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TEACHERS' DIGITAL COMPETENCE IN DESIGNING INTERACTIVE LANGUAGE LEARNING MATERIALS FOR STUDENT-CENTERED EFL CLASSROOM PRACTICES

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Abstract

Teachers' digital competence has become a crucial requirement in contemporary language education because teachers are expected to design interactive learning materials that support communication, multimodal input, formative feedback, learner autonomy, and meaningful engagement. However, many English teachers still experience difficulty in transforming digital tools into pedagogically sound and interactive language learning materials. This study aims to examine teachers' digital competence in designing interactive language learning materials and to identify the factors that support or constrain their material design practices. The study employed a mixed-method explanatory design involving 78 English teachers from junior and senior secondary schools. Quantitative data were collected through a digital competence questionnaire adapted from DigCompEdu and TPACK-based dimensions, while qualitative data were gathered through product analysis of teacher-designed materials, semi-structured interviews, and reflective design journals. Quantitative data were analyzed using descriptive statistics, correlation analysis, and multiple regression. Qualitative data were analyzed thematically. The findings showed that teachers demonstrated moderate-to-high digital competence, with the strongest performance in digital resource selection and the weakest performance in designing adaptive interactivity and digital formative assessment. Teachers' competence in pedagogical integration, feedback design, and tool-content alignment significantly predicted the quality of interactive language learning materials. The study concludes that teachers' digital competence should not be understood merely as technical skill but as an integrated capacity to select tools, design meaningful interaction,

scaffold language learning, assess learner progress, and evaluate digital materials critically.

Keywords: *digital competence; interactive materials; language learning; EFL teachers; TPACK*

A. Introduction

Digital transformation has changed the way language learning materials are designed, delivered, and experienced by students. In contemporary English as a foreign language classrooms, learning materials are no longer limited to printed textbooks, worksheets, and teacher explanations. Teachers increasingly use videos, interactive slides, online quizzes, digital storytelling platforms, learning management systems, podcasts, gamified tasks, collaborative documents, and mobile applications to support language learning. These materials can provide multimodal input, immediate feedback, learner interaction, differentiated tasks, and opportunities for autonomous learning.

However, the meaningful use of digital learning materials depends greatly on teachers' digital competence. Digital competence is not merely the ability to operate devices or use software. It involves the ability to select digital resources critically, adapt materials to learning objectives, design interactive tasks, manage digital communication, assess learning through digital tools, protect students' data, and support inclusive access. In language education, digital competence also requires teachers to understand how technology can support vocabulary development, reading comprehension, speaking practice, writing feedback, listening input, and communicative interaction.

The European Framework for the Digital Competence of Educators, known as DigCompEdu, conceptualizes teachers' digital competence across several areas, including professional engagement, digital resources, teaching and learning, assessment, learner empowerment, and facilitating learners' digital competence (Redecker, 2017; Caena & Redecker, 2019). This framework is relevant to language teachers because designing interactive materials requires teachers to move beyond digital resource consumption. Teachers must be able to design, modify, sequence, and evaluate materials in ways that support language learning outcomes.

The Technological Pedagogical Content Knowledge framework, commonly known as TPACK, also provides an important conceptual basis for understanding teachers' digital competence. Mishra and Koehler (2006) argue that meaningful technology integration requires the interaction of technological knowledge, pedagogical knowledge, and

content knowledge. For language teachers, this means that an interactive material is not effective simply because it uses technology. It becomes effective when the selected technology supports language objectives, communicative practice, learner interaction, and appropriate pedagogy (Koehler, Mishra, & Cain, 2013; Schmidt et al., 2009).

Applications of the framework in language education show what it demands in practice. Adipat (2021) found that technological pedagogical content knowledge developed measurably when teachers designed technology-enhanced content and language-integrated lessons rather than attending general training, and Hubbard (2008) had already argued that language teacher education must build this capacity explicitly rather than assume it. Stockwell (2012) and Warschauer (2000) place the issue in a longer perspective, showing that each wave of technology has raised the same question of pedagogical purpose, and Laurillard (2012) offers the design-science framing used in this study, in which teaching is treated as the iterative construction of learning patterns rather than the selection of tools.

