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Article

EFL Students' Engagement with Machine Translation as a Translanguaging Resource: A Mixed-Methods Study

Mariko Yuasa*
Osamu Takeuchi
Kansai University, Japan

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Abstract
Growing evidence supports machine translation's (MT) effectiveness for second and foreign language (L2) writing among English as a Foreign Language (EFL) learners. Although MT use by less-proficient learners is often criticised for causing disengagement from the writing process, how these learners actually interact with MT remains underexplored. Adopting a multidimensional engagement framework, this explanatory sequential mixed-methods study examines the engagement of CEFR A2-level EFL learners in MT-assisted writing. A novel instrument, the Engagement in MT-assisted Writing scale, was administered to 434 university students to assess four engagement dimensions: behavioural, cognitive (pre- and post-editing), affective, and social. Cluster analysis identified four distinct engagement profiles (high, moderate, affective–social low, and low), with social engagement being consistently weak across all groups. To contextualise these patterns, follow-up interviews were conducted with seven students—three from the high, three from the moderate, and one from the affective–social low group. The findings revealed that learners primarily used MT as a translanguaging resource for L2 writing, showing cognitive engagement through pre- and post-editing strategies to enhance MT output. Participants in the moderate and affective–social low groups also used MT to support multilingual, real-life communication. Despite frequent MT use, two moderate-group participants expressed uncertainty about revising MT outputs, while one reported feeling guilty about relying on MT. These insights may reshape educators' perspectives on students' MT use, highlighting the importance of targeted strategy instruction. Further, adopting translanguaging approaches can help students use MT purposefully to express their voices more confidently in L2 writing.

Keywords
Machine translation, engagement, second language writing, mixed-methods approach, translanguaging

*Corresponding author. Email: maritama0617@gmail.com

1 Introduction

Artificial intelligence (AI) has transformed how students approach second and foreign language (L2) writing, with machine translation (MT) emerging as an essential resource for university students (Chang et al., 2022; Chung & Ahn, 2022; Huang et al., 2025). Empirical research has consistently demonstrated that intermediate and advanced learners—those with a Common European Framework of Reference for Languages (CEFR) level of B1 and above—benefit significantly from MT use, producing linguistically more complex texts with fewer grammatical errors while developing metalinguistic awareness (Chon et al., 2021; Lee, 2020, 2022; Yang et al., 2023). However, many L2 educators have expressed concerns that MT use may reduce learning motivation or hinder L2 development (Groves & Mundt, 2021; Stapleton & Leung, 2019), particularly for low-proficiency learners (CEFR A2 level and below), who often face difficulties in writing independently or identifying errors in MT output (Chung, 2020, 2024; Lee & Briggs, 2021).

Recent research has approached MT through translanguaging theory, which views multilingual learners as dynamically drawing on their full linguistic repertoire (García, 2009). This perspective reframes MT as a vital composing tool for expressing voice in L2 writing (Jiang et al., 2024), rather than focusing solely on writing outcomes. Studies have elucidated how multilingual L2 writers use MT strategically as a translanguaging resource to convey intended meaning (e.g. Grieve et al., 2024; Zhou et al., 2022). However, while translanguaging highlights learners' strategic use of MT, it does not fully explain how learners engage in MT-assisted writing or how it is sustained.

In MT-assisted writing, students' active participation or *engagement* in the writing process becomes crucial (Yuasa & Takeuchi, 2024b), as reduced cognitive demands may inadvertently disengage students from the learning process (Briggs, 2018; Groves & Mundt, 2021). Defined as active involvement across behavioural, cognitive, affective, and social dimensions (Philp & Duchesne, 2016), engagement has gained prominence in second language acquisition (SLA) research, with empirical studies demonstrating that greater engagement leads to higher L2 achievement (Dincer et al., 2019; Hiver et al., 2024; Liu et al., 2023). The engagement framework has recently been applied to investigate students' use of automated writing evaluation tools such as Grammarly (e.g. Koltovskaia, 2020; Zhang & Hyland, 2023) and generative AI models such as ChatGPT (e.g. Huang & Teng, 2025; Teng & Huang, 2025); however, MT use has not been comprehensively investigated. Studies examining students' MT use and related attitudes mostly rely on single-item surveys that lack theoretical grounding. To our knowledge, no study has employed validated multi-item scales to systematically measure MT engagement (e.g. Alrajhi, 2023; Tsai, 2022; Zhou et al., 2022). More importantly, MT research has centred on intermediate and advanced learners, leaving the unique challenges faced by lower-proficiency learners underexplored (Klimova et al., 2022; Lee, 2023).

To address these critical gaps, this study examines how CEFR A2-level EFL university students engage with MT as a translanguaging resource. The translanguaging lens could offer new insights for educators who see MT as an obstacle, potentially facilitating MT tools' integration into writing instruction. Using a newly validated, multi-item engagement scale grounded in SLA theory (Yuasa & Takeuchi, 2025), this mixed-methods study investigates the following research question: How do university-level EFL students with limited proficiency engage in MT-assisted writing?

2 Literature Review

2.1 Conceptual framework

2.1.1 MT and translanguaging

In much of SLA research, L2 writing has traditionally been viewed as the production of error-free text, with outcomes measured according to their syntactic complexity, accuracy, lexis, and fluency

(CALF). These benchmarks, often set against native-speaker norms, reflect a monoglossic ideology that conceptualises languages as 'bounded autonomous systems', thus overlooking L2 users' fluid, multilingual practices (García, 2009, p. 158). Such perspectives may promote a deficit-oriented view of L2 learning, focusing on learners' linguistic limitations, while overlooking their multilingual competence and strengths (Grieve et al., 2024; Lin, 2020). Although academic writing standards remain important for discourse communities (Swales, 1990), such expectations can be daunting for low-proficiency learners, leading to their reliance on MT to produce text that exceeds their actual L2 proficiency (Murtisari et al., 2024).

