https://doi.org/10.15625/2615-8965/22620115

Examining Digital Formative Assessment Challenges through the TPACK Lens in Tertiary EFL Classrooms

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ABSTRACT: *Digital formative assessment (DFA) is increasingly adopted in higher education to enhance feedback and support continuous learning. However, its implementation remains challenging in practice. Guided by the Technological Pedagogical Content Knowledge (TPACK) framework, this study examines the challenges of implementing DFA in tertiary English as a Foreign Language classrooms. A qualitative multiple-case study was conducted at a public university in Vietnam, involving six EFL teachers. Across the six cases, data were collected through 18 classroom observations and 30 semi-structured interviews conducted throughout one course. Data was analysed using thematic analysis, combining deductive coding based on TPACK domains with inductive identification of emerging themes. The findings show that DFA challenges are interconnected across TPACK domains. Technological constraints disrupted participation and increased workload, while digital tools were often used superficially, with limited feedback and data use. Pedagogical issues, including uneven participation and classroom management difficulties, persisted. Content-related constraints led to simplified tasks, which limited assessment depth. Most importantly, the main challenges arose from difficulties in integrating technology, pedagogy, and content, which resulted in fragmented and misaligned DFA practices.*

KEYWORDS: **Digital formative assessment, TPACK, higher education, EFL teachers**
➔ Received 12/11/2025 ➔ Revised manuscript received 14/3/2026 ➔ Published 16/9/2026.

1. Introduction

Over the past few years, the rapid development of information and communication technology (ICT) and the unexpected shift to online education caused by the COVID-19 pandemic have pushed teaching and learning into a completely different stage compared to the pre-pandemic period. When most undergraduate courses were required to move from traditional face-to-face instruction to fully online delivery, institutions, teachers, and students encountered considerable challenges in testing, assessing, and evaluating learners' academic performance (Ghanbari & Nowroozi, 2021; Prather et al., 2025). The sudden transition required all stakeholders to rapidly enhance their ICT competencies and adopt digital tools to meet the demands of remote teaching (Lo, 2021). As a result, technology integration was implemented in various forms, and digital assessment became a necessary component of instructional practice across many educational contexts. As higher education institutions continue to promote blended, hybrid, and flexible learning models, digital assessment has become increasingly integral to the ongoing digital transformation in education (Tahir et al., 2025).

Within this context, DFA has gained attention for its potential to support continuous feedback, monitor student progress, and inform instructional decisions in both online and face-to-face environments (Faber, 2020; Köroğlu, 2021; Zhang & Crawford, 2024). DFA enables automated feedback, diversified assessment formats, and real-time learning analytics, offering opportunities to enhance teaching effectiveness. However, despite these advantages, implementing DFA remains inconsistent and challenging across contexts (Børte et al., 2023; Moorhouse & Kohnke, 2023). Existing studies suggest that difficulties arise not only from technological limitations but also from teachers' pedagogical understanding, content-specific

assessment practices, and their ability to integrate these elements meaningfully (Børte et al., 2023; Krishnan, 2023; Taufiqulloh et al., 2023).

To better understand the complexity of these issues, the TPACK framework developed by Punya Mishra and Matthew Koehler provides a useful analytical lens. This framework conceptualizes effective technology integration as the interaction among technological, pedagogical, and content knowledge. From this perspective, challenges in implementing DFA tools can be explained as misalignments within and across these domains. For example, teachers may possess basic technological knowledge but still struggle to align digital tools with formative assessment principles and language-learning objectives. In addition, contextual factors such as students' readiness and institutional support may further influence how these knowledge domains are enacted in actual classroom practices.

Although previous studies have identified a range of challenges associated with DFA, much of the existing literature has focused on students' perceptions and learning experiences. Comparatively less attention has been paid to teachers' experiences of implementing DFA in actual classroom settings. Moreover, many studies have relied primarily on questionnaires or interviews, providing limited evidence of how challenges emerge during classroom practice. As a result, there remains a need for classroom-based research examining how teachers enact DFA, respond to implementation challenges, and adapt their practices across different teaching contexts. This gap is particularly evident in the Vietnamese tertiary EFL context, where digital assessment has become increasingly common but where teachers continue to face diverse implementation demands. Addressing this gap, the present study adopts a qualitative multiple-case design to investigate how tertiary EFL teachers experience and respond to DFA challenges in practice. By combining classroom observations with interviews across an entire course, the study explores how challenges emerge, how teachers respond to them, and how these experiences vary across cases. Accordingly, this study addresses the following research questions:

1. What challenges do tertiary EFL teachers experience when implementing DFA from a TPACK perspective?

2. How do these challenges appear and differ across cases in integrating technology, pedagogy, and content during DFA implementation?

