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Technology-Enhanced Language Learning: A Case Study of a Language Lab Initiative in the UAE

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Abstract

Objectives: This study aimed to explore the implementation and perceived impact of a technology-enhanced language laboratory in a private K–12 school in the UAE. It also aimed to identify how the lab supported Arabic as a First Language (AFL) and Arabic as a Second Language (ASL), enhance student engagement, and promote teacher professional development within a digitally enriched learning environment.

Methods: The study used a qualitative case study design,drawing on semi-structured interviews, classroom observations, and document analysis. The initiative integrated information and communication technologies (ICT) to support multimedia-based learning, interactive speaking and listening tasks, and blended language instruction.

Results: The study results showed that that the lab fostered authentic, collaborative, and interactive learning experiences increased student motivation, and offered a space for pedagogical reflection. The study results also showed that full institutional integration was hindered by scheduling limitations, inadequate teacher training, and the absence of long-term sustainability planning.

Conclusion: The study presents a potentially transferable model for multilingual, technology-supported language learning in the UAE and wider Gulf region. It also recommends that educators, school leaders, and policymakers ought to seeking to implement or enhance digitally enriched, context-responsive language education frameworks aligned with evolving educational technology practices.

Keywords: language labs, Technology-enhanced learning, Educational technology integration, Arabic language education, UAE schools.

تعلّم اللّغة مدعومًا بالتّكنولوجيا: دراسةُ حالة لمبادرةِ مختبرٍ لغويّ في دولة الإمارات العربيّة المتّحدة

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ملخّص

الأهداف: يتناولُ هذا البحث النّوعيّ دراسة حالة؛ لتطبيق وتأثير مبادرة مختبرٍ لغوي مدعومٍ بالتكنولوجيا في مدرسة خاصّة، بدولة الإمارات العربية المتحدة، تضمّ المراحل من رياض الأطفال حتى الصّف الثاني عشر. وتستكشف الدراسة كيف ساهم المُختبر في دعم تعليم اللّغة العربيّة كلغةٍ أولى (AFL) وكلغة ثانية (ASL) ، وتعزيز تفاعل الطّلاب، وتطوير الممارسات المهنيّة للمعلّمين في بيئة تعليميّة رقميّة متقدّمة.

المنهجيّة: اعتمدت الدّراسة على منهج دراسة الحالة النوعية، وتمّ جمع البيانات من خلال مقابلات شبه منظّمة، وملاحظات صفّيّة، وتحليل وثائق. وشملت المبادرة توظيف تكنولوجيا المعلومات والاتصال (ICT) لتقديم تعليم متعدّد الوسائط، ومهام تفاعليّة في مهارات التّحدّث والاستماع، وتعليم لغويّ مدمج.

النّتائج: أظهرت النّتائج أنّ المختبر وفّر بيئة تعليمية أصيلة وتعاونيّة وتفاعليّة، وعزّز من دافعية الطلاب، وأتاح مساحة للتفكّر التربوي وتطوير الموارد الرّقميّة. ومع ذلك، فإن دمجه الكامل ضمن المؤسّسة التّربويّة واجه تحدّيات تمثّلت في صعوبات الجدولة، ونقص تدريب المعلّمين، وعدم وجود خطّة واضحة لاستدامة المبادرة.

الاستنتاجات: رغم خصوصيّة السّياق المدرسيّ، تقدّم الدراسة نموذجًا قابلًا للتّطبيق في مبادرات تعليميّة متعدّدة اللّغات، ومدعومة بالتّكنولوجيا في دولة الإمارات العربيّة المتّحدة ومنطقة الخليج. وتطرح توصيات عمليّة للمربّين، وقادة المدارس، وصنّاع القرار لتطبيق أو تحسين أطر تعليم اللّغة المدعومة رقميًا والمُستجيبة للسّياقات التّعليميّة المحلّية.

الكلمات المفتاحية : المُختبرات اللّغوية، التّعلّم المدعوم بالتّكنولوجيا، دمج التّكنولوجيا في التّعليم، تعليم اللّغة العربيّة، مدارس الإمارات.

1. Introduction

The integration of technology into language learning has gained significant traction in recent years, driven by the evolving demands of 21st-century education and the growing need for learners to acquire linguistic competencies through dynamic, interactive platforms (Chapelle, 2003; Warschauer & Healey, 1998). Among the most promising innovations are technology-enhanced language laboratories, which offer immersive, learner-centred environments that support individualized instruction, immediate feedback, and learner autonomy (Beatty, 2010). These labs facilitate engagement across all four language domains—listening, speaking, reading, and writing—using multimedia content and adaptive learning software. Empirical studies have shown that such tools significantly enhance both linguistic performance and student motivation (Golonka et al., 2014; Yang & Chen, 2007).

Unlike traditional audio-based language labs of the past, modern technology-enhanced laboratories are digitally equipped learning spaces that integrate multimodal tools—including voice recorders, speech analysis software, interactive platforms, and multimedia libraries—allowing for both synchronous and asynchronous language practice. Within the United Arab Emirates (UAE), schools have increasingly invested in digital infrastructure and educational technology to improve learning outcomes, especially in multilingual and multicultural contexts (Rabaah et al., 2016; Al-Awidi & Ismail, 2014). Despite this momentum, the literature remains limited in several key areas: the integration of educational technology in Arabic language classrooms (particularly Arabic as a second or additional language), the pedagogical effectiveness of such tools, and the contextual realities faced by schools in the Gulf region.