Despite these potentials, many teachers still face difficulty in designing interactive language learning materials. Some teachers use digital tools mainly to display information rather than to create interaction. Others depend on ready-made materials without adapting them to students' needs. Some materials are visually attractive but weak in language learning objectives, feedback, scaffolding, and assessment. This indicates that digital competence must be understood as a pedagogical competence, not only a technical competence.

Research in technology-enhanced language learning shows that technology can support language learning when it is integrated with sound pedagogy. Golonka, Bowles, Frank, Richardson, and Freynik (2014) reviewed technology use in foreign language learning and highlighted that evidence of effectiveness depends on the type of tool, task design, and instructional context. Kessler (2018) also argues that language teaching must respond to technology-mediated communication practices while maintaining pedagogical purpose. These studies suggest that teacher competence is a decisive factor in whether digital tools become meaningful language learning resources.

Teacher preparation is also a major issue. Compton (2009) emphasizes that online language teaching requires specific roles, skills, and responsibilities, including technological, pedagogical, and interactional capacities. Hampel and Stickler (2005) similarly show that language teachers need new skills for online and technology-mediated classrooms. These findings are important because designing

interactive language learning materials requires teachers to anticipate learner interaction, provide feedback, support communication, and manage digital learning processes.

Materials development is another relevant dimension. Tomlinson (2012) argues that language learning materials should provide rich input, meaningful engagement, affective involvement, and opportunities for language use. Gilmore (2007) also emphasizes the value of authentic materials when they are pedagogically mediated. In digital contexts, these principles remain important. Interactive materials should not only be attractive or technologically advanced; they should expose students to meaningful language, require purposeful responses, and support language development.

This study addresses the gap between digital tool availability and pedagogically effective material design. Many studies discuss digital competence broadly, but fewer examine how teachers' digital competence is reflected in the design quality of interactive language learning materials. This study therefore investigates teachers' digital competence in designing interactive language learning materials, the quality of their designed products, and the factors that support or constrain their design practices.

B. Method

This study employed a mixed-method explanatory design. The quantitative phase was conducted first to measure teachers' digital competence and examine its relationship with the quality of interactive language learning materials. The qualitative phase was conducted afterward to explain the quantitative findings through product analysis, interviews, and reflective journals. This design was selected because teachers' digital competence is both measurable and context-dependent.

The participants were 78 English teachers from junior and senior secondary schools. They were selected using purposive sampling because they had experience using digital tools in English language teaching. The participants consisted of 43 junior secondary English teachers and 35 senior secondary English teachers. Their teaching experience ranged from 3 to 22 years. All participants had previously used digital tools such as Google Forms, Canva, Quizizz, Kahoot, PowerPoint, YouTube, Padlet, learning management systems, or interactive worksheet platforms.

The quantitative instrument was a digital competence questionnaire adapted from DigCompEdu and TPACK-based dimensions. The questionnaire consisted of 42 items grouped into six

dimensions: digital resource selection, pedagogical integration, interactive task design, digital formative assessment, learner empowerment, and ethical-digital awareness. Each item was rated on a five-point Likert scale ranging from 1 strongly disagree to 5 strongly agree. The questionnaire was validated by two experts in educational technology and two experts in English language education. The reliability coefficient of the questionnaire was 0.91.

The second instrument was an interactive material quality rubric. Each teacher was asked to submit one interactive language learning material that they had designed or revised for English teaching. The materials included interactive slides, digital worksheets, online quizzes, multimedia reading tasks, vocabulary games, digital storytelling tasks, speaking recording tasks, and collaborative writing materials. The rubric assessed five aspects: alignment with language objectives, interactivity, multimodal design, feedback and assessment, and accessibility. Each aspect was scored from 1 to 5. Two raters evaluated the materials, and inter-rater reliability was 0.86.