2. Literature review

2.1. Digital formative assessment in higher education

DFA refers to the use of digital platforms and tools—such as learning management systems (LMS), online quizzes, automated feedback applications, and video-based responses—that enable teachers to monitor student progress and generate feedback to inform adjustments to teaching and learning activities (Looney, 2019). Its purpose is consistent with the broader concept of formative assessment, which emphasizes supporting learning through timely feedback, identifying misconceptions, and guiding instructional decisions (Black & Wiliam, 2018; Brandmo et al., 2020). According to this interpretation, assessment becomes formative when both teachers and students intentionally use evidence of learning to inform subsequent instructional actions and learning strategies.

DFA has become an increasingly important component in undergraduate-level higher education, particularly following the COVID-19 pandemic, during which digital learning environments expanded rapidly (Ghanbari & Nowroozi, 2021). In this context, DFA has been implemented across a wide range of courses and academic skill areas, including written assignments, problem-solving tasks, project-based work, presentations, and discipline-specific assessments. The use of Internet-based applications is often considered beneficial, as it facilitates faster feedback delivery, increases opportunities for learner engagement, and generates data that teachers can use to adapt and improve their instructional practices (Faber, 2020).

However, despite these advantages, research has consistently indicated that the effectiveness of DFA depends on more than the availability of technological tools (Moorhouse & Kohnke, 2023). The extent to which DFA enhances

learning is influenced by a range of contextual factors, including institutional technological infrastructure, teachers' pedagogical readiness, and students' motivation and capacity to engage in continuous assessment processes. Therefore, although DFA offers significant potential to improve teaching and learning at the undergraduate level, its successful implementation is largely shaped by the broader educational context in which it is applied.

2.2. The technological pedagogical content knowledge framework

The TPACK framework, developed byMishra and Koehler (2006), conceptualizes effective technology integration as the interaction among three core domains: technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK) (Mishra & Koehler, 2006). TK refers to teachers' ability to use digital tools, PK to knowledge of teaching and assessment strategies, and CK to subject-matter expertise. In addition, the framework includes intersecting domains—technological pedagogical knowledge (TPK), technological content knowledge (TCK), pedagogical content knowledge (PCK), and the integrated TPACK—which together explain how these knowledge types interact to support effective teaching.

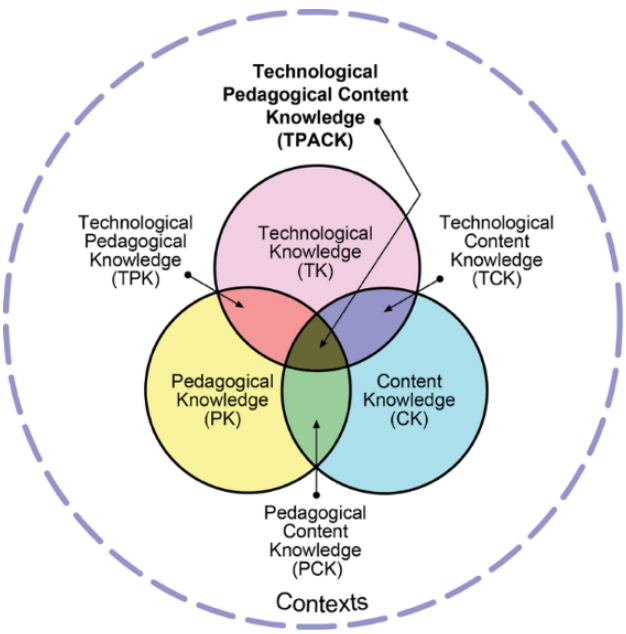


Figure 1. The TPACK framework (Mishra & Koehler, 2006)

In the context of DFA, TPACK provides a useful lens for understanding how teachers design and implement technology-enhanced assessment practices. For instance, TK supports the use of digital platforms such as learning management systems and online quizzes, while PK guides the design of formative tasks, feedback strategies, and student engagement (Gan & Leung, 2020). CK ensures that assessment tasks align with subject-specific learning objectives, such as language skills in EFL contexts. Importantly, effective DFA depends on integrating these domains, in which digital tools are used not only for task delivery but also to facilitate timely feedback, monitor learning progress, and inform instructional decisions (Savitri et al., 2024).

