Sapuan, W. N. M., & Sulaiman, N. A. (2025). Development and Validation of an Instrument to Evaluate Constructs for Integrating AI Into ELT. *Teaching English with Technology*, *25*(1), 60–82. https://doi.org/10.56297/vaca6841/OZFH1876/BLVQ7621

ISSUES

Development and Validation of an Instrument to Evaluate Constructs for Integrating AI Into ELT

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Keywords: Artificial intelligence, English Language Teaching, framework, instrument development, instrument validation

https://doi.org/10.56297/vaca6841/OZFH1876/BLVQ7621

Teaching English with Technology

Vol. 25, Issue 1, 2025

The COVID-19 pandemic has transformed teaching and learning in ESL education, particularly through the integration of artificial intelligence (AI) technologies into current English Language Teaching (ELT) practices. However, to ensure the seamless integration of these technologies into ELT practices, a proper framework needs to be developed and validated for future reference by ESL educators. Hence, this study aims to develop and validate the proposed constructs for the framework, using the Content Validity Index (CVI) method with assistance from six experts. Eleven constructs were identified from previous studies, with seven derived from the AI-TPACK framework and four from the Framework for Teaching. These constructs are categorised into three domains: Technological Proficiency, Pedagogical Compatibility, and Social Awareness. The data were analysed using the CVI method. The results show that the S-CVI/Ave value was 0.91, meeting the satisfactory CVI threshold for six experts (>0.83). However, the S-CVI/UA value was 0.73, which does not meet the acceptable CVI value (>0.83). As a result, 10 items with an S-CVI/UA less than 0.83 were removed. Additionally, two more items were excluded due to their constructs having insufficient valid items, with only one item remaining in each construct. Following these amendments, both the S-CVI/Ave and S-CVI/UA values improved to 0.99 and 0.91, respectively. The study proves that the content validity process is crucial to ensuring a reliable and valid instrument for developing a framework for integrating AI into the ELT practices.

1. Introduction

The COVID-19 pandemic has altered the education setting, transitioning teaching and learning from traditional face-to-face classrooms to online platforms. This transformation increased dependence on digital resources, leading to the integration of AI technologies as educators pursued new and modern methods to support distant and flexible learning. AI technologies have evolved significantly in the education field, integrating Computer Science, Cybernetics, Linguistics, and many more (Abdullah Sharadgah & Abdulatif Sa'di, 2022). Sindermann et al. (2021) and Xiaohong and Yanzheng (2021) identified AI as an intelligent system capable of understanding and processing human language. These capabilities of AI provide learners and educators with a secure environment for language learning.

Among the latest AI applications, natural language processing (NLP) and machine learning (ML) have enabled personalised instruction and feedback tailored to each learner's needs (Binu, 2024). Additionally, chatbots are a significant AI application that can engage learners in an authentic language environment (Rahimi & Sevilla-Pavón, 2024). With these advantages, AI technologies are becoming increasingly important to the future of education (Alhalangy & AbdAlgane, 2023). However, there is a lack of focus on the integration of AI into the ELT field despite its rapid progress in education, especially after the pandemic (Abdullah Sharadgah & Abdulatif Sa'di, 2022). Past studies have mostly investigated AI integration in the education field in general (Crompton et al., 2024). As a result, ESL educators are still seeking their way to incorporate this new technology into their ELT practices.

To address this gap, this study aims to develop and validate a framework that combines the AI-TPACK model (Ning et al., 2024) and the Framework for Teaching (Danielson, 2007). The combination is relevant since the AI-TPACK covers the intersection of AI technologies with pedagogical and content knowledge (Ning et al., 2024), while the Framework for Teaching addresses classroom practice and educator professionalism (Danielson, 2007). By integrating these two models, the proposed framework aims to capture the technological, pedagogical, and instructional competencies required for ESL lecturers to effectively and practically integrate AI into their ESL classrooms. The framework would help educators effectively navigate the challenges of incorporating AI into their teaching, ensuring that the technology is used ethically and enhances the learning experience in the ESL classroom. As suggested by Kohnke et al. (2023), having a structured framework would guide English educators in using AI ethically and professionally. In this context, it would ensure that the integration of AI into ELT aligns with best practices and promotes positive learning outcomes. Furthermore, the British Council (Edmett et al., 2023) reported on the importance of developing a specific framework for the seamless integration of AI into ELT practices so that educators feel more comfortable and competent in using AI technologies.

In developing the framework, it was necessary to identify and validate the proposed constructs. According to Lambert and Newman (2023), constructs are concepts that help us understand the world and its functions. The characteristics of constructs can be varied across fields. In this study, the constructs were identified from past studies and validated by experts in both the English language and the technology in education fields. Then, the CVI method was used as a novel approach to calculate the validity of the identified constructs. In validating the constructs, the following research questions are addressed in the study:

RQ1 - What is the item-level content validity index (I-CVI) of the instrument to evaluate constructs for the AI-ELT framework?

RQ2 - What is the scale-level content validity index (S-CVI) of the instrument to evaluate constructs for the AI-ELT framework?

2. Literature review

2.1. English Language Teaching (ELT)

Enhancing English Language Teaching (ELT) methods is crucial for improving communication and education at a global scale (Ghafoor & Asharaf, 2023). This is relevant given the extensive use of the English language in employment, communication, and global connectivity (Lan et al., 2020). According to Mallillin (2021), effective ELT approaches in higher education are tailored to students' capabilities, addressing challenges in language learning to ensure students' academic achievement and prepare them for the real world. Furthermore, ELT practices provide students with the skills they need to interact and connect with people effectively.