Translanguaging perspectives challenge this deficit orientation. Originally defined as 'the act performed by bilinguals of accessing different linguistic features or various modes of what are described as autonomous languages, to maximise communicative potential' (García, 2009, p. 140), translanguaging has evolved with digital technologies to encompass *digital translanguaging* (Lu & Gu, 2024). In this framework, MT becomes 'a translingual and multimodal composing tool' (Jiang et al., 2024, p. 4) that enables learners to draw on their full linguistic repertoire and cultivate their own voice (Beiler & Dewilde, 2020; Grieve et al., 2024; Kelly & Hou, 2022). Within this framework, rather than merely compensating for deficiencies, MT serves as a meaning-making resource that reframes L2 writing as a dynamic, multilingual process.

While translanguaging theory explains how MT supports multilingual practices, it provides limited insights into how learners interact with MT. To understand how they maintain their MT use as a translanguaging resource, we must examine the concept of student engagement.

2.1.2 Student engagement

Given the rapid evolution of AI-assisted writing practices, it is essential to examine how learners' participation is sustained when assisted by AI-powered tools. The concept of student engagement—defined as active participation in the learning process (Mercer & Dörnyei, 2020)—has garnered increasing attention in SLA research (Hiver et al., 2021; Hiver et al., 2024). Engagement is multidimensional, encompassing behavioural (e.g. time on task and level of effort), cognitive (e.g. deep processing and strategy use), and affective dimensions (e.g. emotions and attitudes towards learning) (Mercer, 2019). Additional dimensions include social engagement (initiating and sustaining interaction [Svalberg, 2009]) and agentic engagement (proactive roles in learning [Reeve & Tseng, 2011]). This multifaceted framework enables exploration of how learners' initial intention to learn is sustained through these factors' dynamic interaction.

In MT-assisted writing, merely using MT tools (i.e. behavioural engagement) does not foster L2 development. Cognitive engagement—critically evaluating first language (L1) input and L2 output while applying specific strategies—is essential (Yuasa & Takeuchi, 2024b). Affective engagement is also important, as students who view MT as motivating, useful and valuable are more likely to integrate it into L2 writing (Chang et al., 2022; Chung & Ahn, 2022; Huang et al., 2025; Yang et al., 2023). Social engagement—e.g. peer interaction facilitated by MT—can enhance language awareness (Lee, 2021) and deepen cognitive engagement (Svalberg, 2018). Finally, agentic engagement—i.e. students' proactive efforts to create supportive learning environments (Reeve, 2013)—becomes increasingly relevant in technology-enhanced learning contexts (Kern, 2024). Taken together, translanguaging and engagement offer a complementary theoretical framework for examining how learners interact with MT in L2 writing.

2.2 Review of empirical studies

2.2.1 MT as a translanguaging resource

Research in higher education contexts has consistently demonstrated MT use's effectiveness in L2 writing (Klimova et al., 2022; Lee, 2023). When intermediate and advanced EFL learners use MT

to revise their self-written drafts, it helps improve their final writing by reducing grammatical errors and enhancing vocabulary use and syntactic complexity (Alrajhi, 2023; Chon et al., 2021; Lee, 2020, 2022; Tsai, 2022; Yang et al., 2023). These studies typically evaluate outcomes according to CALF benchmarks, which mirror academic writing conventions (Chon et al., 2021; Chung & Ahn, 2022). However, such measurements may overlook learners' dynamic process of utilising their full linguistic repertoire for L2 writing.

Recent empirical studies have examined MT use through a translanguaging lens, investigating how English for Academic Purposes (EAP) learners access their resources in L2 writing (Grieve et al., 2024; Liu & Chen, 2024; Zhou et al., 2022). Liu and Chen (2024) found that Chinese master's students employed MT as a translanguaging tool for academic writing, actively manipulating its output through strategies such as simplifying input, breaking down L1 sentences and comparing MT-generated alternatives. This 'richly heteroglossic' process reflects the learners' 'evolving meaning-making journey' (Liu & Chen, 2024, p. 14). Similarly, Zhou et al. (2022) investigated Chinese EAP students' writing practices in an English as a Medium of Instruction programme. These students critically engaged with MT to support their learning rather than simply replacing their own writing with MT output, demonstrating clear awareness of its affordances and limitations. For these students, MT served as a 'parallel technology' (p. 10)—i.e. an additional resource that complements conventional instruction. Grieve et al. (2024) reinforced this view through interviews with nursing and midwifery English as an Additional Language students at an Australian university. These linguistically diverse students dynamically utilised both L1 and L2 as resources, critically integrating MT into their writing assignments. The authors proposed 'an informed, strengths-oriented, and translanguaging approach' (p. 11), encouraging students to leverage their full linguistic repertoire through MT and other online tools.

These studies reveal the dynamic writing process of EAP students who strategically employ MT to construct meaning across languages. As Hall and Cook (2012) argued, 'the learners' own language plays a central role in the development and use of their new language' (p. 281). By engaging with L1 and L2, learners enhance their metalinguistic awareness, which supports language development (Roehr, 2008). While translanguaging studies have revealed how learners mobilise MT strategically, they have provided limited insight into whether and how consistently learners sustain such practices. This requires attention to student engagement.

2.2.2 Engagement in MT-assisted writing

A parallel debate concerns whether learners, particularly those with limited proficiency, remain engaged in MT-assisted writing (Yuasa & Takeuchi, 2024b). It has often been argued that lower-proficiency learners frequently input their L1 text into MT and use the output with minimal revision—a practice criticised as cognitive disengagement or L2 writing avoidance (Briggs, 2018; Murtisari et al., 2024). However, recent qualitative studies challenge this assumption, revealing more strategic and engaged approaches among learners with limited proficiency.