However, studies indicate that teachers often struggle to integrate these domains into practice, leading to a superficial or fragmented use of digital tools (Tseng et al., 2022). In the context of DFA, challenges may arise at different levels of the TPACK framework. For example, technical difficulties may reflect TK-related challenges, while difficulties in using digital tools to provide feedback may be associated with TPK. More complex issues, such as misalignment among digital tools, assessment objectives, and language-learning content, may reflect challenges at the integrated TPACK level. Therefore, this study adopts the TPACK framework as an analytical lens to examine how challenges in DFA implementation arise from gaps or tensions within and across technological, pedagogical, and content knowledge domains, as well as from contextual influences in classroom settings.

2.3. Challenges of digital formative assessment from a TPACK perspective

Although DFA offers significant benefits for enhancing feedback and supporting student learning, its implementation in higher education remains complex and challenging. Previous studies have identified various barriers related to technology, teachers, students, and institutional conditions (Børte et al., 2023; Krishnan, 2023; Taufiqulloh et al., 2023). However, these challenges are often presented as isolated

categories rather than as interconnected issues. Drawing on the TPACK framework proposed by Punya Mishra and Matthew Koehler, this study reconceptualizes these challenges as tensions within and across technological, pedagogical, and content domains.

2.3.1. Technological knowledge-related challenges

Technological challenges are among the most frequently reported barriers to DFA implementation. These challenges reflect not only limitations in teachers' technological knowledge but also issues related to the availability and quality of digital infrastructure. Previous studies have indicated that unstable Internet connections, limited access to digital devices, and slow system responsiveness can significantly disrupt assessment activities and reduce users' overall experience (Kaeane & Molokomme, 2025; Köroğlu, 2021; Sarrab et al., 2016). In addition, the design of digital tools presents further challenges. Some platforms are not well aligned with formative assessment purposes, making it difficult for students to interpret feedback or monitor their learning progress effectively. Moreover, many digital tools tend to focus on individual performance and provide limited support for assessing collaborative learning processes (Çekiç & Bakla, 2021; Van Aalst & Chan, 2007).

2.3.2. Pedagogical knowledge-related challenges

Pedagogical challenges arise from teachers' understanding of formative assessment principles and their ability to apply them effectively. Research indicates that many teachers have an unclear or limited understanding of formative assessment, which affects their ability to design meaningful tasks and provide effective feedback (Børte et al., 2023; Moorhouse & Kohnke, 2023). In some cases, teachers continue to rely on traditional assessment approaches even when using digital tools, leading to a misalignment between technology use and pedagogical objectives (Krishnan, 2023). In addition, limitations in pedagogical content knowledge make it difficult for teachers to design assessment tasks closely aligned with subject-specific goals, particularly in language-learning contexts where feedback and skill development are essential.

2.3.3. Technological pedagogical knowledge-related challenges

At the intersection of technology and pedagogy, many challenges stem from teachers' limited ability to integrate digital tools into meaningful instructional practices. Research has shown that technology is often used superficially, with digital tools treated as supplementary add-ons rather than as integral components of formative assessment (Børte et al., 2023; Kaeane & Molokomme, 2025). As a result, DFA practices may place greater emphasis on task completion than on improving student learning. For example, online quizzes and automated feedback systems are not always aligned with formative assessment principles, such as promoting student reflection or providing actionable feedback. This suggests a gap in technological-pedagogical knowledge, where teachers can operate digital tools but encounter difficulties using them effectively for pedagogical purposes.

2.3.4. TPACK challenges

At a deeper level, challenges in DFA implementation reflect difficulties in integrating technological, pedagogical, and content knowledge. Effective DFA practices alignment among digital tools, instructional strategies, and subject content. However, many teachers experience challenges in achieving this integration (Børte et al., 2023; Moorhouse & Kohnke, 2023). For example, teachers may struggle to select appropriate digital tools for assessing specific language skills or to interpret assessment data to inform their instructional decisions. As a result, DFA practices may become fragmented, with limited coherence among learning objectives, assessment design, and feedback processes. These findings suggest that the key challenge lies not in any single domain, but in integrating multiple knowledge domains into teaching practice.

2.3.5. Contextual influences on TPACK implementation

In addition to knowledge-related challenges,

contextual factors play a significant role in shaping the implementation of DFA. Student-related issues, such as heavy workload, digital fatigue, and reduced engagement, may limit the effectiveness of formative assessment practices (Taufiqulloh et al., 2023; Krishnan, 2023). Therefore, institutional factors also play a critical role. Constraints such as limited infrastructure, insufficient training, and unclear policies may hinder teachers' ability to integrate DFA effectively (Tang et al., 2022). In some cases, teachers may adopt digital tools primarily to meet institutional requirements rather than to enhance student learning, resulting in a more surface-level application of DFA.