Most schools in Dubai offer language clubs and informal activities to supplement language acquisition, particularly for learners of Arabic as an additional language. However, a review of current school practices reveals a notable gap: the lack of structured, technology-supported Arabic language labs designed to enhance both teaching and learning in a systematic and sustainable way. The few existing studies on Arabic and technology often remain theoretical, limited in scope, or insufficiently grounded in K–12 classroom practice.

This study addresses that gap by examining the design, implementation, and early outcomes of the Jameel Azzam Arabic Language Lab, an innovative initiative launched at Jumeirah Baccalaureate School, a private K–12 school in Dubai. The project was funded by Dr. Ziad Azzam, a parent and active member of the school community, in memory of his late father. Following collaborative planning between the Head of Languages and the Senior Leadership Team, the lab was established as a state-of-the-art facility equipped with computers, headsets, audio recording devices, and curated pedagogical resources grounded in second language acquisition theory. The lab was intended not only as a student-centred learning space but also as a hub for teacher professional development, research, and collaborative lesson design.

One of the lab's primary goals was to enhance students' proficiency in Modern Standard Arabic (Fusha), particularly by improving phonetic accuracy and reducing dialectal interference. It also supported teachers in responding more effectively to student needs by enabling the review of recorded performances and the provision of individualized feedback.

Nevertheless, the implementation of such a facility was not without its challenges. Issues such as teacher readiness, alignment with curricular standards, infrastructure management, and sustaining student engagement had to be strategically addressed to ensure long-term success and sustainability (Bax, 2003; Hubbard, 2009). This paper explores both the pedagogical impact and the implementation challenges associated with the language lab, contributing to the growing body of literature on technology-enhanced language learning. It offers insights relevant to educators, administrators, and policymakers considering similar initiatives within comparable educational settings.

The remainder of this paper is structured as follows: the next section presents a review of relevant literature, situating the study within broader theoretical and empirical work on technology-enhanced language education. This is followed by a description of the qualitative methodology employed, including data collection and analysis procedures. The subsequent section presents key findings and discusses them in relation to prior research. The paper concludes with practical recommendations, acknowledgements of limitations, and directions for future research.

2. Literature Review

2.1 Technology in Language Education

Educational technology has transformed language teaching globally, particularly through Computer-Assisted Language Learning (CALL). Warschauer and Healey (1998) outlined the early stages of CALL, highlighting how technology fosters interactive, student-centred learning. Later research expanded on this, demonstrating how digital tools support learner autonomy, differentiated instruction, and timely feedback (Chapelle, 2003; Beatty, 2010; Golonka et al., 2014). Ahmed and Nasser (2022) reaffirmed the relevance of multimodal digital platforms, particularly in hybrid or blended learning models that align with 21st-century skills.

However, despite these technological advances, embedding such tools meaningfully into classroom practice remains a challenge. Lai and Morrison (2013) found that teachers' pedagogical beliefs and access to professional learning significantly influence the successful integration of digital tools. Their findings emphasize the importance of institutional readiness, extending beyond infrastructure to include pedagogical preparedness.

2.2 Language Labs: Evolution and Pedagogical Value

Language labs have evolved from traditional audio-drill spaces into multimedia-rich environments aligned with Communicative Language Teaching (CLT) principles (Hubbard, 2009). These labs now incorporate tools such as speech recognition software, collaborative platforms, and video libraries that support both student learning and teacher development. Jwaifell and Gasaymeh (2023) noted that digital Professional Learning Networks (PLNs), when well-designed, foster teacher capacity and encourage collaborative professional cultures.

Evidence shows that modern language labs enhance learner fluency, motivation, and metacognitive awareness (Yang & Chen, 2007; Levy & Stockwell, 2006; Chapelle, 2001). In a Gulf context, Aljanahi and Al-Issa (2023) reported that AI-supported tools in ESL classrooms promote engagement, collaboration, and oral proficiency—key outcomes that reinforce the relevance of technology-enhanced labs.

2.3 Implementation Challenges: Gaps Between Access and Practice

Despite well-documented benefits, the implementation of language labs is not always seamless. Bax (2003) introduced the notion of "normalisation," wherein technology becomes an embedded, invisible part of pedagogy—a goal rarely achieved in practice. Challenges such as infrastructure limitations, misalignment with curriculum objectives, and insufficient technical support often hinder this process (Slaouti & Motteram, 2006; González-Lloret & Ortega, 2014). Teacher training is particularly crucial. Without ongoing, pedagogy-informed professional development, access to technology alone is unlikely to produce meaningful impact (Hubbard, 2009; Alhashmi & Elyas, 2022).

2.4 Regional Context: Technology Integration in UAE Schools

In the UAE, digital innovation is a national educational priority aligned with Vision 2031. Nevertheless, studies reveal a gap between infrastructure provision and actual classroom practice. Almekhlafi and Almeqdadi (2010) and Al-Ali (2020) found that many teachers lack the support and training needed to use educational technologies effectively, even though students often display strong digital fluency.

Recent UAE-based research supports these findings. Omar et al. (2021) identified challenges including scheduling constraints, inconsistent EdTech policy implementation, and gaps in digital training. Alhashmi and Elyas (2022) further cautioned that without strategic planning and institutional support, EdTech initiatives are unlikely to endure or achieve meaningful outcomes. These studies highlight the need to view EdTech integration not merely as a technical issue but as a systemic one involving leadership, culture, and policy.