In a computer-tracking study of 49 U.S.-based novice-to-advanced French and Spanish learners, Hellmich and Vinall (2023) found that MT output was reviewed in 144 of 302 writing instances. Learners employed various strategies, including scrolling through alternative translations, adjusting input, cross-referencing word usage with external resources, and back-translation (translating MT output back to L1) to verify if the intended meaning was retained. This strategic approach was particularly evident among low-proficiency learners. Murtisari et al. (2024) observed CEFR A2-level Indonesian learners using back-translation to verify whether English MT output retained the intended L1 meaning, iteratively editing their L1 input until achieving satisfactory translation. These studies highlight how lower-proficiency learners actively employ pre-editing and post-editing strategies, contradicting assumptions of cognitive disengagement and revealing their engagement with the writing process.

Building on their qualitative findings, we must further explore engagement not in isolation but considering its multidimensional aspects. Although some studies have used surveys (e.g. Alrajhi, 2023; Tsai, 2022; Zhou et al., 2022), these tend to be single-item and lack theoretical grounding, thus reinforcing the need for validated measures.

2.3 Present study

Empirical research on translanguaging and engagement in the MT-assisted writing context has identified two focal gaps. First, studies have predominantly focused on advanced learners, thus offering a limited perspective of low-proficiency EFL learners. Second, engagement has only been partially explored, thereby necessitating comprehensive measurement through validated instruments. To address these gaps, this mixed-methods study investigated low-proficiency learners' MT engagement. We employed the Engagement in MT-assisted Writing scale, a newly validated instrument measuring four key engagement dimensions among Japanese university EFL students at the CEFR A2 level: behavioural, cognitive (encompassing both pre-editing and post-editing strategies), affective, and social engagement (Yuasa & Takeuchi, 2025). To fully capture learners' lived experiences outside the classroom, we complemented our survey data with individual interviews (Mackey & Gass, 2022). Thus, we investigated the following research question from quantitative and qualitative perspectives:

RQ: How do university-level EFL students with limited proficiency engage in MT-assisted writing?

3 Methods

3.1 Study design

To investigate the engagement of CEFR A2-level EFL students in MT-assisted writing at both the group and individual levels, we employed a mixed-methods design. This approach enabled a comprehensive, multi-level analysis by integrating quantitative and qualitative data sources (Dörnyei, 2007). Specifically, we adopted an explanatory sequential mixed-methods design (Creswell & Creswell, 2023), which involved an initial questionnaire survey followed by interviews to provide contextualised insights into individual experiences.

Survey data were initially analysed using cluster analysis to categorise learners based on their engagement level. Cluster analysis is a multivariate exploratory technique that identifies homogeneous subgroups (clusters) within a sample based on shared characteristics (Dörnyei, 2007). This method has been widely used in L2 research to group learners according to individual difference variables—such as attitudes, motivation, and strategy use—thus revealing diverse language learning trajectories (Staples & Biber, 2015). Follow-up interviews were conducted with selected participants from each cluster to gain deeper insights into their engagement profile.

3.2 Participants

The study involved 448 (234 male [52.2%] and 214 female [47.8%]) EFL students from a private university in western Japan, recruited through convenience sampling. Participants were first- (n = 192) and second-year students (n = 256), aged 18–22 years (M = 19.4, SD = 0.73). To align with the study's focus on lower-proficiency students, we targeted non-English majors enrolled in compulsory English classes that met twice a week. These students represented 15 disciplines, including sociology, social safety sciences, informatics, business and commerce, chemistry, and materials and bioengineering. English proficiency was assessed using the Global Test of English Communication-Listening and Reading (GTEC-LR)[1], with scores ranging from 0 to 500. Based on the test results (N = 434, M = 190.30, SD = 52.26), approximately 90% of the participants were at A2 level, with around 5% at A1 and 5% at B1.

3.3 Instrument

Quantitative data were collected using the Engagement in MT-assisted Writing scale, developed by Yuasa and Takeuchi (2025), to assess how Japanese EFL university students at the A2 level typically use MT, such as doing assignments outside the classroom. This 17-item scale assesses five dimensions of engagement: behavioural engagement (the time and effort learners invest in using MT), cognitive engagement in pre-editing (strategies used when inputting L1 text), cognitive engagement in post-editing (strategies employed to correct MT output), affective engagement (learners' attitudes towards using MT), and social engagement (learners' interactions with others to enhance MT usage). Agentic engagement was initially included but was removed following the exploratory factor analysis. The scale has been psychometrically validated, demonstrating satisfactory reliability coefficients ($\alpha > .70$) and confirmed construct, convergent, and discriminant validity. The questionnaire used a six-point Likert scale, ranging from 'strongly disagree' to 'strongly agree'. Additionally, participants reported their frequency of MT use on a separate six-point Likert scale ('never' to 'always'). Demographic data—including age, gender, and faculty—were also recorded. All survey items were administered in the participants' L1.

3.4 Data collection

This study conducted a two-phase data collection process comprising a questionnaire survey and semi-structured interviews. In the first phase, the Engagement in MT-assisted Writing scale was administered via Google Forms from November to December 2023. Using convenience sampling, course instructors contacted by the first author distributed the survey link to their students, who were invited to participate voluntarily using their smartphones. Students received an explanation of the study's purpose, data-handling procedures, and measures to ensure anonymity, in accordance with the university's ethical guidelines. Only those who consented moved forward with the survey. At the end of the survey, respondents were asked if they were willing to participate in follow-up interviews regarding their experience with MT. Of the 28 respondents, seven agreed to be interviewed—one in face-to-face and six online via Zoom. Table 3 outlines the profiles of the interview participants: five female students and two male students.