In brief, the challenges of DFA can be understood as interconnected issues within and across the TPACK domains, shaped by contextual factors. Rather than viewing these challenges as isolated categories, a TPACK perspective suggests that the main difficulty lies in integrating technological, pedagogical, and content knowledge in a coherent and meaningful manner within classroom practice.

3. Methodology

3.1. Design of the study

This study adopted a qualitative multiple-case study design to examine the challenges of implementing DFA in tertiary EFL classrooms through the lens of the TPACK framework. A qualitative approach was selected to capture teachers' experiences, interpretations, and classroom practices, which are not easily explored through quantitative methods (Stake, 2006; Yin, 2018). In addition, the multiple-case design enabled in-depth analysis of individual teacher cases and cross-case comparison. This was important for identifying how challenges are experienced and how they vary across teachers within the same institutional context.

The study was guided by the TPACK framework, which served as an analytical lens to examine how challenges emerge from tensions in integrating technological, pedagogical, and content knowledge. Rather than treating challenges as isolated issues, this approach allows for a more comprehensive understanding of how they are shaped in practice.

3.2. Research setting and participants

This study was conducted at a public higher education institution in an urban area in Vietnam, where English is taught as a compulsory subject for non-English-major students. The institution has increasingly encouraged the use of digital tools in teaching and assessment. The English program includes two compulsory General English courses designed to help students achieve B1 level according to the Common European Framework of Reference for Languages (CEFR), which is required for graduation. These courses were delivered in the first semester of the 2025–2026 academic year. Each course lasts 11 weeks, with class sizes ranging from approximately 30 to 50 students. The main textbook used is Life, published by Cengage Learning, supported by the institutional learning management system, SPARK.

The assessment structure allocates 50% of the total grade to formative assessment. Within this component, 30% is designed and implemented by individual teachers, while the remaining 20% is based on completing online assignments on the SPARK platform. The remaining 50% is allocated to summative assessment, which consists of final paper-based tests conducted according to the university's official examination schedule. This structure provides teachers with a certain degree of flexibility in integrating DFA tools into their teaching practices while maintaining standardized evaluation requirements.

Participants were selected using purposive sampling to ensure their relevance to the research objectives (Merriam & Tisdell, 2016; Stake, 2006). Two criteria guided the selection: (1) participants were tertiary EFL teachers teaching non-English-major students, and (2) they had experience using digital tools in formative assessment. The final sample included six EFL teachers from the same institution. Although they shared a common institutional context, they differed in terms of teaching experience and professional background, allowing the study to examine both common and diverse experiences of DFA-related challenges across cases.

Table 1. Participant demographics

Teachers	Gender	Age	Highest degree	Teaching experience (years)
Teacher 1	Female	25	MA in English Language	03
Teacher 2	Male	26	MA in English Language	04
Teacher 3	Female	29	MA in TESOL	07
Teacher 4	Female	33	MA in TESOL	11
Teacher 5	Female	36	MA in TESOL	14
Teacher 6	Female	42	MA in TESOL	20

3.3. Data collection and analysis

Data were collected through semi-structured interviews and classroom observations to capture both teachers' reported experiences and their actual classroom practices.

Semi-structured interviews were chosen for their flexibility, which allows follow-up questions and deeper exploration of participants' responses (Creswell & Creswell, 2023; Merriam & Tisdell, 2016). In this study, interviews were used to explore how teachers perceive and experience challenges in DFA implementation, while observations provided additional evidence of how these challenges appear in practice. All interviews were conducted in Vietnamese to facilitate natural expression (Duff, 2008). Interview recordings were transcribed verbatim in Vietnamese. Quotations included in this article were translated into English by the researcher and checked against the original transcripts to ensure accuracy. Ethical approval was obtained from the university before data collection. All participants provided informed consent and were assured of confidentiality and anonymity.

Classroom observation was used as a second data-collection instrument to capture naturally occurring teaching practices (Mirhosseini, 2020). Each of the six participating teachers was observed three times across the course, corresponding to the early, middle, and later stages. This allowed the study to examine how DFA practices were introduced, sustained, and adapted over time. A structured observation protocol was used to document how DFA tools were implemented in practice, focusing on challenges related to tool use, student engagement, and classroom interaction.