2.5 Identified Gap and Contribution

The existing literature demonstrates the pedagogical promise of language labs and educational technologies. However, there is a notable absence of practice-based, contextually grounded research in multilingual K–12 environments—particularly in Arabic language instruction in the UAE. Most studies focus on infrastructure or general attitudes toward EdTech rather than on its pedagogical implications in diverse classroom settings.

This study addresses this gap by examining the implementation and pedagogical impact of a technology-enhanced

language lab in a UAE private school. It contributes localized insights that extend global literature and offer a grounded understanding of how educational technologies are adopted, adapted, and experienced within Arabic language education.

Table 1: Summary of Key Studies in the Literature Review (1998–2023)

Author(s)	Focus	Key Findings	Region/Context
Warschauer & Healey (1998)	History of CALL	Technology enhances language skills through interactive tools.	Global
Bax (2003)	Normalization of technology in education	Effective tech integration requires alignment with pedagogy.	Global
Levy & Stockwell (2006)	Mobile learning and CALL	Improves student engagement and content retention.	Global
Nicol & Macfarlane-Dick (2006)	Self-regulated learning and feedback	Feedback fosters autonomy and metacognitive development.	Global
Yang & Chen (2007)	Mobile-assisted learning	Increases language proficiency and learner independence.	East Asia
Hubbard (2009)	Language lab evolution	Modern labs support both instruction and teacher development.	Global
Beatty (2010)	Computer-assisted language learning	Encourages learner autonomy and reduces performance anxiety.	Global
Almekhlafi & Almeqdadi (2010)	Tech in UAE classrooms	Infrastructure exists, but teacher training remains inconsistent.	Gulf-based
Wiliam (2011)	Formative assessment in practice	Ongoing feedback improves student outcomes.	Global
Lai & Morrison (2013)	Teacher development in CALL	Teacher beliefs and training critically impact tech integration.	Global
Golonka et al. (2014)	Effectiveness of language labs	Labs improve linguistic skills and motivation.	Global
González-Lloret & Ortega (2014)	Technology-mediated task-based learning	Most effective when aligned with assessment and scaffolding.	Global
Al-Ali (2020)	Digital literacy in UAE language education	Students are digitally literate; teachers lack structured training.	UAE-specific
Omar et al. (2021)	Barriers to EdTech in UAE K–12 schools	Inconsistent scheduling and limited pedagogical training hinder tech integration.	UAE-specific
Ahmed & Nasser (2022)	Blended learning in GCC higher education	Blended, multimodal platforms enhance engagement and digital literacy skills.	Gulf-based
Alhashmi & Elyas (2022)	Sustainability of EdTech integration in UAE	Tech projects risk short-termism without leadership vision and teacher capacity.	UAE-specific
Aljanahi & Al-Issa (2023)	AI tools in Gulf ESL classrooms	AI-supported platforms boost oral proficiency, engagement, and peer collaboration.	Gulf-based
Jwaifell & Gasaymeh (2023)	Digital professional learning for language teachers	Digital PLNs enhance teacher agency but face access and time barriers.	Gulf-based

3. Methodology

3.1 Research Design

Building on insights from the reviewed literature, this study adopted a qualitative case study approach to examine how a technology-enhanced language laboratory was implemented, utilized, and perceived within a multilingual K–12 school context in the UAE.

The qualitative case study approach was selected for its strength in facilitating an in-depth, contextually grounded understanding of complex educational practices within real-life institutional settings (Yin, 2014). This methodology enabled the researcher to capture the nuanced experiences of educators and school leaders, as well as the contextual factors that influenced the integration of technology in language instruction. To guide this inquiry, the study was structured around the following research questions:

3.2 Research Questions

The research was guided by the following questions:

1. How was the technology-enhanced language laboratory implemented and utilized within a private K–12 school in the UAE?
2. What were the perceived pedagogical impacts of the language lab on students' language proficiency, confidence, engagement, and teachers' professional development practices?
3. What challenges and enabling factors influenced the integration and sustained use of the language lab in language instruction practices?

3.3 Context and Participants

To address these questions meaningfully, it was important to understand the institutional context in which the language lab was introduced.

The study was conducted in a large, multilingual school that had recently introduced a dedicated technology-enhanced language laboratory — a digitally equipped space designed to support interactive, multimodal language instruction and assessment. Unlike traditional audio-based labs, this modern facility integrated computers, high-fidelity headsets, professional recording software, and curated digital resources aligned with contemporary language acquisition practices. It was part of a broader institutional strategy to enhance technology integration in teaching and learning. The lab was equipped with personal computers, high-quality professional-grade headsets designed for language learning environments, professional recording software, and curated digital resources aligned with contemporary language acquisition theories and pedagogical frameworks. Designed for dual use, the lab functioned both as a dynamic student learning environment and as a professional learning space where teachers could conduct research, develop lessons, and collaborate on instructional design.

In practice, the language lab supported a range of activities, including listening comprehension exercises, speaking drills, audio-visual interpretation tasks, and teacher-led formative and summative assessments. It was used to create and administer speaking and listening assessments for both Arabic as a First and as a Second Language (AFL and ASL), offering a dedicated environment for phonetic correction, dialect neutralization, and the promotion of Modern Standard Arabic (Fusha) pronunciation. However, teacher engagement with the lab was inconsistent; while some educators incorporated it regularly into their instructional practice, others engaged infrequently, often citing time constraints, technical challenges, and limited training opportunities.