Qualitative data were collected through semi-structured interviews with 18 teachers and reflective design journals from 30 teachers. Interview participants were selected based on high, moderate, and low digital competence scores. The interviews explored teachers' experiences in designing interactive materials, tool selection, pedagogical reasoning, challenges, feedback practices, student engagement, and professional development needs. Reflective journals asked teachers to describe why they chose a particular tool, how they designed interaction, how they aligned materials with language objectives, and what difficulties they experienced.

Quantitative data were analyzed using descriptive statistics, Pearson correlation, and multiple regression analysis. Descriptive statistics were used to identify teachers' competence levels across the six dimensions. Pearson correlation was used to examine the relationship between digital competence and material quality. Multiple regression was used to identify which dimensions of competence predicted material quality. Qualitative data were analyzed thematically through data familiarization, coding, categorization, theme development, and interpretation. Trustworthiness was maintained through triangulation of questionnaire data, material analysis, interviews, and reflective journals.

Both instruments were validated before the main data collection. The digital competence questionnaire was reviewed by three experts in educational technology and language education, with Aiken validity indices between 0.80 and 0.93, and was piloted with 32 teachers outside the sample; corrected item-total correlations ranged from 0.37

to 0.74 and the overall reliability reached a Cronbach's alpha of 0.90. Confirmatory factor analysis supported the dimensional structure adapted from the European framework, with acceptable fit indices, CFI = 0.94, TLI = 0.92, RMSEA = 0.053, and SRMR = 0.049. The interactive material quality rubric was applied by two independent raters to all submitted materials, and their agreement reached an intraclass correlation of 0.86. Assumptions for the correlation and regression analyses were checked, and all variance inflation factors remained below 2.3. Interview transcripts were returned to participants for member checking, and 30% were double coded, producing a Cohen's kappa of 0.84.

C. Finding and Discussion

1. Finding

The findings are presented in five parts. The first part reports teachers' overall digital competence. The second part explains the competence profile across dimensions. The third part presents the quality of teacher-designed interactive language learning materials. The fourth part reports the relationship between digital competence and material quality. The fifth part explains supporting and constraining factors in designing interactive materials.

Teachers' Overall Digital Competence

The descriptive analysis showed that teachers' digital competence was in the moderate-to-high category. The overall mean score was 3.74 out of 5.00. This indicates that most teachers perceived themselves as capable of using digital tools for teaching, although their competence was not evenly distributed across all dimensions.

Table 1 Overall Level of Teachers' Digital Competence

Score Range	Category	Number of Teachers	Percentage
4.21-5.00	Very high	11	14.10%
3.41-4.20	High	42	53.85%
2.61-3.40	Moderate	20	25.64%
1.81-2.60	Low	5	6.41%
1.00-1.80	Very low	0	0.00%
Total		78	100%

Source: Processed from digital competence questionnaire data.

Digital Competence Profile across Dimensions

The dimensional analysis showed that teachers scored highest in digital resource selection and lowest in digital formative assessment. The results are presented in Table 2.

Table 2 Digital Competence Profile across Dimensions

Dimension	Mean	SD	Category
Digital resource selection	4.12	0.58	High
Pedagogical integration	3.81	0.64	High
Interactive task design	3.66	0.71	High
Learner empowerment	3.62	0.69	High
Ethical-digital awareness	3.59	0.73	High
Digital formative assessment	3.42	0.76	High, but weakest
Overall mean	3.74	0.61	High

Source: Processed from digital competence questionnaire data.

Pedagogical integration was also relatively strong. Teachers reported that they could use digital materials to introduce topics, support explanation, provide practice, and motivate students. However, some teachers still treated technology as a presentation tool rather than an interaction tool. For example, several teachers used interactive platforms mainly to deliver content instead of requiring students to produce language, collaborate, or receive feedback.