Hence, focus should be given to improving the ELT practices and to ensuring students' achievement in academics, as well as in other areas. This includes exploring recent trends in integrating technology into ELT practices to meet the demands of digital natives (Alakrash et al., 2022). The field of ELT is changing alongside the progress of technology in education (Samuelson Udo, 2023), which has digitally transformed English language instruction (Anggeraini, 2020). For example, ELT practices in the classroom have undergone massive transformation from traditional classroom settings that exercised a teacher-centred approach and face-to-face interactions (Al-khresheh, 2024) to online methods for flexibility and personalised learning experience (Mustapha et al., 2021). The changes are particularly relevant, as Williyan et al. (2024) highlight how AI technologies help educators to create content tailored to learners' unique learning styles, language proficiency levels, and cultural contexts. The transformation is indeed necessary, looking at the rate of progress of technology used in today's world among digital natives, especially after the COVID-19 pandemic.

2.2. Past studies on AI integration in ELT

AI technologies have been used in supporting language teaching for many areas (Valledor et al., 2023). Based on past studies, AI technologies have been used in developing language skills such as reading comprehension (Govindarajan & Christuraj, 2023; Punar Özçelik & Yangın Ekşi, 2024), grammar use (Kucuk, 2024), speaking (Alhalangy & AbdAlgane, 2023), writing and listening (Govindarajan & Christuraj, 2023). According to a systematic review by Lim and Toh (2024), AI applications, such as quiz apps, puzzle apps, and platform-based apps, have been identified as effective tools for supporting language learning. Furthermore, these technologies are also used for error checking (Y.-J. Lee et al., 2024) and language translation (Mabuan, 2024). They have also been used to provide corrective feedback (Binu, 2024) and personalised learning resources (Meniado, 2023) to learners.

It is impressive when AI can offer learners interactive learning activities (Orsi Koch Delgado et al., 2020), affective support (S. Lee et al., 2024) and collaborative learning and peer support (Kohnke et al., 2023). Among the AI applications used in language learning are Busuu, Drops, Duolingo, Fluenz, Lingo Play, LiveMocha and Living Language (Powers, 2019). There are other AI applications that support English language learning among students such as Beelingup, Memrise, and HelloTalk (Duffy, 2018). Additionally, ChatGPT, a widely recognised generative-AI chatbot that responds to users' written inputs or prompts, has gained significant attention in higher education (Cong-Lem et al., 2024). However, there is no specific ranking for each application. As technology progresses and more language learning apps are developed, the rankings of the best applications tend to change over time (Hassan, 2021).

2.3. Challenges of integrating AI in education

Despite all the benefits discussed regarding the integration of AI in ELT practices, previous studies have also indicated that educators and students often hold unfavourable attitudes toward the integration of AI technologies in education. These insights provide an understanding of the challenges involved in integrating AI technologies in ESL contexts. Vazhayil et al. (2019) identified problems related to inadequacies in downward communication and educators' apprehensions about unrestricted internet access, which may hinder the effective integration of AI in education. The research observed communication breakdowns between administrators and instructors about the implementation of new technologies in the curriculum. These issues have resulted in inconsistencies in information dissemination and could affect educators' ability to deliver lessons successfully. Another issue expressed by educators is their apprehension regarding students' misconduct. Students may engage in activities such as surfing other websites or playing games, as internet access is now unrestricted and readily available, which may hinder their learning. Furthermore, Kim and Kim (2022) found that educators had fears about the potential challenges associated with the implementation of AI technology in education, such as concerns over their future positions, the potential of AI to match human comprehension, and the legitimacy of the outcomes generated by AI. The authors reported that educators viewed the AI support system as taking on the role of educators and students, leading to fears that their professional responsibilities might be reduced to that of classroom helpers and/or supervisors. Kohnke et al. (2023) showed a comparable issue when instructors expressed apprehension over potential replacement. This resulted in their reluctance to include AI technologies in their teaching.

According to Kim and Kim (2022), educators acknowledge the necessity of time to reflect and assess their roles following the integration of AI into the curriculum. They are also concerned about AI's ability to explain how it

arrives at decisions or the consequences produced by the system for enhanced understanding. Finally, users should be informed if the source of the output is from an AI system for validation purposes.

2.4. Development and validation of an instrument for AI integration into the ELT practices framework

The proposed constructs are identified from past studies. They are adapted from two frameworks which are the AI-TPACK framework by Ning et al. (2024) and the Framework for Teaching by Danielson (2007). These two models complement each other in developing a holistic framework that covers the aspects of technology, pedagogy, classroom practice, and educator professionalism that are needed to integrate AI technologies into ESL lecturers' teaching practices. There are 11 constructs altogether. Seven are from the AI-TPACK Framework (Ning et al., 2024): Content Knowledge (CK), Pedagogical Knowledge (PK), AI-Technological Knowledge (AI-TK), Pedagogical Content Knowledge (PCK), AI-Technological Content Knowledge (AI-TCK), AI-Technological Pedagogical Knowledge (AI-TPK), and AI-Technological Pedagogical Content Knowledge (AI-TPACK). Four constructs are from the Framework for Teaching (Danielson, 2007): Planning and Preparation (PP), Classroom Environment (TCE), Instruction (I), and Professional Responsibilities (PR).

The constructs were categorised into three domains of using AI in education: technological competencies, pedagogical, and social awareness. The domains were originally developed by Kohnke et al. (2023) to define the digital competencies required for educators to effectively use ChatGPT. In this study, however, these domains were adapted to this new proposed framework.