Table 1

Interview Participants' Profiles

Name[1]	Gender	Age	Year	GTEC-LR score[2]	MT tools used
Aoi	female	19	2	201	GT, DeepL
Mika	female	19	2	226	GT
Naomi	female	19	1	105	GT[3]
Saeko	female	20	2	195	GT
Yoko	female	19	1	119	GT, Papago
Koki	male	19	1	79	GT
Taka	male	19	1	89	GT

Note. [1]Pseudonyms; [2]GTEC-LR test scores out of 500, [3]Google Translate

The second phase, which involved interviews, took place in January 2024. Seven participants were again informed about the study's purpose, its voluntary nature, and the procedures for handling data to ensure confidentiality. Written informed consent was obtained prior to the interviews. The first author conducted one-on-one, semi-structured interviews in Japanese, the native language of both the interviewer and interviewees (see Appendix 1 for interview questions). A friendly and trusting atmosphere was

established to facilitate open and honest discussion with interviewees (who were meeting the interviewer for the first time), as 'building rapport, trust, and a comfortable atmosphere' is essential for effective online interviews (Guo et al., 2024, p. 3). Each interview lasted approximately 30 minutes, resulting in 180.9 minutes of recorded audio data from seven participants (M = 25.8 minutes per interview). The research protocol was reviewed and approved by the ethics committee of the authors' faculty (Approval #23-25).

3.5 Data analysis

3.5.1 Survey data analysis

The survey data were first cleaned by excluding samples with missing test scores. Outliers, which may indicate individual variation, were carefully examined and retained unless they displayed unnatural response patterns, such as selecting the same rating for all items. The final sample size was 434, ensuring adequate representation of the population. To identify distinct engagement groups, the Engagement in MT-assisted Writing scale data were clustered using JASP version 0.17. Hierarchical cluster analysis, a widely used method in L2 research (Staples & Biber, 2015), was performed using Euclidean distance to assess similarity. Ward's method served as the hierarchical clustering algorithm to produce clusters of comparable size (Hair et al., 2019). Group differences were then confirmed using one-way analyses of variance (ANOVAs), and each cluster was named to reflect its defining characteristics.

3.5.2 Interview data analysis

A content analysis was conducted to explore how students from each engagement group employed MT. The semi-structured interview data were transcribed using an AI-based transcription tool, Notta, and excerpts related to MT engagement were extracted. Upon review, six engagement categories were inductively identified and defined: behavioural, cognitive (in both pre-editing and post-editing), affective, social (consistent with the survey definitions), and agentic engagement, referring to learners' proactive use of MT in L2 learning. Following these definitions, the first author coded and labelled 112 excerpts. A second coder independently labelled the data, achieving an inter-rater reliability of 94.6%. Six discrepancies were identified and resolved through discussion.

4 Results

4.1 Quantitative findings

We aimed to identify distinct student engagement groups in MT-assisted writing, based on the intensity of five engagement constructs: behavioural, cognitive (pre-editing), cognitive (post-editing), affective, and social engagement. The self-reported frequency of MT use was summarised: 63 participants (14.5%) reported using MT 'always', 215 participants (49.5%) 'often', and 132 (30.4%) 'sometimes', together accounting for 94.5% (n = 410) of the 434 participants. Conversely, 24 participants (5.5%) reported lower frequencies of MT usage, with 12 (2.8%) selecting 'not very often', 8 (1.8%) choosing 'hardly ever', and 4 (0.9%) indicating 'never'. These results indicate that most participants used MT frequently (N = 434, M = 4.69, SD = 0.88).

Table 2 presents descriptive statistics for the Engagement in MT-assisted Writing scale, including questionnaire items with means, standard deviations, and reliability coefficients for each engagement factor. The data were normally distributed, with acceptable skewness and kurtosis values (± 1.96; Hair et al., 2019). Although the reliability for cognitive engagement in pre-editing was relatively low (Cronbach's

α = .73), all factors exceeded the .70 threshold (Hair et al., 2019), indicating acceptable internal consistency. Overall, participants reported strong behavioural and cognitive engagement (both pre- and post-editing), alongside relatively high affective engagement. By contrast, social engagement showed the lowest mean among all factors.

Table 2

Descriptive Statistics for Engagement in MT-assisted Writing (Six-point Likert Scale)

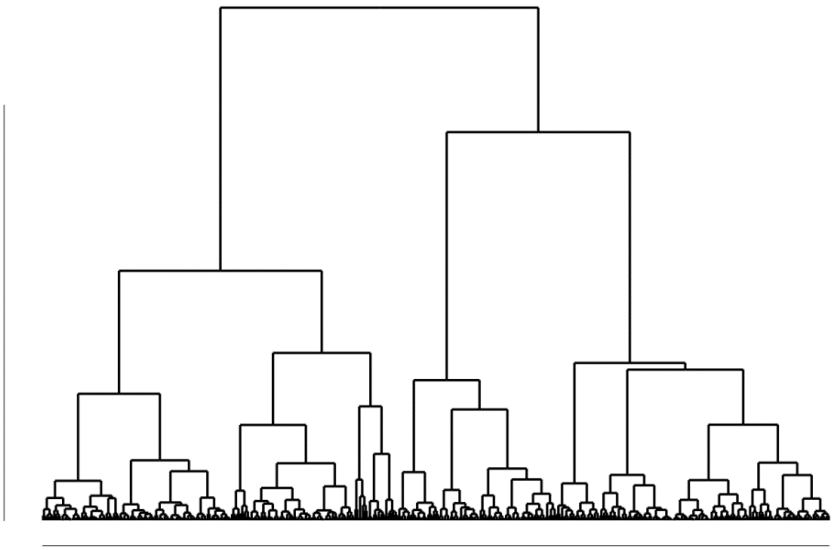
No.	Questionnaire items	*M*	*SD*
	Behavioural engagement (α = .87)		
1	I rely heavily on MT when writing in English.	4.37	1.18
2	I often use MT when writing in English.	4.53	1.03
3	MT is indispensable for writing in English.	4.50	1.10
4	I actively use MT when I feel I cannot write well in English on my own.	4.85	0.96
5	I actively use MT instead of Japanese–English dictionaries.	4.76	1.10
	Cognitive engagement in pre-editing (α = .73)		
6	I modify the Japanese source text until the intended English text is produced.	4.26	1.18
7	I use easy-to-understand Japanese in the source text when I use MT.	4.75	1.07
8	I add a Japanese subject in the source text if it is missing when I use MT.	4.68	1.06
	Cognitive engagement in post-editing (α = .84)		
9	I check the English in the MT output and self-correct errors if necessary.	4.77	1.05
10	I read the MT output to see if it is correct.	4.84	1.06
11	I always compare the Japanese I entered in the source text with the English in the MT output.	4.80	1.02
	Affective engagement (α = .83)		
12	Using MT makes writing in English less challenging.	4.01	1.14
13	I feel good about using MT because I can write English sentences fluently.	3.85	1.16
14	If I can use MT, I am happy to write in English.	3.64	1.33
	Social engagement (α = .81)		
15	I ask my friends, teachers, or someone outside school what MT applications are available.	2.86	1.32
16	I ask my friends, teachers, or someone outside school how to use MT.	2.63	1.26
17	I discuss how to use MT with my friends or teachers.	2.52	1.32