Data collection began with an initial semi-structured interview (approximately 30–45 minutes) to gather demographic information and explore teachers' planned use of DFA. Each classroom observation lasted for a full lesson (approximately 135 minutes) and was followed by a semi-structured interview of approximately

Table 2. Data collection procedure

Stage	Data collection	Focus
Pre-course	Initial Interview	- Teacher background and planned DFA practices
Early stage (Weeks 1–2)	Observation 1 + Interview 1	- Initial implementation challenges
Mid stage (Weeks 4–6)	Observation 2 + Interview 2	- Emerging challenges in DFA implementation
Late stage (Weeks 9–10)	Observation 3 + Interview 3	- Ongoing challenges and response
End of course	Final interview	-Overall reflection on challenges experienced throughout the course

30 minutes. At the end of the course, a final interview (30–45 minutes) was conducted to examine how teachers adapted their DFA practices and responded to challenges throughout the course. Across the six cases, a total of 18 classroom observations and 30 semi-structured interviews were conducted.

Data were analysed using a thematic approach that combined deductive and inductive procedures (Clarke & Braun, 2017). First, interview transcripts and observation notes were read repeatedly to achieve data familiarization. Initial coding was then conducted deductively using the TPACK framework. Challenges were categorized into TK, PK, CK, TPK, TCK, PCK, and the integrated TPACK domains, as shown in Table 3. Coding was conducted by the researcher, and coding decisions were documented throughout the analysis to maintain consistency and transparency. Following the deductive coding process, inductive coding was conducted to identify additional themes that were not fully captured by the TPACK framework. Those were related to contextual influences such as student behavior, class size, and institutional conditions. Interview and observation data were then triangulated by comparing teachers' reported experiences with observed classroom practices. Finally, cross-case analysis was conducted by comparing similarities and differences across the six cases to identify recurring patterns and variations in DFA implementation.

3.4. Trustworthiness

To ensure the study's trustworthiness, the criteria proposed by Lincoln & Guba (1985) -credibility, transferability, dependability, and confirmability- were applied. Credibility was enhanced through triangulation of interview and observation data and member checking of interview summaries. Transferability was supported through a detailed description of the research context, participants, and classroom settings. Dependability and confirmability were ensured through systematic coding procedures and by maintaining a clear audit trail of coding, theme development, and data interpretation.

4. Data findings

Before analysing the challenges of DFA across 6 cases, an overview of its implementation across 6 classes was presented in Table 4. As shown in Table 4, teachers employed a range of tools for different purposes, including conducting quizzes, facilitating interaction, collecting student responses, managing tasks, and tracking participation. In several cases, multiple tools

Table 3. TPACK-based coding framework for DFA challenges

Domain	Definition in this study	Example challenge
TK	Challenges related to using digital tools and technologies	Internet instability, device limitations, tool reliability
PK	Challenges related to teaching and classroom management	Uneven participation, student distraction, group work issues
CK	Challenges related to language content and assessment content	Difficulty assessing higher-order language skills
TPK	Challenges in using technology to support formative assessment processes	Limited feedback use, superficial use of assessment data
TCK	Challenges in aligning digital tools with language content	Unsuitable tools for certain language skills
PCK	Challenges in assessing language content pedagogically	Simplification of assessment tasks due to student proficiency
TPACK	Challenges involving the integration of technology, pedagogy, and content	Fragmented implementation, assessment misalignment

Table 4. Digital tools and their classroom functions in formative assessment

Digital tool	Classroom function
Wayground / Quizlet	Conducting interactive quizzes and reviewing answers
Padlet	Facilitating student interaction and sharing responses
Zalo	Assigning tasks, collecting submissions, and communicating with students
Google Forms/ Mentimeter	Collecting student responses and formative assessment data
Google Sheets	Recording scores and tracking student participation
AI tools (ChatGPT/ Gemini/ Copilot/ Google AI Studio)	Generating content for the formative assessment tasks
LMS SPARK	Assigning tasks, monitoring completion, and supporting formative assessment

were used together to support different aspects of classroom assessment activities.

Regarding the challenges tertiary EFL teachers experience when implementing DFA through a TPACK lens, analysis of interview and classroom observation data revealed that challenges were multifaceted and interconnected. These hindrances arose not only within individual domains but more critically from misalignment across technology, pedagogy, and content. Across cases, although digital tools were widely adopted, their use often remained limited to specific functions, particularly engagement, rather than supporting the full formative assessment cycle.

4.1. Technological challenges

Teachers across cases encountered infrastructure-related challenges, particularly unstable internet connectivity and inconsistent student access to devices. As teacher 5 noted, "Sometimes it is difficult to implement DFA activities in other classes because the Wi-Fi is very poor." (Teacher 5), while another explained that "Not all students in the class can log in to the digital assessment task, so I have to wait for a long time". (Teacher 3). Similarly, teacher 4 reported that "Some students were in the middle of the activity when they got disconnected," indicating frequent disconnection during activities. These challenges were also evident in classroom observations, where some students were unable to join or complete digital tasks due to weak internet connections or device issues, and, in some cases, were disconnected and unable to rejoin ongoing activities. In addition to access issues, limitations of digital tools further increased teachers' workload. For example, teacher 5 noted, "I use ChatGPT to generate exercises, but some of the items are incorrect." This suggests that digital tools did not always function reliably; therefore, teachers has to spend more time verifying and adjusting.