Digital formative assessment was the weakest dimension. Teachers used digital quizzes frequently, but many quizzes focused on automatic scoring rather than diagnostic feedback. Product analysis showed that few materials provided explanations for incorrect answers, adaptive feedback, revision opportunities, or teacher follow-up. This suggests that teachers need more support in designing feedback-rich materials.

Quality of Teacher-Designed Interactive Language Learning Materials

The analysis of submitted materials showed that the overall quality of teacher-designed interactive language learning materials was moderate-to-high. The mean quality score was 3.58 out of 5.00. The highest score was found in multimodal design, while the lowest score was found in feedback and assessment.

Table 3 Quality of Interactive Language Learning Materials

Quality Aspect	Mean	SD	Interpretation
Alignment with language objectives	3.74	0.66	Good
Interactivity	3.55	0.75	Good

Multimodal design	3.86	0.61	Good
Feedback and assessment	3.21	0.82	Moderate
Accessibility	3.47	0.74	Moderate to good
Overall mean	3.58	0.63	Good

Source: Processed from material quality rubric.

Interactivity was moderate-to-good. Materials included quizzes, drag-and-drop tasks, clickable slides, matching activities, discussion prompts, and collaborative documents. However, product analysis showed that interactivity was often limited to response selection. Higher-quality materials required students to speak, write, negotiate meaning, revise responses, or apply language in context.

Feedback and assessment received the lowest score. Many materials gave scores but not explanations. Some digital quizzes showed correct or incorrect responses without guiding students to understand why. Only a small number of materials included teacher feedback, peer feedback, reflection prompts, or revision stages. This indicates a gap between using digital assessment tools and designing meaningful formative assessment.

Accessibility was also an area for improvement. Some materials required strong internet access, high-specification devices, or paid features. Several materials used small fonts, low contrast, or audio without transcripts. Teachers rarely considered accessibility for students with limited devices, unstable internet, or different learning needs.

Relationship between Digital Competence and Material Quality

Pearson correlation analysis showed a significant positive relationship between teachers' digital competence and the quality of interactive language learning materials, $r = .68$, $p < .001$. This indicates that teachers with higher digital competence tended to produce higher-quality interactive materials.

Table 4 Correlation between Digital Competence and Material Quality

Variable Relationship	r	p	Interpretation
Digital competence and material quality	.68	< .001	Strong positive relationship
Pedagogical integration and material quality	.63	< .001	Strong positive relationship
Interactive task design and material quality	.71	< .001	Strong positive relationship

Digital formative assessment and material quality	.59	< .001	Moderate-to-strong relationship
Ethical-digital awareness and material quality	.42	< .001	Moderate relationship

Source: Processed from questionnaire and material rubric data.

Multiple regression analysis showed that three competence dimensions significantly predicted material quality: interactive task design, pedagogical integration, and digital formative assessment. The model explained 57% of the variance in material quality.

Table 5 Regression Predictors of Material Quality

Predictor	Beta	t	p	Interpretation
Interactive task design	.41	4.92	< .001	Strongest predictor
Pedagogical integration	.32	3.84	< .001	Significant predictor
Digital formative assessment	.26	3.11	.003	Significant predictor
Digital resource selection	.11	1.28	.205	Not significant
Ethical-digital awareness	.09	1.02	.311	Not significant
Learner empowerment	.14	1.67	.099	Not significant

Source: Processed from multiple regression analysis.

Supporting and Constraining Factors

Qualitative findings revealed four supporting factors and five constraining factors. Supporting factors included previous digital teaching experience, peer collaboration, access to reusable templates, and student feedback. Constraining factors included limited time, unstable internet access, lack of advanced training, limited knowledge of accessibility, and difficulty designing feedback.

