic writing tasks.

As such, EFL teachers must ensure that students develop proficiency in core aspects of language use, including grammar, cohesion, and argumentative structure. To support this progression, iterative teaching approaches are essential. Christie and Macken-Horarik (2011) emphasise the value of reintroducing key concepts throughout the learning process to consolidate students' understanding. In our study, teacher-researchers found it necessary to directly teach language rules, such as pronoun use, basic sentence patterns, and voice, especially in response to gaps in students' grammatical knowledge. These interventions were designed to help students navigate conceptual thresholds and access the vertically structured knowledge inherent in English academic writing.

Teachers are responsible for identifying essential concepts in academic writing development. This responsibility builds on a clear understanding of vertically structured knowledge. The first author made the pedagogical decision to restrict student access to AI-powered writing tools. Throughout the class activities, she ensured that students refrained from using MT when drafting and developing their writing, reinforcing the need for direct engagement with the target language.

Drawing on these insights, we identify four core pedagogical conditions that teachers must consider when regulating MT use in beginner academic writing

classrooms to support effective language development. First, teachers cannot compel students to abstain from using MT throughout the entire course unless a consensus is reached with students, specifying designated 'on-class project sessions' where MTs are inaccessible. Teachers must communicate the rationale behind restricting MT access: the focus is on learning how to write without MT assistance. Providing students with this information will show them the value and purpose of the limitation (Doyle, 2018). Additionally, internet access is prohibited during these sessions to prevent the replication of others' work from online platforms.

Second, teachers need to engage in negotiations with students to ensure compliance with this rule during the designated sessions. This involves informing students about the significance of limiting MT usage for the development of language skills (Zierer, 2019). In this process, teachers must caution students against the uncritical use of MT, which could lead to confusion and misunderstandings. A strong commitment is required from teachers to collaborate with students in developing their drafts and facilitating their learning.

Third, teachers should employ strategies to help students develop their drafts without translating the entire L1 draft into English text. In this scenario, teachers play a crucial role in assisting students in finding English vocabulary that accurately conveys their expressions. This involves teachers acting as 'living dictionaries' (Rao & Yu, 2021) or permitting students to use 'pocket' dictionaries to explore word meanings. Acting as living dictionaries offers students benefits such as learning new vocabulary, improving spelling, and understanding usage when teachers deliberately write words on a whiteboard, pronounce them, and incorporate them into sentences (Zhang, 2018).

Fourth, following the current Communicative Language Teaching (CLT) approach, teachers are advised to acquaint students with the target language. This involves exposing students to English spoken or written texts, and teachers should provide reading resources before engaging in writing activities (Bakken & Lund, 2018). Students' immersive interaction with authentic English texts can significantly enhance their development of knowledge and skills related to vocabulary and language structure in the target language. Importantly, exposure to English texts reduces students' reliance on MT during writing activities, as they become more acquainted with the relevant vocabulary for the given topic.

While Kukulska-Hulme (2024) suggests that MT restrictions may reduce opportunities for scaffolded support, others, such as Loyet (2017), propose that guided MT use can enhance linguistic competence by providing immediate lexical feedback and language support. This counterargument highlights the need to balance restrictions with opportunities for strategic technology use—an area that warrants further research.

The findings enhance existing theories about MT integration effects on EFL language development by specifying the effects and by disproving the idea that technology use always benefits students. This study shows that MT tools help students create first drafts and understand readings but their unregulated application might hinder the growth of essential language abilities which requires specific teacher guidance. Moreover, the impact of MT varies across proficiency levels, indicating that while advanced learners might leverage MT for deeper linguistic analysis and creative output, beginners often need more structured support to develop fundamental language skills.

These findings have important implications for TESOL practitioners and policymakers because they show the requirement for specific teacher training and precise guidelines regarding MT classroom implementation. The research limitations include studying one educational environment and a small participant group but the collected reflective insights create a solid basis for additional studies. Research should investigate the extended impact of MT regulation and its implementation methods in different learning settings to improve the findings' general applicability.

In addition, our findings suggest long-term effects on student self-directed learning and their ability to use digital tools effectively. Students who depend too heavily on MT tools risk reduced capacity for independent language learning and critical digital problem-solving. Therefore, educators must implement MT integration in a way that also fosters autonomy and digital literacy to meet the demands of future academic and professional contexts (Lee, 2020). Our findings underscore the need to regulate AI use in pedagogically principled ways, preserving space for deep language learning while preparing students for critically engaged participation in digital academic environments.

Conclusion

This study contributes to growing debates around the use of machine translation in EFL academic writing by showing that, for beginner learners, unregulated MT use can undermine the development of foundational language skills. Drawing on Bernstein's theory of vertical knowledge structures, our findings demonstrate that students need structured support and sequenced instruction to progress from surface-level text production to deeper engagement with grammar, cohesion, and academic genre.

While MT offers practical benefits, particularly in the drafting phase, its integration into EFL classrooms requires thoughtful mediation. We recommend that teachers, particularly those working with novice writers, limit MT use during in-class writing activities and instead focus on supporting learners as they acquire the core competencies of English sentence construction and paragraph organisation. These pedagogical choices are not about resisting technology but about preserving the conditions necessary for students to cross key threshold concepts in academic writing.

Implications for practice include the need for teacher education programs to incorporate training in digital literacy, including strategies for managing AI-powered tools like MT. Curriculum designers must also integrate digital tools in ways that align with the goals of language development, ensuring that technology serves to enhance, not bypass, the acquisition of academic English. Future research should explore how different models of MT regulation impact learner autonomy, grammatical development, and digital engagement across diverse instructional contexts. Ultimately, how we teach with technology must reflect not only what students can access, but what they must come to understand and how knowledge itself is structured, built, and made meaningful through language.

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