Note. MT = machine translation, L2 = second language.

Subsequently, agglomerative hierarchical cluster analysis was performed using Ward's method alongside the Euclidean distance technique to create student engagement profiles. Based on the dendrogram (Figure 1), a four-cluster solution was selected that balances interpretability with clear group differentiation. An ANOVA confirmed significant differences among clusters across engagement variables. Table 3 outlines the means and standard deviations for each engagement variable and frequency of MT use, along with the ANOVA results, which indicate significant group differences with large effect sizes, $\eta^2 > .16$, (Plonsky & Oswald, 2014).

Figure 1

Dendrogram of the Clustering Procedure



Note. The vertical axis represents the steps in the hierarchical procedure, whereas the horizontal axis displays each sample.

Table 3

ANOVA[1] Results: Group Performance in T-assisted Writing Engagement

Engagement variables	**Cluster 1** *n* = 86 (19.8%)	**Cluster 2** *n* = 171 (39.4%)	**Cluster 3** *n* = 84 (19.4%)	**Cluster 4** *n* = 93 (21.4 %)	***F*-value[2]**	η^2
	M (SD)	*M (SD)*	*M (SD)*	*M (SD)*		
Behavioural	5.24 (0.69)	4.86 (0.56)	4.41 (0.93)	3.70 (0.78)	81.03	.36
Cognitive (pre-editing)	5.42 (0.56)	4.63 (0.55)	4.49 (0.97)	3.71 (0.77)	89.52	.38
Cognitive (post-editing)	5.64 (0.46)	4.60 (0.74)	5.27 (0.68)	3.99 (0.83)	99.36	.41
Affective	4.84 (0.90)	4.08 (0.57)	2.66 (0.86)	3.51 (0.81)	130.45	.48
Social	3.23 (1.24)	2.56 (0.99)	1.77 (0.68)	3.16 (0.89)	41.80	.23
Frequency of MT use	5.06 (0.84)	4.91 (0.62)	4.55 (0.77)	4.10 (0.93)	27.29	.16

Note. [1] one-way analysis of variance, [2] $p < .001$, The post-hoc tests were conducted using the Games–Howell method, as the sample size of each group was not well balanced. Most cluster pairs had a significant difference ($p < .001$), except for clusters 2–3 in cognitive engagement in pre-editing and 1–4 in social engagement.

An ANOVA analysis identified four distinct engagement clusters: high engagement (Cluster 1), moderate engagement (Cluster 2), affective–social low engagement (Cluster 3), and low engagement (Cluster 4). These clusters showed clear patterns across most engagement constructs, as well as frequency of MT use. However, social engagement deviated from the patterns observed in the other dimensions. As shown in Table 3, the high-engagement group (Cluster 1), comprising approximately 20% of the sample, reported the highest scores across all engagement dimensions. By contrast, the low-engagement group (Cluster

4), also representing about 20% of the sample, demonstrated the lowest levels of engagement in most areas. However, their social engagement scores were comparable to those of the high-engagement group. The moderate-engagement group (Cluster 2), the largest one with nearly 40% of the sample, showed average levels of engagement across most constructs. Notably, the affective–social low group (Cluster 3), comprising nearly 20%, displayed a different engagement pattern—the lowest levels of affective and social engagement but high cognitive engagement, particularly in post-editing. Another distinctive feature of this group is their English proficiency, indicated by GTEC-LR test scores. This group had significantly higher scores (M = 208.98, SD = 48.37) than the high (M = 185.23, SD = 48.35), moderate (M = 186.67, SD = 50.96) and low (M = 184.77, SD = 58.21) engagement groups (F = 4.58, p = .004, η^2 = .03).

4.2 Qualitative findings

Using interviews, we examined how students from each engagement group interacted with MT. Based on the cluster analysis, seven participants were assigned to three engagement clusters: Naomi, Saeko, and Yoko in the high-engagement group; Aoi, Koki, and Taka in the moderate-engagement group; and Mika in the affective–social low-engagement group (see their profiles in Table 1). No participants were categorised into the low-engagement group. The interviews revealed students' diverse engagement with MT. To illustrate this, interview excerpts were summarised using six engagement codes: behavioural, cognitive in pre-editing, cognitive in post-editing, affective, social, and agentic. These were accompanied by the participants' names and turn numbers (T#), indicating their position in the interview transcript (Tables 4–9).

4.2.1 Behavioural engagement

All participants except Aoi reported using MT for their writing assignments. Additionally, Aoi, Koki, and Mika reported using MT for authentic communication with foreigners, a practice made accessible by smartphones (Table 4). For example, Koki used MT as a translanguaging tool to communicate with foreign rugby players at the international matches in Singapore, Taiwan, and Japan, translating from L1 Japanese to L2 English, a lingua franca for all.