Participants were selected through purposive sampling based on their involvement in the design, implementation, or use of the language lab. The study sample included 12 individuals: 7 Arabic language teachers, 2 digital learning coordinators, and 3 members of the school's academic leadership team. This structure ensured the inclusion of instructional, digital support, and administrative perspectives on the implementation of the initiative.

Additionally, three students were purposively selected for interviews and classroom observation based on their active participation in the language lab activities during the data collection period. The students, who represented both AFL and ASL streams and a range of proficiency levels, contributed valuable learner-centred insights into how the lab influenced

their language learning experience, confidence in speaking, and engagement with technology-enhanced tasks.

While the number of student participants was limited, this was an intentional methodological decision aligned with the case study's focus on depth over breadth. The aim was to generate rich, contextualised data from students who had actively engaged with the lab across a range of linguistic and cultural profiles. Additionally, time constraints, ethical considerations, and the need to minimise classroom disruption further informed the scope of student inclusion.

This purposive sampling strategy was guided by the study's aim to explore the pedagogical and institutional impact of the Arabic language lab in depth. Participants were chosen for their direct involvement with the lab and their capacity to offer distinct yet complementary perspectives. Teachers and digital coordinators were selected based on their practical use of the lab in delivering instruction and assessments, while school leaders provided insight into planning, vision, and implementation. The inclusion of students ensured that the research captured learner-centred views regarding engagement, motivation, and technological accessibility. This participant diversity strengthened the study's credibility and richness, in alignment with qualitative case study methodology, which prioritises depth, contextual relevance, and the illumination of complex processes over generalisability (Merriam, 2009; Patton, 2002).

To capture these varied perspectives and experiences, a multi-method qualitative data collection strategy was employed.

3.4 Data Collection

The data were collected over a four-month period using several qualitative methods to ensure depth, triangulation, and contextual richness:

- Semi-structured interviews: These interviews were conducted with all 12 adult participants and the 3 selected students. Each adult interview lasted between 40 and 60 minutes, while student interviews ranged from 30 to 40 minutes. The interviews were recorded with informed consent and explored experiences with the language lab, perceived benefits and challenges, frequency of use, and recommendations for improvement. Student interviews specifically focused on their perceptions of the lab's impact on their confidence, language skills, and enjoyment of learning.
- Classroom observations: Five instructional sessions were observed, concentrating on lab-based listening, speaking, and assessment tasks. An observation protocol guided data collection, capturing student engagement, teacher-student interaction, integration of digital tools, and alignment with curricular objectives. The three selected student interviewees were specifically observed during these sessions to contextualize their interview responses with their real-time behaviour and interaction with lab technologies.
- Document review: Relevant institutional records were examined, including language lab scheduling logs, professional development attendance records, technology usage reports, examples of student speaking and listening assessment tasks, and teacher lesson plans developed for lab use.

Sample Interview Quote

"The lab made my students more excited about speaking. They liked hearing their voices and comparing recordings. It helped them become more aware of their pronunciation mistakes." — Teacher A

Table 1: Sample Uses of the Language Lab

Activity	Description	Frequency
Listening comprehension	Audio texts paired with comprehension exercises	Weekly
Speaking practice	Students record oral responses and receive feedback	Weekly
Teacher planning and resource access	Use of digital resources for lesson planning and research	Bi-weekly
Student assessment tasks	Administration of speaking and listening assessments for AFL and ASL using lab tools	Monthly

3.5 Data Analysis

Data were analysed using thematic analysis, following the six-phase framework outlined by Braun and Clarke (2006): familiarisation with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report. NVivo qualitative data analysis software was utilised to assist with organising and coding the data.

The researcher first transcribed and reviewed all interview recordings and observation notes, then used NVivo software to code the data inductively. An initial round of open coding yielded 134 codes across the three data sources (interviews, observations, and documents). Next, related codes were grouped into potential themes, which were refined and reviewed in relation to both the full data set and the study's research questions. Through this process, four major themes were developed:

1. Enhanced Student Engagement and Motivation
2. Support for Teacher Planning and Professional Development
3. Challenges in Integration and Consistency
4. The Role of Leadership and Sustainability

These themes were reviewed collaboratively with a senior colleague to ensure coherence, relevance, and consistency. Plus, a sample of coded transcripts (approximately 25%) was independently reviewed by a colleague with qualitative research experience. While formal inter-coder reliability testing was not employed—given the study's qualitative and exploratory nature—peer debriefing and reflective memos were used to enhance analytical credibility. Thick description and verbatim excerpts from participants were included in the findings to support transparency and trustworthiness.

3.6 Ethical Considerations

Ethical approval for the study was obtained from the school's principal and the school's leadership team prior to data collection. All participants, including teachers, leaders, and students, provided informed consent and were assured of confidentiality and the voluntary nature of their participation. For student participants, additional parental consent was secured in line with ethical research protocols for minors. Data were anonymized, and pseudonyms were used in the reporting of findings. Participants were informed of their right to withdraw from the study at any stage without consequence.

While ethical safeguards were carefully observed, the study was not without methodological and contextual limitations.