4.2. Pedagogical - Technological challenges

A central challenge across cases was the difficulty of using digital tools pedagogically to support formative assessment, particularly in relation to feedback and data use. Although digital tools generated immediate results, their use was often limited. For example, teacher 5 noted, "After the quiz finished, I only looked at the overall percentage… I didn't go into each student's result." Similarly, observations showed that some digital activities ended without feedback. Teachers just ended the quiz and moved on.

In contrast, another teacher reported using the results for review and to explain incorrect answers. Teacher 1 explained, "If the correct percentage of the question item is low, I will review the content more carefully." In addition, time constraints further restricted implementation, with teachers prioritizing lesson pacing over feedback, as seen in both interview and observation data, where activities ended without correction. Moreover, digital tools created classroom management

challenges, as students were easily distracted. "When I ask students to take out their phones to participate in a Wayground quiz, they often take the opportunity to browse Facebook or Zalo" (Teacher 4). This led her to either restrict tool use or adjust task design. Finally, teachers reported a mismatch between tools and language skills, particularly for productive skills: "When applied to productive skills, it is not effective… it is only suitable for reviewing grammar and vocabulary." (Teacher 5)

4.3. Pedagogical challenges

Pedagogical issues persisted across cases, particularly in group work, classroom management, and student engagement during the formative assessment tasks. Group work was often ineffective, with uneven participation, as one teacher noted that "one student ends up doing most of the work, while the others do not really participate" (Teacher 5). Similarly, another teacher highlighted that the lack of discussion limited understanding (Teacher 6), a finding also observed in practice, where students divided tasks without meaningful collaboration. Classroom management was another challenge, as teachers struggled to monitor participation and maintain engagement. Some used monitoring strategies, while others imposed stricter control, such as asking students to put away their phones (Teacher 4). However, observations showed that lessons were often teacher-centred, with lower student engagement. Finally, engagement was uneven: participation increased during digital activities but declined afterward, particularly due to fatigue or loss of focus after game-based tasks (Teacher 4, Teacher 5).

4.4. Content-related constraints (CK)

In a few cases, content-related challenges in implementing DFA were closely linked to students' proficiency levels, which in turn shaped how teachers designed and used assessment tasks. For example, one teacher explained that "for A1-level students, it is already acceptable if they can recognize or catch key words when listening, so I cannot expect them to understand the content fully" (Teacher 2), which was reflected in classroom observations where tasks were simplified and focused mainly on vocabulary. In another case, content difficulty led to further adaptation, as a teacher reported, "Because the reading text is too long and difficult, I decided to skip the reading section and only focus on teaching vocabulary" (Teacher 4). While these adjustments made DFA tasks more accessible, they also constrained the scope of assessment, limiting opportunities to assess deeper language skills.

4.5. Integrated TPACK challenges

Across cases, the most persistent challenges appeared at the level of TPACK integration. Misalignment between technology, pedagogy, and content was evident across cases. In fact, teachers often used multiple tools in parallel rather than as an integrated system, as teacher 2 explained that "I often have to use different tools such as Zalo, apps, and the board separately, rather than integrating them into a single coherent system" (Teacher 2). In addition, digital tools were not always aligned with assessment goals, with some teachers noting that "online tools are mainly used for participation, not for formal assessment purposes" (Teacher 4). Other teachers applied tools selectively depending on the content. Across cases, digital tools were primarily used to enhance engagement rather than support deeper learning, as reflected in the comment that they "mainly help increase students' motivation, but they do not significantly improve their knowledge" (Teacher 5). This challenge was also observed in practice, where high engagement did not necessarily lead to clear learning outcomes. Finally, contextual factors such as class size and classroom control further shaped implementation, requiring teachers to adapt strategies, including limiting tool use or placing digital activities at specific points in the lesson. Teacher 2 explained, "In large classes, providing feedback and checking students' work becomes very time-consuming and tiring" (Teacher 2). Also, teacher 4 added, "I usually use digital tools near the end of the lesson to better manage classroom control."

Overall, the findings indicate that the

challenges of implementing DFA are not primarily due to a lack of access to technology, but rather to difficulties in aligning technology, pedagogy, and content. To synthesize these cross-case findings, Table 5 summarizes the core TPACK-related challenges identified across cases.