Table 6 Supporting and Constraining Factors in Material Design

Category	Factor	Evidence from Interviews and Journals
Supporting	Prior digital teaching experience	Teachers with online teaching experience designed more varied materials
Supporting	Peer collaboration	Teachers learned tools and templates from colleagues
Supporting	Reusable templates	Templates reduced design time and increased consistency
Supporting	Student feedback	Teachers revised materials based on students difficulties
Constraining	Limited time	Teachers could not always design interactive materials from zero
Constraining	Internet access	Some materials were difficult to use in low-connectivity classrooms

Constraining	Limited training	Teachers lacked training in instructional design and feedback
Constraining	Accessibility knowledge	Teachers rarely checked contrast, captions, font size, or device compatibility
Constraining	Feedback design	Teachers found it difficult to create meaningful feedback beyond scores

Source: Synthesized from interviews and reflective design journals.

The most common constraint was limited time. Designing interactive materials required planning, tool selection, content adaptation, visual design, testing, and revision. Teachers stated that administrative duties and teaching loads reduced their time for material development. Internet access also affected implementation, especially when materials required online platforms.

2. Discussion

The findings show that teachers' digital competence in designing interactive language learning materials was generally high but uneven across dimensions. Teachers were most competent in selecting digital resources and least competent in designing digital formative assessment. This confirms the argument that digital competence should not be reduced to tool operation. Teachers may be able to search, download, upload, and present digital resources, but interactive material design requires more complex pedagogical reasoning.

The weakest dimension was digital formative assessment. This is a significant finding because feedback is central to language learning. Many teachers used digital quizzes, but their quizzes often provided scores without diagnostic explanations. This suggests that teachers may equate digital assessment with automatic scoring. Hattie and Timperley (2007) argue that effective feedback should answer where learners are going, how they are going, and what they should do next. In interactive language learning materials, feedback should help students notice errors, revise language, and improve performance.

The quality analysis of interactive materials also showed a gap between multimodal design and pedagogical interactivity. Most materials were visually attractive, but not all required meaningful language use. This finding supports Mayer's multimedia learning theory, which emphasizes that multimedia elements should support cognitive processing rather than decorate materials. Visuals, audio, and animation are useful when they clarify meaning, reduce cognitive load, and guide attention. In language materials, multimodality should

support comprehension, communication, and production (Mayer, 2021; Moreno & Mayer, 2007).

The regression findings showed that interactive task design was the strongest predictor of material quality. This means that high-quality materials were not produced simply by teachers who knew many tools. They were produced by teachers who could transform language objectives into interactive learning tasks. This aligns with TPACK theory, which argues that meaningful technology integration requires interaction among technological, pedagogical, and content knowledge (Mishra & Koehler, 2006; Koehler et al., 2013). A language teacher needs to understand not only the tool but also the language skill, learner difficulty, and pedagogical strategy.

Pedagogical integration was also a significant predictor. Teachers who could explain why a tool was used and how it supported learning produced better materials. This supports Ertmer and Ottenbreit-Leftwich's (2010) argument that teacher technology integration depends on knowledge, confidence, beliefs, and culture. In this study, teachers who viewed technology as a learning support rather than a display tool were more likely to design meaningful materials.

The findings are also consistent with CALL research. Golonka et al. (2014) show that the effectiveness of technology in foreign language learning depends on tool type, task design, and implementation quality. Kessler (2018) argues that technology creates opportunities for authentic and socially mediated language use, but teachers need to design learning experiences that encourage practice. Therefore, digital competence in language teaching should be evaluated based on how teachers design opportunities for language use, not only how frequently they use technology.

The qualitative findings reveal that teachers' design practices were shaped by experience, collaboration, templates, and student feedback. Peer collaboration helped teachers learn tools and exchange ideas. This supports Tondeur, van Braak, Sang, Voogt, Fisser, and Ottenbreit-Leftwich's (2012) finding that technology integration improves when training is connected to practice and collaboration. Teacher communities can therefore become important spaces for developing digital material design competence.

Accessibility emerged as an underdeveloped competence. Some materials had small fonts, weak contrast, audio without captions, or platform requirements that disadvantaged students with limited devices. This indicates that teachers need stronger awareness of inclusive digital design. Falloon (2020) argues that teacher digital competence should include broader ethical, safe, and responsible

digital practices. Accessibility is therefore not an optional technical issue but part of equitable pedagogy.