Table 4

Summary of Behavioural Engagement

High engagement	Moderate engagement	Affective–social low engagement
• To find unknown expressions when writing a diary in English (**Naomi**, T197). • To keep up with the compulsory English class held online (**Saeko**, T100). • To overcome difficulty in expressing herself in English assignments (**Yoko**, T110).	• To hold conversations with foreign students in the dormitory **(Aoi**, T54) • To communicate with foreign rugby players during international matches (**Koki**, T147,181, 187) • To complete L2 writing homework (**Taka**, T116)	• To manage foreign customers at a restaurant using expressions beyond fixed phrases while working part-time (T157); to find French (new L2) verbs and nouns that can be used from the textbook (**Mika**, T161)

Aoi explained her reliance on MT when conversing with international students at the dormitory:

> *I try to speak [in English] without using MT, but our conversation doesn't last. When my conversation partner looks puzzled and says, "Pardon?" I immediately turn to MT.* (Excerpt 1; Aoi, T140).

Reflecting on her first-year compulsory English class, Saeko described the challenges of keeping up with online learning after the pandemic:

> *On entering [university], I suddenly had to speak and write in English, but I'd never learned to communicate in English. I couldn't keep up in class without translating behind [the computer screen]* (T100). *Since then, I've relied heavily on MT and have gradually found it helpful.* (Excerpt 2; Saeko, T102)

Naomi, Yoko, and Mika primarily used MT to support their writing. Particularly, Mika expressed frustration over her limited vocabulary and the challenges of expressing herself in L2:

> *I need to use MT when I want to use expressions I don't know. Otherwise, my [vocabulary] won't improve* (T79). *... Except when studying for exams, how we consult [unknown words] is more important than what we learn, although I don't feel like I'm making any progress [in English].* (Excerpt 3; Mika, T174)

4.2.2 Cognitive engagement in pre- and post-editing

When entering Japanese text into MT, all participants—except Koki and Taka—used translation-friendly, easy-to-understand Japanese, opting for written forms rather than colloquial expressions (Table 5). Instead of writing in L2, they used L1 to construct L2 sentences and repeatedly refined L1 until they achieved satisfactory results. Most participants explained their strategies during this process in detail; however, Koki and Taka were unable to articulate theirs.

Table 5

Summary of Cognitive Engagement in Pre-Editing

High engagement	Moderate engagement	Affective–social low engagement
• Use written forms as in textbooks (**Naomi**, T167). • Use easy-to-understand L1 (T151); Type L1 with intended L2 structures such as 'if' and 'because' clause (**Saeko**, T134, 137). • Use less complicated (T114), formal L1 (**Yoko**, T137).	• Try to use formal L1 (**Aoi**, T88) • Type L1 into MT repeatedly until the intended L2 output appears (**Koki**, T133) • Change word order, such as adverbs (**Taka**, T142)	• Type different L1 expressions into MT several times (**Mika,** T109)

The interviews revealed that participants did not blindly trust the MT output. They assessed its accuracy as low as 'fifty-fifty' (Saeko), 'passable' (Koki) or between 70%–90% (Taka, Yoko, and Naomi), with Mika stating that accuracy 'depends on our Japanese'. These uncertainties led participants to frequently review and verify the MT output, often employing back-translation to ensure that the intended meaning was conveyed. They resorted to their L1 to evaluate the accuracy of L2. However, the depth and nature of their post-editing strategies varied considerably (Table 6).

Table 6

Summary of Cognitive Engagement in Post-Editing

High engagement	Moderate engagement	Affective–social low engagement
• Back-translate MT output to ensure nuances are maintained (T115); check and replace L2 words using other apps/ websites (T121); correct grammar (**Naomi**, T161) • Re-type L1 to ensure intended structures or nuances (T137); modify MT output and back-translate (**Saeko**, T153) • Cross-check Papago's output using Google Translate to ensure meaning (T86); change original L1 if unfamiliar L2 vocabulary appears (T115); check unfamiliar vocabulary on the websites (**Yoko**, T125)	• Use DeepL to double-check Google Translate output for politeness (**Aoi**, T72,88) • Adjust verb tenses in MT output (**Koki**, T202) • Read and check MT output (**Taka**, T121)	• Replace unknown words with familiar ones (T97); modify sentence structures (e.g. active/passive voices) (T101); check unknown words online (T105); back-translate to confirm meaning (**Mika**, T123)

Naomi, Yoko, and Mika cross-referenced various websites to replace unfamiliar terms with more familiar ones, whereas Yoko and Aoi utilised multiple MT tools to ensure their intended meanings were conveyed. Grammar correction varied in complexity—from minor tense adjustments by Koki to modifications of sentence structures by Mika and Saeko. Furthermore, during interviews, Naomi and Saeko frequently employed the term 'nuance' to describe their editing strategies (Table 6), whereas Aoi repeatedly referenced the term 'politeness'. These terms underscore their attention to both form and meaning, as well as tone. Mika, however, had a different reason for post-editing: that of authorship: 'When I use MT output as it is, and someone asks whether it is my opinion, I wouldn't be sure. I'd feel a sense of guilt' (Excerpt 4; Mika, T141).

4.2.3 Affective, social, and agentic engagement

Five participants expressed positive views about using MT (Table 7). However, Saeko, who had previously relied on an electronic dictionary in high school, had mixed feelings (Excerpt 5), as did Mika (Excerpt 4).

Table 7

Summary of Affective Engagement

High engagement	Moderate engagement	Affective–social low engagement
• With MT, I can use longer sentences in my English diary. (**Naomi**, T195) • Without MT, I would not have been able to get credit for my English class. **(Saeko**, T127)	• Google's camera function is pretty good and easy to use. (**Aoi**, T78) • MT is so good. (**Koki,** T171) • I will continue to have MT help with my writing. (**Taka**, T184)	• I feel a sense of guilt (**Mika**, T141)

> *When I get nervous [during online classes], I can't even produce sentences at a junior high school level. I also forget vocabulary … I've always felt pressured to respond quickly. Gradually, my focus has shifted from improving my English to simply earning credits. I've become increasingly reliant on MT.* (Excerpt 5; Saeko, T107, T109)

Regarding social engagement, three participants reported learning to use MT applications from their friends (Table 8). However, none indicated using MT collaboratively.