As shown in Table 5, challenges occurred across all TPACK domains, but the most significant issues were related to the integration of technology, pedagogy, and content in practice. Some challenges, particularly technical and participation-related issues, were reported across several cases. Teachers dealt with them in different ways depending on their teaching context and strategies. These differences show that implementing DFA is not the same across classrooms and is strongly influenced by contextual factors.

4.6. Cross-Case patterns of DFA implementation and challenges

While the previous sections presented challenges within the TPACK domains, the multiple-case design also enabled comparisons across the six cases. To further illustrate how DFA challenges varied across cases, Table 6 summarizes the main DFA tools, purposes, challenges, and observed classroom evidence for each teacher. The comparison highlights both recurring and case-specific challenges in DFA implementation.

As shown in Table 6, DFA challenges varied across cases. Some teachers experienced tool-related constraints, such as unstable internet connections, platform limitations, or the need to verify AI-generated content. Others faced more pedagogical challenges, including student

Table 5. Summary of DFA challenges across TPACK domains

TPACK domain	Challenge	Description	Case pattern
TK	Resource and technical constraints	Internet instability, device limitations, and tool reliability affect participation.	Reported across several cases, teachers responded through selective use or adaptation
TPK	Limited pedagogical use of tools	Data used superficially; feedback constrained by time and classroom management issues	Varies from surface use to limited follow-up support
PK	Pedagogical challenges	Uneven participation, ineffective group work, and fluctuating engagement	Differences in control and facilitation approaches
CK	Content constraints	Task simplification due to student proficiency limits assessment depth	Some adjust expectations; others simplify or skip content
TPACK	Integration challenges	Fragmented use, assessment misalignment, and focus on engagement over learning.	Some use tools strategically; others use them separately.

Table 6. Cross-Case Comparison of DFA Challenges

Case	Main DFA tools	DFA purpose	Main challenges	Observed evidence
T1	Zalo, Wayground, SPARK	Monitor progress and identify learning gaps	Time constraints; limited suitability for productive skills	Digital tools mainly supported grammar and vocabulary review
T2	Zalo, Google Forms, SPARK	Monitor participation and provide feedback	Feedback workload; connectivity issues; higher-order skills assessment	Multiple tools were used, but individualized feedback remained difficult

Case	Main DFA tools	DFA purpose	Main challenges	Observed evidence
T3	Wayground, Padlet, Mentimeter	Feedback, writing development, engagement	Concerns about AI-assisted responses, limited peer feedback, and large classes	High engagement during digital activities and writing tasks
T4	Wayground, Google Forms, Wheel of Names	Check understanding and review content	Student distraction, low proficiency, and technical problems	Engagement increased during games but declined afterward
T5	Wayground, Quizlet, AI-generated quizzes, SPARK	Review learning and exam preparation	Limited preparation time; unreliable homework data; unequal participation; ineffective group work	Digital tools were mainly used for review and competition-based activities.
T6	PowerPoint, student-generated quizzes, SPARK, AI tools	Peer learning and collaboration	Uneven participation, low speaking confidence, and large classes	Student-generated assessment required strong scaffolding

distraction, uneven group participation, and limited engagement after digital activities. Content-related constraints were also evident when teachers simplified tasks because of students' proficiency levels. Across cases, these challenges rarely appeared in isolation. They often reflected the interaction between technology, pedagogy, content, and classroom conditions, which supports the interpretation that the most persistent difficulties occurred at the level of TPACK integration.

5. Discussion

The findings show that the challenges of implementing DFA in tertiary EFL classrooms extend beyond access to technology. Although digital tools were widely used across the six cases, their effectiveness was often limited. The main issue was not the availability of technology but the difficulty of using digital tools to support formative assessment. This finding is consistent with previous research, which emphasizes that the effectiveness of DFA depends on how digital tools are used pedagogically rather than simply on their availability (Moorhouse & Kohnke, 2023).

At the technological level, issues such as unstable Internet connections and limited device access disrupted students' participation, as supported by earlier studies (Köroğlu, 2021). However, this study further shows that these challenges also affected teaching decisions. In several cases, teachers simplified tasks, reduced interaction, or adjusted the use of digital tools to address technical problems. This suggests that technological challenges affected not only access to DFA but also the implementation of formative assessment in practice.