3.7 Limitations

Given that this initiative represented a pioneering model within the UAE's K–12 sector, the study was based on a single-site case and therefore was not intended to be broadly generalizable across all educational institutions in the country. Nevertheless, the uniqueness of the initiative enhanced its value as a context-rich, exploratory investigation of technology-enhanced Arabic language learning in a private school setting.

A particular strength of this study lay in the inclusion of direct student perspectives through interviews and classroom observations. However, the number of student participants was limited to three. This decision was influenced by the study's qualitative case study design, which prioritised depth of insight over representativeness, as well as by logistical and ethical considerations related to student access and availability. While their contributions were valuable, they may not reflect the full diversity of learner experiences within the school or beyond. Future studies should seek to engage a broader and more representative student sample.

Despite these limitations, the insights drawn from the conception, early implementation, and lived experiences of stakeholders within this language lab offer practical implications for similar educational contexts and contribute meaningfully to the limited region-specific literature on structured, technology-supported language instruction—particularly for Arabic as a second language. However, the study did not incorporate quantitative validation measures—such as pre- and post-intervention test scores or standardised assessment data—which limits its ability to demonstrate measurable learning gains or causality. Future research could benefit from a mixed-methods approach to more robustly

evaluate the pedagogical impact of such innovations.

Within these contextual boundaries, the analysis uncovered major themes aligned with the study's research questions.

4. Findings and Results

The analysis of interview transcripts, classroom observations, student interviews, and document reviews addressed the study's three research questions and revealed four major themes:

1. Enhanced Student Engagement and Motivation
2. Support for Teacher Planning and Professional Development
3. Challenges in Integration and Consistency
4. The Role of Leadership and Sustainability

These themes offer an integrated perspective on the implementation of the technology-enhanced language lab, highlighting both its pedagogical benefits and the institutional factors that shaped its success and limitations. Each theme is discussed below with illustrative evidence and connections to relevant literature.

4.1 Enhanced Student Engagement and Motivation

The introduction of the language lab, coupled with innovative digital tools, notably increased student engagement and motivation, particularly in speaking and listening tasks. Teachers and students alike highlighted the appeal of recording, replaying, and evaluating their own performances.

The lab's podcast setup enabled students to engage in role-plays, debates, and interactive discussions. This was particularly successful in Grade 4 and Grade 8 AFL and Grades 3 and 6 AAL classes, where students took on roles or debated social topics, recording their work using high-quality audio equipment.

A Grade 6 student, typically shy during classroom speaking tasks, confidently narrated a sports commentary in the lab. A Grade 7 student, passionate about football, designed and recorded an Arabic sports analysis segment. Similarly, InVideo AI, a text-to-video tool, was used to convert students' written stories into videos. Students recorded voiceovers and then engaged in reflective language correction exercises—identifying colloquial phrases and replacing them with Modern Standard Arabic (Fusha)

These examples demonstrate how multimodal and interactive technologies not only enhanced students' language production but also fostered ownership of their learning. However, the impact of the language lab extended beyond learners—it also influenced teacher practices and planning processes.

Sample Observation Note:

"Grade 4 AFL students confidently recorded a podcast debate about recycling, showing improved fluency and teamwork. The ability to listen back and re-record gave them ownership over their learning."

This supports Beatty's (2010) view on the value of learner autonomy in digital language environments and affirms Bax's (2003) call for normalizing technology as an everyday instructional tool.

Sample observation note:

"Student X, normally hesitant in class, enthusiastically narrated her sports report, using appropriate vocabulary and a strong, clear voice."

This finding aligns with Beatty's (2010) emphasis on learner autonomy and the importance of safe, experimental digital spaces in language acquisition. It also supports contemporary arguments (Godwin-Jones, 2018) for integrating personalized, technology-mediated activities to foster learner confidence and engagement in second language environments.

Key Tasks Implemented:

- Arabic Reading Recordings:

MYP students participated in a *One Minute Reading Program*, reading curated Modern Standard Arabic texts and recording weekly reading performances. Teachers provided both audio and written feedback, which was archived and

shared with parents as part of individualized progress tracking.

- Listening Comprehension Tasks:

Teachers designed customized listening materials using tools such as Filmora, Plotagon, and Veed.io, aligned with unit objectives. These materials offered students exposure to authentic, real-life scenarios to develop comprehension strategies, with integrated follow-up questions and reflection prompts.

- Speaking Production and Podcast Tasks:

Students created and recorded spoken texts using high-quality audio tools and podcast devices available in the lab. Tasks included role-plays, news reports, debates, and personal narratives. In Grade 4 and Grade 8 AFL and Grade 3 and Grade 6 AAL classes, students engaged in podcast debates and dramatic dialogues, with opportunities to replay, revise, and refine their performances.

- Video Storytelling and Language Standardization:

Using InVideo AI, students converted written stories into video presentations. They recorded voiceovers for these videos, then conducted language correction exercises, identifying colloquial expressions in their speech and collaboratively replacing them with accurate Modern Standard Arabic (Fusha) alternatives. This activity promoted both creativity and linguistic accuracy.

Just as the language lab opened new avenues for student expression, it also prompted significant shifts in teacher planning and professional learning, as explored in the next theme.