Technological competencies refer to an individual's understanding of the features and functionality of AI technologies in ELT practices. Pedagogical compatibility refers to the ability of ESL lecturers to strategically plan and implement AI technologies in ELT practices. Social awareness refers to the understanding among ESL lecturers of AI technologies in ELT practices to ensure their responsible use.

3. Method

Face validity was performed before using the content validity index (CVI) approach to establish the clarity and suitability of the constructs. The constructs were reviewed by two experts in English language studies. Based on their feedback, several amendments were made, primarily focusing on language-related aspects to improve clarity.

Subsequently, CVI was conducted to evaluate the relevance and representativeness of the constructs. According to Yusoff (2019), content validity refers to the degree to which the questions or items in a test match

what the test is supposed to measure. In this study, the instrument was developed and validated through six steps of the CVI process to evaluate the proposed constructs for the integration of AI into the ELT framework.

3.1. Step 1 - Preparing the content validation form

In this study, the content validation form was prepared as a questionnaire consisting of 3 domains, 11 constructs, and 59 items. The items were adapted from the AI-TPACK framework (Ning et al., 2024), which focuses on the integration of AI with pedagogical and content knowledge, and the Framework for Teaching by Danielson (2007), which emphasises classroom practices and professional responsibilities. These two models were chosen because they provide complementary viewpoints essential for creating a comprehensive framework to assist ESL lecturers in incorporating AI into their teaching activities. A Likert scale, ranging from 1 as 'strongly agree' to 5 as 'strongly disagree', was used to record the degree of relevance for each item of the constructs. Experts were requested to assess each item according to the degree of their agreement with its relevance to the proposed construct. After preparing all the items for the questionnaire, a Google Form was created to facilitate its distribution.

3.2. Step 2 - Selecting a review panel of experts

The number of experts was determined based on the recommendation by Yusoff (2019). It is recommended that the number not exceed ten, with at least two experts needed for content validation. Table 1 presents the number of experts and its implications for the acceptable CVI score.

Table 1. The number of experts and the acceptable CVI values (Yusoff, 2019)

Number of experts	Acceptable CVI values	Source of recommendation
Two experts	At least 0.80	Davis (1992)
Three to five experts	Should be 1	Polit & Beck (2006), Polit et al. (2007)
At least six experts	At least 0.83	Polit & Beck (2006), Polit et al. (2007)
Six to eight experts	At least 0.83	Lynn (1986)
At least nine experts	At least 0.78	Lynn (1986)

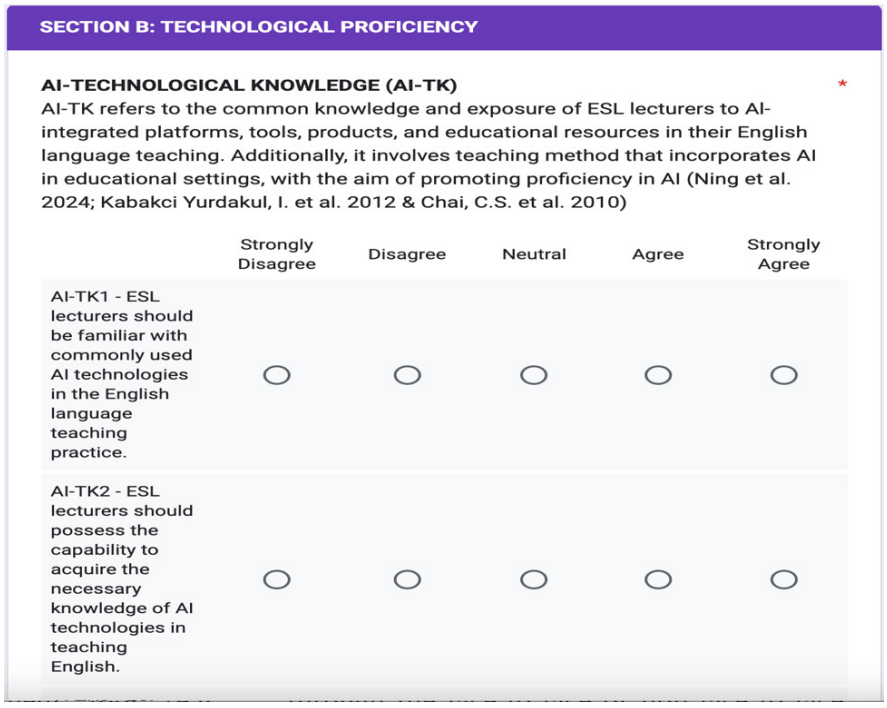
Six criteria were used to choose the experts who participated in this study. First, the experts must hold a PhD in English language, educational technology, or related fields. Second, they should have more than five years of professional teaching experience. Third, they should have a strong publication record in English linguistics or technology-related fields. Fourth, they should be actively engaged in research or professional practice. Fifth, they must agree to dedicate time to review and provide their professional opinions within the study's timeframe. Finally, they should have no conflicts of interest that could affect their evaluation.

3.3. Step 3 - Conducting content validation

After identifying the experts, they were contacted through text messages to seek their agreement to participate in the study. Once their consent was obtained, the link to the Google Form was emailed to them for their perusal. To ensure the experts were fully aware of their roles in the content validation process, they were briefed on their roles when initially contacted. These roles were also clearly outlined in the instructions provided in both the invitation email and the questionnaire. The process was carried out in stages due to varying response times from the experts. The roles of the experts included reviewing domains, constructs, and items by rating the relevance of each item on a scale from 'strongly disagree' to 'strongly agree' and providing their comments on each construct in the designated column.