Table 8
Summary of Social Engagement

High engagement	Moderate engagement
• A friend of mine recommended the Patago app. (**Yoko**, T48)	• A friend of mine in the dorm taught me how to use two apps (DeepL after Google) to check my English. (**Aoi**, T120) • A friend of mine recommended the Google app. (**Taka,** T91)

One excerpt was categorised as agentic engagement (Table 9). Naomi explained how she started keeping a diary in English (Excerpt 6).

Table 9
Summary of Agentic Engagement

High engagement
• Check difficult sentences or unknown words using Google Translate and write them down in a notebook for use when writing a diary. (**Naomi**, T41)

> *During the study-abroad programme last summer, one student in my seminar spoke English fluently, so I copied what she did* (T29). *... I can write in English on my own, but without MT, I tend to use simple sentences.* (Excerpt 6; Naomi, T193)

At the conclusion of their interviews, Taka and Mika posed questions about teachers' perspectives on MT use: 'What do teachers think about us using MT? Do they disapprove, or do they see it as acceptable?' (Excerpt 7; Taka, T204) and 'MT is becoming more common than dictionaries, with few students carrying them. I wonder how schools and teachers] will adapt to this change' (Excerpt 8; Mika, T184).

5 Discussion

5.1 Quantitative findings of student engagement in MT-assisted writing

This mixed-methods study investigated the engagement of CEFR A2-level Japanese university students in MT-assisted writing. The survey identified four profiles—high (19.8%), moderate (39.4%), affective–social low (19.4%), and low (21.4%)—based on five engagement variables. Three groups (high, moderate, and affective–social low) showed strong cognitive and behavioural engagement, with approximately 80% of participants actively revising MT output rather than accepting it uncritically. This challenges earlier claims that less proficient students struggle to detect and correct MT errors (Chung & Ahn, 2022; Lee, 2022; Shin & Chon, 2023). However, engagement patterns were not uniform across all dimensions.

Among these profiles, the affective–social low group exemplifies the complexity of student engagement. This group showed high cognitive engagement, especially in post-editing—strategies considered more cognitively demanding than pre-editing (Bowker & Buitrago Ciro, 2019)—which is supported by their high English proficiency (GTEC-LR $M = 208.98$). However, their social engagement was markedly low. This suggests that learners in this group are more autonomous and less reliant on

peers, enabled by their high English proficiency. In contrast, the low-engagement group displayed weak cognitive engagement in both pre- and post-editing, suggesting that nearly one in five students may use MT uncritically, reinforcing educators' concerns about overreliance. Across all groups, social engagement remained weak, especially among the moderate and affective–social low groups, which together accounted for 60% of participants. Interestingly, the low-engagement group reported slightly higher social engagement, possibly reflecting greater dependence on peer support to compensate for limited revision skills. Taken together, these survey results underscore the multidimensional nature of engagement, a theme further illuminated by the interview findings.

5.2 Qualitative findings of student engagement in MT-assisted writing

Interviews with seven participants provided additional insights into these engagement patterns. Participants from the high and affective–social low groups used MT strategically to support L2 learning, recognising both its usefulness and limitations. This aligns with the high cognitive engagement identified in the survey, contradicting the view of MT as a shortcut to avoid L2 use (Klekovkina & Denié-Higney, 2022; Murtisari et al., 2024; Stapleton & Leung, 2019). Simultaneously, affective engagement was more nuanced. While most participants viewed MT positively, Saeko and Mika expressed mixed feelings (Excerpt 3, 5), echoing concerns noted by Zhou et al. (2022). Mika's (affective–social low) dilemma highlights the gap between cognitive and affective engagement observed in the survey. Since learners' ambivalence towards AI technologies is common (e.g. Yang & Lin, 2025; Zhou et al., 2022), it is crucial to create a supportive environment that encourages exploration of technologies without fear of dependence. These mixed feelings were compounded by uncertainty about institutional policies on MT use (Excerpts 7 and 8), suggesting a need for clear guidance. Interviews also confirmed the overall weak social engagement: No participants reported collaborative MT use, even those (e.g. Koki, Taka) who lacked confidence in evaluating MT output. Furthermore, the absence of interview participants from the low-engagement group may reflect reluctance to discuss MT openly. Without explicit instruction, learners often use MT 'clandestinely' (Paterson, 2023, p. 4), missing opportunities for peer interaction and collective knowledge building.

Beyond learning contexts, interviews also highlighted MT's ecological affordances as a translanguaging resource (Beiler & Dewilde, 2020). Several students described using MT in real-world contexts—comparing Google Translate and DeepL outputs when conversing with international dormitory students (Aoi), interacting with foreign rugby players (Koki), or serving customers at part-time jobs (Mika). In these instances, MT served as a 'fallback strategy' when linguistic resources were lacking (Zhou et al., 2022, p. 5), enabling meaningful multilingual interaction. Others reported refining L2 vocabulary and sentences by iteratively consulting L1, a translanguaging practice observed in multilingual writing (Murtisari et al., 2024). Mika's reflection that 'how we consult [unknown words] is more important than what we learn' (Excerpt 3) illustrates digital literacy skills: searching, evaluating and applying information (Chon et al., 2021; Zhou et al., 2022). Rather than restricting MT use, educators should help students 'learn how to learn' with AI-powered tools (Kern, 2024), such as MT. Taken together, the interviews contextualise the survey results by showing how learners engage strategically with MT as a translanguaging resource for both learning and authentic communication.

5.3 Teaching implications

Drawing on both strands of evidence, the findings emphasise the need for targeted teacher guidance. Explicit instruction in pre- and post-editing strategies can enhance MT performance and learner engagement, as shown in a prior study with CEFR A2-level learners (Yuasa & Takeuchi, 2024b). Such instruction should be reinforced through peer collaboration, which raises metalinguistic awareness

and enables mutual scaffolding (Basturkmen & Philp, 2018; Lee, 2021). Survey and interview findings suggest that some students lack confidence in independently revising MT output. Structured collaboration, coupled with skill-specific strategy instruction, can enhance self-efficacy (Graham et al., 2020; Teng & Zhang, 2020), boosting engagement and potentially increasing L2 use opportunities (Yuasa & Takeuchi, 2024b; Chang et al., 2022).