4.2 Support for Teacher Planning and Professional Development

Teachers reported that the language lab provided valuable opportunities for professional growth, collaborative lesson design, and reflective instructional improvement. The availability of student recordings, podcast debate sessions, and video storytelling projects encouraged teachers to experiment with learner-centred, task-based, and creative methodologies.

Several educators highlighted how the integration of tools like InVideo AI, podcast devices, and Filmora enabled them to design customized speaking, listening, and creative production tasks, which shifted their practice toward more communicative, performance-based teaching.

Participant 7 (Grade 5 Teacher) remarked:

"Having access to resources, podcasts, and recordings in the lab allowed me to rethink my approach to teaching grammar… It became more student-centred and interactive."

Teachers also developed personalized listening comprehension and speaking production assessments for both AFL and ASL classes. These included authentic, scenario-based listening texts and structured speaking prompts, integrated with student interests, such as sports commentaries, debates, and digital storytelling, all aligned with curriculum standards.

This finding corroborates González-Lloret and Ortega's (2014) view that access to technology and digital content enhances teacher agency in adopting task-based and communicative approaches to language teaching. The professional learning culture surrounding the lab's use fostered greater confidence in leveraging digital tools meaningfully.

While the language lab served as a catalyst for pedagogical growth, its integration into existing school systems revealed tensions and gaps. The next theme explores the challenges encountered during implementation.

4.3 Challenges in Integration and Consistency

Despite the lab's potential and initial successes, significant challenges persisted regarding its consistent and pedagogically effective use across classrooms. Key issues included scheduling conflicts, occasional technical difficulties, and limited formal training on integrating tools like podcast recorders and video editing platforms (InVideo AI, Filmora, Veed.io) into regular classroom instruction.

Participant 2 (Learning Coordinator/Middle Leader) noted:

"We have great equipment and engaging tools, but I feel we need a clear timetable, ongoing training, and more shared planning time to make the best use of it."

While Arabic listening tasks have now been centralized in the lab and speaking assessments are regularly conducted through podcasts and storytelling projects, inconsistencies persist in the lab's integration for routine instructional purposes. Some teachers readily embraced the lab's affordances, while others required clearer frameworks and structured support.

These observations echo Al-Ali's (2020) findings about the gap between infrastructure availability and practical pedagogical application in UAE schools, particularly due to insufficient professional development in technology-mediated language instruction.

These challenges highlighted the need for a more strategic, coordinated approach to implementation, one that includes leadership oversight, policy alignment, and ongoing capacity-building efforts. The final theme addresses the importance of leadership in sustaining such innovation.

4.4 The Role of Leadership and Sustainability

School leadership recognized the value of the language lab as a vehicle for enhancing both language acquisition and teacher professional development. Leadership actively supported the lab's integration by approving resources for podcast devices, InVideo AI licenses, and digital audio tools, encouraging staff to pilot innovative speaking and listening tasks, including debates, sports commentaries, and digital storytelling projects.

However, concerns emerged regarding long-term sustainability, resource allocation, and embedding the lab as a routine pedagogical tool rather than an occasional enhancement. While leadership endorsed initiatives like the One Minute Reading Program and centralized Arabic listening assessments, some staff noted a lack of strategic policy frameworks and scheduled professional development sessions to ensure consistent, effective use of lab-based activities.

Participant 11 (Senior Leader) commented:

"We need to move from innovation as a project to innovation as a culture. Otherwise, it will fade out."

This reinforces Bax's (2003) concept of normalization, wherein technology must be fully assimilated into everyday educational practices to achieve sustainable, long-term impact. Leadership commitment to integrating podcast-based debates, video story projects, and consistent performance-based assessments as part of the school improvement plan, accompanied by structured professional learning and clear operational guidelines, is essential for maintaining momentum and equity in students' access to these digital learning opportunities.

Key Recommendations from Leadership Interviews

Insights from the leadership team underscored the need for structural and procedural enhancements to ensure the long-term sustainability and effectiveness of the language lab initiative. The following recommendations emerged directly from leadership interviews:

- Formalize a Lab Usage Schedule Across Departments:

Establish a clearly communicated, equitable timetable to guarantee regular and consistent access for Arabic as a First Language (AFL) and Arabic as a Second Language (ASL) classes, as well as interdisciplinary opportunities.

- Establish Ongoing, Targeted Professional Development Sessions:

Implement continuous training tailored to both the technical and pedagogical dimensions of the lab's tools, including podcast recording devices, InVideo AI, and assessment design for speaking and listening skills.

- Integrate Lab-Based Activities into Assessment and Reporting Structures: Position lab-generated tasks, such as debates, recorded readings, and video storytelling projects, as integral components of formal assessment cycles and student progress reports, ensuring alignment with curriculum standards.
- Allocate a Dedicated Budget for Continuous Digital Resource Updates: Secure an annual, ring-fenced budget for software subscriptions, equipment maintenance, and new digital tools to keep the language lab aligned with contemporary educational technologies and student interests.

These leadership recommendations reinforce the findings regarding the importance of normalization (Bax, 2003) and highlight the crucial role of policy, infrastructure, and professional culture in embedding technology-enhanced language learning practices into everyday school life.