3.4. Step 4 - Reviewing domains, constructs, and items

During the review stage, the experts commented on each construct in a specific column provided after each construct. Each domain and construct was also defined in the questionnaire to prevent misunderstandings or misinterpretations of the terms used in the study. Additionally, the experts were encouraged to contact the researcher if they had any questions or concerns. Figure 1 shows a sample definition for one of the constructs under the technological proficiency domain.



SECTION B: TECHNOLOGICAL PROFICIENCY

AI-TECHNOLOGICAL KNOWLEDGE (AI-TK) *

AI-TK refers to the common knowledge and exposure of ESL lecturers to AI-integrated platforms, tools, products, and educational resources in their English language teaching. Additionally, it involves teaching method that incorporates AI in educational settings, with the aim of promoting proficiency in AI (Ning et al. 2024; Kabakci Yurdakul, I. et al. 2012 & Chai, C.S. et al. 2010)

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
AI-TK1 - ESL lecturers should be familiar with commonly used AI technologies in the English language teaching practice.	○	○	○	○	○
AI-TK2 - ESL lecturers should possess the capability to acquire the necessary knowledge of AI technologies in teaching English.	○	○	○	○	○

Figure 1. Definition of AI-Technological Knowledge (AI-TK) construct

3.5. Step 5 - Scoring each item

In this step, the experts' role was to rate the degree of relevance of each item on a scale from 'strongly disagree' to 'strongly agree' in the questionnaire. A rating of 'strongly disagree' reflected that the item was irrelevant to the construct being assessed, whereas 'strongly agree' indicated a substantial degree of relevance. The experts would submit the questionnaire once they had rated all the items. Since all experts chose to use the Google Form, their submissions were automatically recorded on the platform.

3.6. Step 6 - Calculating CVI

The final step was calculating the CVI for items (I-CVI) and the CVI for scale (S-CVI). The calculation process began with recording the relevance rating for all items. Experts rated each item using a 5-point Likert scale where 1 = 'strongly disagree' and 5 = 'strongly agree', based on how relevant the item was to the corresponding construct. For the purpose of the CVI analysis, ratings of 1 to 3 were recorded as 0 (not relevant) and ratings of 4 and 5 were recorded as 1 (relevant). Then, the I-CVI was calculated by averaging the relevance ratings for each item provided by all experts. The sum of these averages was calculated, and the overall average for all items was determined (S-CVI/Ave) by dividing by the total number of items.

Next, the proportion of items on the scale that achieve a relevance score of 4 or 5 from all experts was calculated (S-CVI/UA) by dividing the sum of the UA by the total number of items. Based on the I-CVI and S-CVI values, items that failed to meet the minimum acceptable threshold (I-CVI < 0.83) were closely reviewed. As applied in this study, items with low ratings were carefully reviewed to identify whether they could be improved or should be discarded. This evaluation was informed by the qualitative feedback from the experts. Items that received low ratings and feedback suggesting irrelevance or ambiguity were completely eliminated. This careful revision and removal process helped strengthen the content validity and ensure the instrument holds practical value for the next phase of validation. The results are shown in Table 2 in the Results section.

4. Results

The instrument used in this study consists of 59 items that were developed based on 11 constructs from the AI-TPACK Framework (Ning et al., 2024) and the Framework for Teaching (Danielson, 2007). Table 2 indicates the experts' ratings of all the items and the CVI calculation.

4.1. Values of item-level content validity index (I-CVI)

Table 2 presents the values of item-level content validity index (I-CVI), which indicate the validity and relevance of the items (the averages are presented in the I-CVI column). The values were obtained from the total number of

experts who rated 'agree' (4) and 'strongly agree' (5) for each item. In the table, these ratings were recorded as 1. The sum of the I-CVIs for the 59 items in the 11 constructs was 53.83.

4.2. Value of scale-level content validity index (S-CVI)

The value of the scale-level content validity index (S-CVI) determines the content validity of the overall scale. It can be determined from the values of S-CVI/Ave and S-CVI/UA. As evidenced in Table 2, all six experts agreed that 43 items are relevant (UA = 1.00). However, they shared different opinions on 16 items (UA = 0). Overall, the proportion of the items that achieved a relevance scale of four or five by all experts was 0.91 (S-CVI/Ave), while the S-CVI(UA) was 0.73, as displayed in Table 3.

From the results, the S-CVI/Ave value is 0.91, which meets the acceptable value for six experts (>0.83), while the S-CVI/UA value did not meet the acceptable value. Therefore, ten items were removed from the instrument to achieve the acceptable CVI value and ensure that the items reached a satisfactory level of content validity (TCE2, TCE3, TCE4, TCE5, I1, PR1, PR2, PR3, PR4, and PR6). The amendment aligns with the recommendations of Polit et al. (2007), who suggested deleting items that do not meet the acceptable value.

Additionally, two more items (TCE1 and PR5) were removed because they were the only remaining valid items within the Classroom Environment and Professional Responsibility constructs. According to Hair et al. (2010), a minimum of three items per construct is generally recommended to sufficiently represent a theoretical domain. Since a single item is insufficient to meaningfully represent a construct, both constructs were also removed from the framework. This decision was based on concerns about the constructs that were inadequately supported by valid items. Overall, these revisions have contributed to strengthening the content validity of the instrument. A list of the deleted items is presented in Table 4.

After removing the items, the value of the S-CVI/UA increased from 0.73 to 0.91 (Table 5). Furthermore, the S-CVI/Ave value also increased from 0.91 to 0.99. The updated S-CVI/UA value now exceeds the acceptable CVI value (>0.83). Finally, a content-valid instrument with the final 47 items in the nine constructs, based on the AI-TPACK framework (Ning et al., 2024) and Framework for Teaching (Danielson, 2007), was developed and validated successfully in this study.