While strategy instruction addresses immediate classroom needs, a broader implication concerns how MT is positioned in L2 writing pedagogy. Emphasising error-free, standard L2 products may inadvertently lead to excessive reliance on MT. With a translanguaging lens, MT serves as a 'parallel technology' supporting L2 writing in conventional classrooms (Zhou et al., 2022, p. 10). This approach reframes educators' roles from delivering knowledge to facilitating learning, helping students use MT purposefully and responsibly. As with EAP students (Grieve et al., 2024; Liu & Chen, 2024; Zhou et al., 2022), lower-proficiency EFL learners can also benefit from using both L1 and MT as scaffolds for L2 writing. Embracing translanguaging perspectives allows learners to navigate between L1 and L2 with the aid of MT, thereby supporting engagement and enhancing L2 writing development.

6 Conclusion

This mixed-methods study examined how Japanese university EFL students at the CEFR A2 level engage with MT-assisted writing. We identified four engagement profiles—high, moderate, affective–social low, and low—with consistently weak social engagement across groups. Interviews further revealed learners' sophisticated use of MT as a translanguaging tool, shaped by its ecological affordances in academic and everyday contexts. Taken together, these findings highlight the importance of recontextualising MT as a pedagogical resource and providing targeted instruction tailored to the needs of lower-proficiency learners.

Simultaneously, several limitations should be noted. Although participants represented diverse academic disciplines with balanced gender representation, all were drawn from a single institution, which may limit generalisability. Additionally, no interview data were obtained from the low-engagement group—which underscores the need for more open dialogue and targeted support. Moreover, while interviewees described strategies to improve MT output, we did not directly observe their implementation. These limitations suggest directions for future research. Studies could examine learners' MT-assisted writing processes more closely—e.g. through stimulated recall interviews—to clarify how L1 and MT are used to negotiate meaning (Yuasa & Takeuchi, 2024a; Liu & Chen, 2024). As our focus was to provide educators with a rationale for informed, judicious MT use rather than measuring writing outcomes, we did not assess MT's impact on learners' texts. Future research might address this gap by investigating how MT strategy instruction influences writing performance. Enhancing the social dimension of learning—such as through collaborative writing tasks—is another important area of inquiry, particularly in relation to other aspects of learner engagement. Furthermore, given the rise of generative AI in L2 writing, future studies should expand the engagement framework to examine learners' responses to GenAI feedback (e.g. Teng, 2024; Teng & Huang, 2025).

The study shed new light on the under-researched engagement of CEFR A2-level EFL students in MT-assisted writing. Grounded in the complementary frameworks of engagement and translanguaging, it offers insights that may reshape educators' perspectives on students' use of MT and related AI tools. By adopting translanguaging approaches for lower-proficiency learners, educators can integrate MT more purposefully into writing pedagogy. With appropriate guidance, students can draw on their L1 and MT as valuable resources to express their voices more confidently in the L2. In doing so, they not only enrich their writing development but also expand their capacity as multilingual L2 users.

Note

1. GTEC-LR is a condensed version of the GTEC that evaluates the four skills of reading, listening, speaking, and writing. The GTEC is intended to measure the English proficiency of secondary and tertiary students in Japan, and its validity has been verified (Kim & Chin, 2019).

Data Availability

Original questionnaire items in Japanese are available at https://osf.io/rmgzu/?view_only=b8b39939a19a4617ad50d6179744cb9c

Appendix 1

Semi-Structured Interview Questions

Part 1: English learning experiences

1. Do you enjoy learning English?
2. Why or why not?
3. How do you assess your English proficiency?
4. Have you taken any official English tests, such as Eiken?

Part 2: L2 writing experiences

1. Do you enjoy writing in English?
2. Have you had any writing lessons at school?
3. What were these lessons about? How much time was spent on writing?
4. What do you find most difficult about writing in English?

Part 3: Background and perception of MT use

1. What MT applications do you use?
2. When did you start using MT?
3. Why did you start using MT?
4. What is your primary purpose for using MT?
5. What do you like about MT?
6. What do you dislike about MT?
7. What are your thoughts on MT accuracy?

Part 4: MT usage and strategies

1. Do you write in English by yourself before using MT?
2. Do you pay attention to anything specific when entering L1 into MT? (pre-editing strategies)
3. Do you read and check the MT output?
4. Do you modify the MT output? If so, how do you modify it? (post-editing strategies)
5. Do you use other sources when revising the MT output?
6. Which sources do you use?
7. How did you learn to use MT?
8. Have you used other AI tools, such as ChatGPT?
9. Would you like to continue using MT?

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Mariko Yuasa is a Ph.D. candidate at the Graduate School of Foreign Language Education and Research, Kansai University, Japan. Her research interests include the application of educational technology, language learning strategies, and second language writing. She has published in *Research Methods in Applied Linguistics* and *AILA Review,* and contributed a chapter to the *Routledge Handbook*.

ORCID: https://orcid.org/0000-0003-0563-4072

Osamu Takeuchi, Ph.D., is Professor at the Faculty of Foreign Language Studies and the Graduate School of Foreign Language Education and Research, Kansai University, Japan. His current research interests include language learning strategies, self-regulation in L2 learning, L2 learning motivation, and the application of technology to language teaching. He has published articles in journals such as Applied Linguistics, International Review of Applied Linguistics in Language Teaching, Innovation in Language Learning and Teaching, and System. He is the recipient of the JACET Award for Outstanding Academic Achievement in 2004 and the 2009 LET Award for Outstanding Academic Achievement.

ORCID: https://orcid.org/0000-0002-5195-992X