Table 2: Summary of Emergent Themes and Supporting Evidence

Theme	Description	Sample Evidence
Enhanced Student Engagement	Students showed increased motivation and confidence in speaking and listening tasks, particularly when using podcast devices, recording software, and AI video tools.	"They love hearing their voices and improving themselves."
Support for Teacher Planning and Professional Development	The lab facilitated instructional design, assessment creation, and reflective teaching, prompting teachers to adopt more student-centred, task-based approaches.	"It pushed me to reflect on how I teach."
Challenges in Integration and Consistency	Irregular scheduling, occasional technical issues, and limited training opportunities affected consistent, effective lab use.	"Great tools, but we need guidance."
Leadership and Sustainability	School leaders emphasized the need for a long-term strategic plan, integration into the curriculum, and ongoing resource investment to avoid short-term project status.	"It shouldn't be a one-year experiment."

Table 3: Key Recommendations from Leadership Interviews

Recommendation Area	Action Suggested
Scheduling and Access Management	Formalize a structured, equitable lab usage schedule across departments.
Professional Development	Organize ongoing, targeted PD workshops focusing on pedagogically effective use of digital tools like podcasts, InVideo AI, and recording software.
Curriculum and Assessment Integration	Embed lab-based speaking and listening activities into formal assessment and reporting frameworks.
Resource Allocation and Sustainability	Allocate dedicated budget for continuous updates to digital resources, equipment maintenance, and capacity building.

5. Discussion

Building on the reviewed literature, this discussion interprets the study's findings in light of regional and global research on educational technology integration, with particular attention to Arabic language learning in multilingual school contexts.

The findings of this study suggest that a thoughtfully implemented, technology-enhanced language lab can contribute meaningfully to improving student engagement, refining speaking and listening assessment practices, and supporting teacher professional development. Examining these results through the lens of the study's research questions reveals several insights regarding the implementation process, pedagogical outcomes, and sustaining factors that influence the successful integration of digital tools in Arabic language classrooms within a multilingual private school context.

Students responded positively to interactive, multimodal language tasks made possible by the lab's resources. The opportunity for students to record, listen to, and reflect on their spoken Arabic performances appeared to enhance both their engagement and confidence, particularly in speaking and listening tasks. These findings support Beatty's (2010) emphasis on the importance of learner autonomy and the value of safe, exploratory digital spaces in language education. In a similar vein, research by Aljanahi and Al-Issa (2023) demonstrated that AI-assisted speaking and listening tools can improve oral proficiency and encourage collaborative learning, especially when learning tasks are personalised and relevant to students' experiences. The current study adds to this growing body of evidence by illustrating the benefits of podcast debates, personalised narratives, and video-based storytelling activities within Arabic language learning contexts.

At the same time, the data suggest that the success of these technology-enhanced initiatives depends on more than just

access to infrastructure. A combination of institutional support, pedagogical strategies, and human factors is essential for meaningful integration. This echoes the conclusions of Lai and Morrison (2013), who stressed that effective educational technology use is closely linked to teacher beliefs, digital skills, and the readiness of the school as an organisation. In this case, challenges such as scheduling difficulties, occasional technical issues, and a lack of sustained professional development emerged as barriers to fully embedding the language lab into everyday teaching practice. These findings are consistent with observations by Alhashmi and Elyas (2022), who cautioned that without strong leadership and continuous teacher training, technology initiatives in UAE schools risk remaining isolated experiments rather than becoming routine aspects of classroom practice.

The research also underlines the crucial role of school leadership in supporting, sustaining, and normalising the use of digital learning environments. Leadership decisions related to allocating resources, providing professional development opportunities, and integrating technology meaningfully into curriculum and assessment frameworks were identified as key factors in determining the long-term success of such initiatives. This aligns with Bax's (2003) concept of the 'normalisation' of technology in education — where digital tools are no longer viewed as add-ons but are seamlessly woven into the fabric of everyday teaching and learning. However, as this study found, the absence of clear policy direction and consistent investment can jeopardise the sustainability and wider impact of even the most promising digital innovations.

While the study offers valuable insights into technology integration in Arabic language education, its context-specific, qualitative design—and the absence of quantitative validation—limit the generalizability and statistical strength of its conclusions.

Further research involving mixed-method or longitudinal studies could investigate the long-term effects of language lab use on student proficiency, confidence, and digital literacy development. Quantitative data could also provide a broader evidence base for school leaders and policymakers aiming to design sustainable, scalable technology-enhanced language programs. Ahmed and Nasser (2022) similarly emphasized the value of longitudinal data in evaluating the sustained pedagogical impact of blended and multimodal platforms in GCC educational contexts.

In summary, this case study adds to the existing literature on educational technology integration by illustrating how diverse digital tools, when strategically implemented and supported, can enrich language learning experiences. It underscores the importance of aligning infrastructure, professional learning, and leadership vision to achieve sustainable pedagogical transformation in language education settings.

6. Recommendations

Drawing on the findings of this study, several actionable recommendations are proposed to enhance the implementation and sustainability of technology-supported language learning initiatives in similar educational contexts.

Firstly, schools should develop a structured implementation framework that clearly outlines lab scheduling protocols, equitable access for all students, integration with curricular goals, and alignment with language assessment structures. This will ensure consistent, purposeful, and pedagogically relevant use of the lab resources across both Arabic as a First Language (AFL) and Arabic as a Second Language (ASL) programs.

Secondly, it is essential to invest in ongoing, targeted professional development for teachers. Training should extend beyond basic technical skills to include pedagogical applications of digital tools, task-based and learner-centered methodologies, and contextually responsive task design. This is justified by the study's finding that sporadic or generic training limited the lab's full pedagogical potential. Tailored, hands-on training programs that focus on integrating tools such as InVideo AI and podcasting devices into differentiated classroom practice are recommended.