5. Conclusions

In conclusion, the content validity process is essential for developing a high-quality, reliable, and valid instrument. This study highlights the importance of content validity in refining instruments used in both pilot testing and surveys. Based on the results, the research questions of the study were

Table 2. Validity and relevance ratings of the items

Items	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	Experts in Agreement	I-CVI	UA
AI-Technological Knowledge (AI-TK)									
AI-TK1	1	1	1	1	1	1	6	1.00	1
AI-TK2	1	1	1	1	1	1	6	1.00	1
AI-TK3	1	1	1	1	1	1	6	1.00	1
AI-TK4	1	1	1	1	1	1	6	1.00	1
AI-TK5	1	1	1	1	1	1	6	1.00	1
AI-Technological Pedagogical Knowledge (AI-TPK)									
AI-TPK1	1	1	1	1	1	1	6	1.00	1
AI-TPK2	1	1	1	1	1	1	6	1.00	1
AI-TPK3	1	1	1	1	1	1	6	1.00	1
AI-TPK4	1	1	1	1	1	1	6	1.00	1
AI-TPK5	1	1	1	1	0	1	5	0.83	0
AI-TPK6	1	1	1	1	1	1	6	1.00	1
AI-Technological Content Knowledge (AI-TCK)									
AI-TCK1	1	1	1	1	1	1	6	1.00	1
AI-TCK2	1	1	1	1	1	1	6	1.00	1
AI-TCK3	1	1	1	1	1	1	6	1.00	1
AI-TCK4	1	1	1	1	1	1	6	1.00	1
AI-TCK5	1	1	1	1	1	1	6	1.00	1
AI-TCK6	1	1	1	1	1	1	6	1.00	1
AI- Technological Pedagogical Content Knowledge (AI-TPACK)									
AI-TPACK 1	1	1	1	1	1	1	6	1.00	1
AI-TPACK 2	1	1	1	1	1	1	6	1.00	1
AI-TPACK 3	1	1	1	1	1	1	6	1.00	1
AI-TPACK 4	1	1	1	1	1	1	6	1.00	1
AI-TPACK 5	1	1	1	1	1	1	6	1.00	1
Planning and Preparation (PP)									
PP1	1	1	1	1	1	1	6	1.00	1
PP2	1	1	1	1	1	1	6	1.00	1
PP3	1	1	1	1	1	1	6	1.00	1
PP4	1	1	1	1	1	1	6	1.00	1
PP5	1	1	1	1	1	1	6	1.00	1
PP6	1	1	1	1	1	1	6	1.00	1
Pedagogical Knowledge (PK)									
PK1	1	1	1	1	1	1	6	1.00	1
PK2	1	1	1	1	1	1	6	1.00	1
PK3	1	1	1	1	1	1	6	1.00	1
PK4	1	1	1	1	1	1	6	1.00	1
PK5	1	1	1	1	1	1	6	1.00	1
PK6	1	1	1	1	1	1	6	1.00	1
Pedagogical Content Knowledge (PCK)									

Items	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	Experts in Agreement	I-CVI	UA
PCK1	1	1	1	1	1	1	6	1.00	1
PCK2	1	1	1	1	1	1	6	1.00	1
PCK3	1	1	1	1	1	1	6	1.00	1
PCK4	1	1	1	1	1	1	6	1.00	1
The Classroom Environment (TCE)									
TCE1	1	1	0	1	1	1	5	0.83	0
TCE2	1	1	0	1	0	1	4	0.67	0
TCE3	1	1	0	1	0	1	4	0.67	0
TCE4	1	1	0	1	0	1	4	0.67	0
TCE5	1	1	0	1	0	1	4	0.67	0
Instruction (1)									
I1	0	1	0	0	0	1	2	0.33	0
I2	1	1	1	1	1	1	6	1.00	1
I3	1	1	1	1	0	1	5	0.83	0
I4	1	1	1	1	0	1	5	0.83	0
I5	1	1	1	1	0	1	5	0.83	0
Content Knowledge (CK)									
CK1	1	1	1	1	1	1	6	1.00	1
CK2	1	1	1	1	1	1	6	1.00	1
CK3	1	1	1	1	1	1	6	1.00	1
CK4	1	1	1	1	1	1	6	1.00	1
CK5	1	1	1	1	1	1	6	1.00	1
Professional Responsibility (PR)									
PR1	0	1	1	1	0	1	4	0.67	0
PR2	0	1	1	1	0	1	4	0.67	0
PR3	0	0	0	1	0	1	2	0.33	0
PR4	0	1	0	1	0	1	3	0.50	0
PR5	1	1	1	1	0	1	5	0.83	0
PR6	0	1	1	1	0	1	4	0.67	0
Proportion relevance	0.90	0.98	0.86	0.98	0.75	1.0	Sum of I-CVI	53.83	43
Average proportions of items judged as relevant by the six experts									

Source: Adapted from Lau Yen Yen et al. (2023)

Table 3. Sum of I-CVI and UA

Sum of I-CVI	53.83	Sum of UA	43
S-CVI Average (Sum of I-CVI/No. of items)	0.91	S-CVI Relevance (Sum of UA/No. of items)	0.73

Source: Adapted from Yusoff (2019)

addressed. The values for the item-level content validity index (I-CVI) and the scale-level content validity index (S-CVI) of the instrument met the acceptable CVI value (>0.83), as suggested by Polit and Beck (2006) and Polit et al. (2007) in Yusoff (2019). This indicates that the final items and constructs for the proposed framework for ESL educators to integrate AI into