A more important finding concerns how digital tools were used in the classroom. Across cases, digital tools were frequently used to increase participation and engagement, but less often to support feedback and instructional adjustment. Although many tools generated immediate results, teachers did not always have sufficient time to review the data or provide follow-up feedback. As a result, digital activities often focused on checking answers rather than using assessment evidence to support learning. This finding is consistent with previous studies showing that technology is frequently used as a supplementary tool rather than as an integrated part of formative assessment (Børte et al., 2023).

This distinction helps explain one of the recurring patterns observed across the six cases. Students were often highly engaged during game-based activities and online quizzes, yet there was limited evidence that this engagement led to deeper learning. In several classrooms, participation increased noticeably during digital activities but declined once the activity ended. Teachers also tended to use quiz results mainly

to identify correct and incorrect answers rather than to provide detailed feedback or modify subsequent instruction. From a formative assessment perspective, engagement alone is not sufficient. Assessment becomes formative when evidence of learning is used to support feedback, learner progress, and instructional decisions (Black & Wiliam, 2018; Brandmo et al., 2020). Therefore, the findings suggest that many teachers were successful in using digital tools to motivate students but encountered difficulties in integrating them into the full formative assessment cycle. This finding extends previous research by showing that the challenge is not whether digital tools can engage students, but whether they can be integrated into feedback and learning processes in meaningful ways.

Content-related constraints also influenced implementation. Teachers frequently adapted assessment tasks to match students' proficiency levels. While these adjustments made activities more accessible, they often reduced opportunities to assess higher-order language skills, particularly in reading and listening. Similar concerns have been reported in previous studies, which emphasize the importance of aligning assessment tasks with learning objectives (Moorhouse & Kohnke, 2023).

Most importantly, the findings highlight that the main challenges in DFA lie in TPACK integration. Difficulties were rarely confined to a single domain. Instead, teachers experienced challenges in aligning digital tools, assessment purposes, teaching strategies, and language content. Contextual factors, including class size, time constraints, student proficiency, and classroom management further shaped these challenges. The cross-case analysis showed that teachers responded differently to these constraints, but similar patterns of fragmented implementation and assessment misalignment appeared across cases. This evidence supports the argument that challenges in DFA are not isolated technological or pedagogical issues. Rather, they arise from the complexity of integrating technology, pedagogy, and content within specific classroom contexts. Effective DFA, therefore, requires not only knowledge of digital tools, pedagogy, and content, but also the ability to combine these elements in ways that support feedback, learner progress, and instructional decision-making.

6. Conclusions & recommendations

This study highlights the key challenges teachers face when implementing DFA in tertiary EFL classrooms through the TPACK lens. The findings show that although a range of digital tools was used in classroom assessment, their implementation was often limited in scope and effectiveness. The main issue was not the lack of technology, but the difficulty of integrating technology, pedagogy, and content in a coherent and meaningful way.

Across the six cases, technological constraints, such as unstable Internet connections and limited device access, disrupted participation and increased teachers' workload. At the pedagogical level, digital tools were used in a limited way, and feedback and assessment data were not fully utilized to support learning. There are pedagogical challenges, including uneven participation, classroom management difficulties, and fluctuating engagement despite the use of digital tools. Moreover, content-related constraints led teachers to simplify assessment tasks to match students' proficiency levels, thereby improving accessibility but reducing opportunities to assess more complex language skills. Most importantly, challenges were most evident at the TPACK integration level. Fragmented use of tools, misalignment between assessment goals and tool functions, and a focus on engagement over learning reduced the effectiveness of DFA.

Overall, the findings indicate that challenges in DFA are not confined to individual domains but arise from interactions among TPACK components and are influenced by contextual factors such as class size, time constraints, and classroom control. These findings suggest that improving DFA requires more than adopting digital tools. It requires a more integrated and pedagogically informed approach. Therefore, several implications can be drawn for practice and policy. First, professional development should focus not only on technical skills but also

on helping teachers integrate digital tools with appropriate pedagogical strategies and content knowledge. Second, institutions should provide support to address contextual constraints, such as improving infrastructure, managing class size, and reducing workload. Third, teachers should be supported in designing assessment tasks that promote meaningful feedback and deeper learning, rather than focusing mainly on engagement.

However, several limitations should be noted. First, the study involved only six teachers from a single institution, which limits the transferability of the findings to other contexts. Second, the study focused exclusively on teachers' perspectives and classroom practices; students' experiences and perceptions of DFA were not examined. Third, the study did not investigate learning outcomes, so it cannot determine how the identified challenges affected students' achievement. Finally, because all cases were drawn from the same institution, the study was unable to compare how different institutional contexts may influence DFA implementation. Future research could address these limitations by including student perspectives, examining learning outcomes, and conducting cross-institutional studies to provide a broader understanding of DFA implementation in higher education.

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