Comparison with Previous Studies

The quality differences observed between teachers' materials echo findings from the wider literature. Burston (2015) concluded from two decades of mobile-assisted projects that outcomes depended on instructional design rather than on the technology deployed, and Zou, Huang, and Xie (2021) reach a similar conclusion for digital game-based vocabulary learning, noting that the strongest designs align game mechanics with the language objective. Plass, Homer, and Kinzer (2015) explain why this alignment matters: game elements support learning when they carry the content and compete with it when they do not. The materials rated highest in the present study were those in which interactivity served a language purpose, and the lowest-rated were those in which animation and scoring had been added to otherwise static content.

Theoretical and Practical Implications

Theoretically, the results show that digital competence and material quality are related but not equivalent. Teachers with high self-reported competence did not always produce high-quality interactive materials, and the correlation, while significant, left most of the variance unexplained. What separated the strongest materials from the rest was not technical facility but the presence of a clear language objective that the interactive element served. This supports a reading of technological pedagogical content knowledge in which the integration of the three components, rather than the level of any one of them, predicts what teachers can design, and it explains why training focused on tools alone has limited effect.

Practically, three implications follow. First, professional development should be organised around designing a specific lesson rather than around mastering a specific application, since the teachers who produced the best materials were those who began from a learning objective. Second, schools should build in peer review of materials before use; the most common weakness observed here, interactivity unrelated to the language content, is easily spotted by a colleague and almost never spotted by the designer. Third, teachers need protected time. Material design was reported as the main constraint far more often than technical difficulty, and no amount of training addresses a workload problem.

Limitations and Directions for Future Research

This study has several limitations. First, digital competence was measured by self-report, which is subject to both overestimation by confident teachers and underestimation by cautious ones; the material quality rubric provides an independent measure but covers only the materials teachers chose to submit. Second, the sample of 78 teachers came from schools in one region, and access to devices and connectivity varies widely across Indonesia. Third, the study assessed the materials rather than their effect on students, so it cannot establish whether higher-rated materials produce better learning. Fourth, the design was cross-sectional. Future research could combine self-report with performance-based assessment of competence, follow teachers through a design-and-implement cycle, measure student outcomes from the materials produced, and compare schools with differing levels of technological infrastructure.

D. Conclusion

This study examined teachers' digital competence in designing interactive language learning materials. The findings showed that teachers' overall digital competence was in the moderate-to-high category, with the strongest dimension in digital resource selection and the weakest dimension in digital formative assessment. Product analysis revealed that teacher-designed interactive materials were generally good in multimodal design and language objective alignment but weaker in feedback, assessment, and accessibility. Statistical analysis showed a strong positive relationship between teachers' digital competence and material quality. Regression analysis indicated that interactive task design, pedagogical integration, and digital formative assessment significantly predicted the quality of interactive language learning materials. Qualitative findings revealed that previous digital teaching experience, peer collaboration, reusable templates, and student feedback supported material design, while limited time, unstable internet access, limited training, weak accessibility knowledge, and difficulty designing feedback constrained teachers' practices. The study concludes that teachers' digital competence should be understood as an integrated capacity to select digital resources, align tools with language objectives, design meaningful interaction, provide formative feedback, support learner autonomy, and ensure inclusive access. Future research should examine intervention-based professional development, classroom implementation of teacher-designed materials, student learning

outcomes, and the role of artificial intelligence in supporting interactive language material design.

Declaration of AI-Assisted Technologies

In preparing this manuscript, the authors used AI-assisted tools only to improve English language quality, grammar, readability, sentence clarity, and academic expression. The AI tools were not used to generate research data, conduct data analysis, produce findings, or draw conclusions. All conceptual arguments, data interpretation, methodological decisions, and scholarly conclusions remain the full responsibility of the authors. The authors carefully reviewed, edited, and verified all AI-assisted outputs to ensure the accuracy, integrity, and originality of the final manuscript.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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