Table 4. The list of deleted items

Item (n=12)	Experts selecting rating 4 or 5						Experts in Agreement	I-CVI
	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6		
TCE1	1	1	0	1	1	1	5	0.83
TCE2	1	1	0	1	0	1	4	0.67
TCE3	1	1	0	1	0	1	4	0.67
TCE4	1	1	0	1	0	1	4	0.67
TCE5	1	1	0	1	0	1	4	0.67
I1	0	1	0	0	0	1	2	0.33
PR1	0	1	1	1	0	1	4	0.67
PR2	0	1	1	1	0	1	4	0.67
PR3	0	0	0	1	0	1	2	0.33
PR4	0	1	0	1	0	1	3	0.50
PR5	1	1	1	1	0	1	5	0.83
PR6	0	1	1	1	0	1	4	0.67

Source: Adapted from Lau Yen Yen et al. (2023)

Table 5. Sum of I-CVI and UA.

Sum of I-CVI	46.33	Sum of UA	43
S-CVI Average (Sum of I-CVI/No. of items)	0.99	S-CVI Relevance (Sum of UA/No. of items)	0.91

Source: Adapted from Yusoff (2019)

their ELT practices are valid and reliable to be used in pilot testing and in an actual study stage later. Nevertheless, further refinement is needed to ensure the framework remains cohesive following the removal of certain constructs and to confirm the instrument's overall efficacy before the actual survey. Thus, the validation process will continue in which the instrument will undergo pilot testing and data will be collected and later analysed using Rasch model analysis. This model is a well-established measurement model used for developing measures in educational research (Bailes & Nandakumar, 2020). It will provide a comprehensive analysis of item reliability, fit statistics, person-item alignment, and overall construct validity. The final instrument will be improved through a thorough validation process to ensure that all items accurately measure the intended constructs and align with the framework's aims. This validation technique enhances the instrument's credibility and facilitates its application in both research and practical English Language Teaching contexts.

Testing the validated instrument developed in this study will ensure its practicality and benefits to ESL lecturers in integrating AI technologies, especially in preparing and delivering classroom instruction. The instrument offers a systematic method to identify strengths and gaps in their competencies to integrate AI into ELT practices. Educators and institutions can use this tool to inform the design of targeted professional development

programmes, ensuring that training aligns with the real needs of ESL lecturers in adopting AI tools responsibly and effectively. In classroom settings, the framework serves as a practical reference for lecturers to plan, reflect, and improve their AI-integrated teaching strategies, whether they are selecting appropriate technologies, adapting pedagogical methods, or upholding ethical standards. As AI advances, this framework provides ESL educators a reliable yet adaptable basis to guide their ongoing use of AI, thus improving teaching quality and student learning results.

For future studies, it is recommended to expand the expert panel size, potentially to at least nine experts, as suggested by Lynn (1986) and cited by Yusoff (2019). A larger panel would offer a broader range of perspectives, thereby improving the validity of the process. Additionally, an expanded pool of expert feedback could help identify potential issues in real-world ELT practices, ensuring that the instrument is not only valid but also effective in meeting the needs of ESL educators integrating AI into their ELT practices.

Published: June 16, 2025 EEST.

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Appendix A. Instrument to Evaluate Constructs for Integrating AI into ELT

Dear experts,

This survey is aimed to gain feedback on identified constructs for the AI-ELT Framework, a framework designed to integrate Artificial Intelligence into English language teaching for ESL lecturers. Your input will be instrumental in refining and validating these constructs. Your expertise will help ensure that the framework is both effective and practical for future application in enhancing English language teaching through AI. Your participation is on a voluntary basis. You are free to withdraw from the study at any time should you choose to do so, and your decision will be respected without any consequences. Your privacy and confidentiality will be strictly maintained throughout the research process.

The questionnaire is adapted from Teachers' AI-TPACK Scale (Ning et al., 2024) and Framework of Teaching (Danielson, 2007) to develop an AI-ELT framework for ESL lecturers. There are 11 constructs that centre on integrating Artificial Intelligence (AI) technologies in English language teaching. To assist you with the terms used in the study, definitions and explanations of the proposed constructs are provided in this questionnaire.

1. CONTENT KNOWLEDGE (CK)

CK, in the context of this research, refers to the specific knowledge of lecturers as subject matter experts in the teaching of English as a second language (ESL) as a specific subject (Jüttner et al., 2013; Koh et al., 2010; Ning et al., 2024).

2. PEDAGOGICAL KNOWLEDGE (PK)

PK refers to the common knowledge of ESL lecturers on the teaching pedagogies, methodologies, and practices of English as a second language (ESL). (Gatbonton, 2000; Ning et al., 2024; Watzke, 2007)

3. AI-TECHNOLOGICAL KNOWLEDGE (AI-TK)

AI-TK refers to the common knowledge and exposure of ESL lecturers to Al-integrated platforms, tools, products, and educational resources in their English language teaching. (Chai et al., 2010; Kabakci Yurdakul et al., 2012; Ning et al., 2024)

4. PEDAGOGICAL CONTENT KNOWLEDGE (PCK)

PCK refers to the specific knowledge of ESL lecturers as subject matter experts in the use of a specific pedagogy as well as the choice of appropriate teaching methods and strategies for specific instructional content to be used in their English language teaching. (Abbitt, 2011; Ning et al., 2024; Schmelzing et al., 2013)

5. AI-TECHNOLOGICAL CONTENT KNOWLEDGE (AI-TCK)

AI-TCK refers to the specific knowledge and exposure of ESL lecturers as subject matter experts to the appropriate use of Al-integrated technologies in their English language teaching. (Baser et al., 2016; Lin et al., 2013; Ning et al., 2024)

6. AI-TECHNOLOGICAL PEDAGOGICAL KNOWLEDGE (AI-TPK)

AI-TPK refers to the common knowledge and exposure of ESL lecturers on the appropriate use of AI-integrated teaching methodologies and their understanding how these methodologies could transform their English language teaching. (Angeli & Valanides, 2009; Ning et al., 2024)

7. AI- TECHNOLOGICAL PEDAGOGICAL CONTENT KNOWLEDGE (AI-TPACK)

AI-TPACK refers to the common knowledge and exposure of ESL lecturers as subject matter experts to the use of AI-integrated teaching methodologies in their English language teaching. (M.-H. Lee & Tsai, 2010; Ning et al., 2024; Schmidt et al., 2009; Voogt et al., 2013)

8. PLANNING AND PREPARATION (PP)

Planning and Preparation refer to how ESL lecturers design their English language teaching with the integration of AI for student learning. This includes their capability to understand the curriculum and their students (Danielson, 2007).

9. THE CLASSROOM ENVIRONMENTS (TCE)

The classroom environments refer to the supportive settings that ESL lecturers create by integrating AI into their English language teaching. The condition of the classroom could support student learning and cater for students' social-emotional needs (Danielson, 2007).

10. INSTRUCTION (I)

Instruction refers to the delivery of clear and accurate English language teaching by the ESL lecturers with AI technologies. This involves questioning and discussion techniques, students' engagement, feedback, flexibility, and responsiveness (Danielson, 2007).

11. PROFESSIONAL RESPONSIBILITY (PR)

Professional responsibility refers to the ESL lecturers' professionalism in integrating AI in their English language teaching. Their credibility in teaching profession includes serving students, organisation, and the community (Danielson, 2007).

BASIC INFORMATION

Expert's Details

Name

Date

Institution

Expertise Area(s)

AI-ELT SCALE

Please use the following scale to rate your degree of agreement with each statement.

SD = Strongly Disagree

D = Disagree

N = Neutral

A = Agree

SA = Strongly Agree

Construct	Item	Degree of Relevance				
		SD	D	N	A	SA
TECHNOLOGICAL COMPETENCIES						
AI-TECHNOLOGICAL KNOWLEDGE (AI-TK)						
AI-TK1	ESL lecturers should be familiar with commonly used AI technologies in the English language teaching practice.	1	2	3	4	5
AI-TK2	ESL lecturers should possess the capability to acquire the necessary knowledge of AI technologies in teaching English.	1	2	3	4	5
AI-TK3	ESL lecturers should frequently incorporate specific AI technologies into their English language teaching.	1	2	3	4	5
AI-TK4	ESL lecturers should be well-informed about using AI technologies to enhance the English language teaching process.	1	2	3	4	5
AI-TK5	ESL lecturers should be knowledgeable about using AI technologies for interactive English language teaching purposes.	1	2	3	4	5
Comment on AI-Technological Knowledge construct:						
AI-TECHNOLOGICAL CONTENT KNOWLEDGE (AI-TCK)						
AI-TCK1	ESL lecturers should be familiar with using AI in English language teaching, such	1	2	3	4	5

Construct	Item	Degree of Relevance				
		SD	D	N	A	SA
	as using AI language applications.					
AI-TCK2	ESL lecturers should be effortlessly capable of using AI in English language teaching domains.	1	2	3	4	5
AI-TCK3	ESL lecturers should be proficient in using AI to update their knowledge within the English language teaching discipline.	1	2	3	4	5
AI-TCK4	ESL lecturers should be skilful in selecting appropriate AI tools for English language teaching based on what they are teaching.	1	2	3	4	5
AI-TCK5	ESL lecturers should be adept at using AI in English language teaching to effectively enhance students' comprehension of the learning material.	1	2	3	4	5
AI-TCK6	ESL lecturers should be competent in using AI in English language teaching to broaden the knowledge horizons of students.	1	2	3	4	5
Comment on AI-Technological Content Knowledge construct:						
AI-TECHNOLOGICAL PEDAGOGICAL KNOWLEDGE (AI-TPK)						
AI-TPK1	ESL lecturers should be able to use AI in English language teaching to enhance their pedagogical perspectives.	1	2	3	4	5
AI-TPK2	ESL lecturers should be able to apply appropriate AI tools in various English language teaching activities.	1	2	3	4	5
AI-TPK3	ESL lecturers should have the capacity to select AI in English language teaching to sustain students' motivation and interest.	1	2	3	4	5
AI-TPK4	ESL lecturers should be able to apply AI in English language teaching to assess the learning outcomes of students.	1	2	3	4	5
AI-TPK5	ESL lecturers should be proficient in using AI to optimise classroom management in English language teaching.	1	2	3	4	5
AI-TPK6	ESL lecturers should possess the ability to explain information derived from AI to provide real-time feedback in their English language teaching.	1	2	3	4	5
Comment on AI-Technological Pedagogical Knowledge construct:						
AI- TECHNOLOGICAL PEDAGOGICAL CONTENT KNOWLEDGE (AI-TPACK)						
AI-TPACK1	ESL lecturers should be knowledgeable in integrating AI with English language content and teaching methods to improve classroom teaching efficiency and effectiveness.	1	2	3	4	5
AI-TPACK2	ESL lecturers should be specialists in selecting appropriate English language AI-based teaching methods on the content for instruction.	1	2	3	4	5
AI-TPACK3	ESL lecturers should be well-trained in using AI to create, simulate, and adapt scenarios that are in line with the English language content.	1	2	3	4	5
AI-TPACK4	ESL lecturers should be the experts in using personalised AI with suitable English language teaching methods as well as guide students in practical learning.	1	2	3	4	5
AI-TPACK5	ESL lecturers should be excellent at using AI for self-directed learning, further deepening their subject knowledge and understanding of English language teaching pedagogical theories.	1	2	3	4	5
Comment on AI-Technological Pedagogical Content Knowledge construct:						
PLANNING AND PREPARATION (PP)						
PP1	ESL lecturers should be able to use AI to demonstrate knowledge and pedagogy in their English language teaching.	1	2	3	4	5
PP2	ESL lecturers should be able to use AI to demonstrate knowledge of students in their English language teaching.	1	2	3	4	5
PP3	ESL lecturers should be able to use AI to set instructional outcomes in their English language teaching.	1	2	3	4	5
PP4	ESL lecturers should be able to use AI to demonstrate knowledge of resources in their English language teaching.	1	2	3	4	5
PP5	ESL lecturers should be able to use AI to design coherent instruction in their English language teaching.	1	2	3	4	5
PP6	ESL lecturers should be able to use AI to design student assessments in their English language teaching.	1	2	3	4	5
Comment on Planning and Preparation construct:						
PEDAGOGICAL COMPATIBILITY						
PEDAGOGICAL KNOWLEDGE (PK)						
PK1	ESL lecturers should be able to use a variety of diverse English language teaching methods in the ESL classroom.	1	2	3	4	5
PK2	ESL lecturers should be able to select appropriate English language teaching methods based on the instructional content.	1	2	3	4	5
PK3	ESL lecturers should be able to adjust their English language teaching methods based on students' performance or feedback.	1	2	3	4	5
PK4	ESL lecturers should possess knowledge of effective ESL classroom organisation and management.	1	2	3	4	5
PK5	ESL lecturers should take into consideration students' backgrounds, interests, motivations, and other needs during their ESL teaching class.	1	2	3	4	5
PK6	ESL lecturers should have knowledge of using multiple assessment methods in English language teaching to evaluate students' learning outcomes.	1	2	3	4	5
Comment on Pedagogical Knowledge construct:						
PEDAGOGICAL CONTENT KNOWLEDGE (PCK)						

Construct	Item	Degree of Relevance				
		SD	D	N	A	SA
PCK1	ESL lecturers should be proficient in formulating English language curriculum plans with ease.	1	2	3	4	5
PCK2	ESL lecturers should be well-acquainted with the focal points and challenging aspects of English language teaching.	1	2	3	4	5
PCK3	ESL lecturers should be well-versed in engaging group activities in English language teaching for students.	1	2	3	4	5
PCK4	ESL lecturers should be efficient in correcting the errors made by students in learning the English language.	1	2	3	4	5
Comment on Pedagogical Content Knowledge construct:						
THE CLASSROOM ENVIRONMENTS (TCE) - removed						
TCE1	ESL lecturers should be able to use AI to create an environment of respect and rapport in their English language teaching.	Removed				
TCE2	ESL lecturers should be able to use AI to establish a culture for learning in their English language teaching.	Removed				
TCE3	ESL lecturers should be able to use AI to manage classroom procedures in their English language teaching.	Removed				
TCE4	ESL lecturers should be able to use AI to manage student behaviour in their English language teaching.	Removed				
TCE5	ESL lecturers should be able to use AI to organise physical spaces in their English language teaching.	Removed				
Comment on The Classroom Environments construct:						
INSTRUCTION (I)						
I1	ESL lecturers should be able to use AI to communicate with students in their English language teaching.	Removed				
I2	ESL lecturers should be able to use AI to improve their questioning and discussion techniques in their English language teaching.	1	2	3	4	5
I3	ESL lecturers should be able to use AI to engage with students in their English language teaching.	1	2	3	4	5
I4	ESL lecturers should be able to use AI to improve their instruction in their English language teaching.	1	2	3	4	5
I5	ESL lecturers should be able to use AI to demonstrate flexibility and responsiveness to their students in their English language teaching.	1	2	3	4	5
Comment on The Instruction construct:						
SOCIAL AWARENESS						
CONTENT KNOWLEDGE (CK)						
CK1	ESL lecturers should possess a strong understanding of the concepts and principles related to the teaching discipline of the English language.	1	2	3	4	5
CK2	ESL lecturers should completely understand the evolution of concepts and principles in the English language subject.	1	2	3	4	5
CK3	ESL lecturers should be knowledgeable about how the English language can be applied in everyday life.	1	2	3	4	5
CK4	ESL lecturers should have a deep understanding of the knowledge structure (organisation) of the English language content.	1	2	3	4	5
CK5	ESL lecturers should possess a substantial knowledge of the ESL instructional materials and curriculum standards.	1	2	3	4	5
Comment on Content Knowledge construct:						
PROFESSIONAL RESPONSIBILITY (PR) - removed						
PR1	ESL lecturers should be able to use AI to reflect on their English language teaching.	Removed				
PR2	ESL lecturers should be able to use AI to maintain accurate records of their English language teaching.	Removed				
PR3	ESL lecturers should be able to use AI to communicate with their students' families.	Removed				
PR4	ESL lecturers should be able to use AI to participate in any activities with a professional ESL community.	Removed				
PR5	ESL lecturers should be able to use AI to grow and develop their English language teaching professionally.	Removed				
PR6	ESL lecturers should be able to use AI to show professionalism in their English language teaching.	Removed				
Comment on Professional Responsibility construct:						

THANK YOU!