A third recommendation is to foster a collaborative professional culture by encouraging the formation of professional learning communities within schools. Teachers should have regular opportunities to co-design lab-based activities, share resources, and reflect on challenges and successes in integrating digital tools. This approach will enhance peer learning, build collective expertise, and address the inconsistencies noted in this study's findings regarding lab activity design and implementation.

Leadership commitment emerged as a pivotal factor in enabling sustainable digital innovation. School leaders should strategically embed the language lab initiative into whole-school improvement and digital strategy plans, allocate protected budgets for infrastructure maintenance and software updates, and prioritize teacher capacity-building programs. This recommendation is grounded in the study's conclusion that isolated technology initiatives, lacking institutional support, risk becoming unsustainable.

Furthermore, it is recommended that schools implement systematic mechanisms for monitoring and evaluating the lab's pedagogical impact. Data sources such as student interviews, usage logs, assessment outcomes, and teacher feedback should inform ongoing refinement and development of the initiative. Regular evaluation will allow school leaders to make evidence-based decisions and maintain the program's relevance and effectiveness.

Finally, it is crucial to prioritize equity, differentiation, and accessibility in the design and delivery of lab activities. The study highlighted the need for culturally responsive task design and differentiated scaffolding to ensure that all students—regardless of language background, ability, or confidence—can engage meaningfully with the lab's resources. Schools should develop support systems and task options that cater to diverse learner profiles, ensuring inclusive participation and maximizing the initiative's educational value.

7. Conclusion

This case study explored the design and early implementation of a technology-enhanced Arabic language lab in a multilingual private school in Dubai. Through a qualitative case study approach, it revealed that while digital tools can enrich language teaching—particularly in Arabic as a second language—their success depends on thoughtful integration, staff readiness, and institutional support.

The study identified key benefits, including improved student engagement, differentiated instruction, and enhanced teacher collaboration. At the same time, it uncovered challenges such as limited training opportunities, logistical hurdles, and the absence of a long-term integration plan. These findings echo Bax's (2003) emphasis on the 'normalisation' of technology and reinforce the idea that sustainable EdTech implementation must go beyond hardware to include strategic planning, leadership buy-in, and ongoing professional development.

Importantly, the absence of quantitative data limits the ability to assess the lab's full impact on student achievement. Future research could adopt a mixed methods design to provide a more comprehensive evaluation and explore long-term effects.

Despite its limitations, the study contributes to the scarce literature on technology-enhanced Arabic instruction and offers actionable insights for schools aiming to adopt similar models. Ultimately, successful digital initiatives are shaped not just by technological tools, but by the people, pedagogies, and policies that that enable their effective use.

8. Theoretical Contribution

This study contributes to the theoretical discourse on technology-enhanced language learning in multilingual school contexts, particularly within underexplored domains such as Arabic as a First and Additional Language in Gulf education systems. It advances theory in three key areas:

8.1 Normalisation of Technology in Multilingual Language Classrooms

Drawing on Bax's (2003) concept of the 'normalisation' of educational technology, this study extends the theory by illustrating the nuanced, incremental process by which digital tools become embedded in everyday classroom practice — not merely through access or use, but through institutional support, teacher agency, and contextual fit. The findings suggest that in multilingual and culturally diverse contexts, normalisation requires culturally responsive pedagogy, sustained leadership engagement, and differentiated implementation strategies. Thus, this study contributes to a more contextually grounded understanding of normalisation in non-Western, multilingual schooling environments.

8.2 Pedagogical Agency and Ecological Models of Technology Use

This research also engages with sociocultural and ecological models of technology integration in education (e.g., Zhao

& Frank, 2003), which emphasise the interaction of individual, institutional, and cultural factors. The findings support and expand these models by highlighting how teacher agency, digital literacy, and collaborative practice within professional learning communities interact with infrastructural and leadership variables to shape the implementation and pedagogical utility of digital innovations. The study affirms the view that technology adoption is a socially mediated process, embedded in organisational culture and influenced by teacher beliefs and local educational policies.

8.3 Task-Based Learning and Learner Autonomy in Digital Environments

In alignment with constructivist theories of language acquisition and task-based language teaching (TBLT), the study shows that interactive, student-led digital tasks (e.g., podcast debates, AI-supported dialogues, video storytelling) foster learner autonomy, especially in speaking and listening skills. By applying TBLT principles to Arabic language education — a field where such applications remain rare — the study helps extend task-based learning theory into less commonly researched languages and digital spaces. It affirms Beatty's (2010) view of technology as a catalyst for learner-centered, self-directed engagement in language learning.

In summary, this study contributes to theoretical understandings by contextualising existing models of technology integration and task-based pedagogy within the specific realities of Arabic language instruction in multilingual, culturally diverse school systems. It calls for further theoretical exploration that accounts for the linguistic, institutional, and policy complexities shaping EdTech adoption in the Arab world.

9. Implications for Policy and Practice

The results of the research show various important implications for educational policy, curriculum development, and school leadership in the UAE and similar multilingual, culturally diverse contexts. First, the shown positive impact on student engagement and teacher professional growth highlights the pedagogical value of integrating language labs and technology-supported learning environments within national education improvement initiatives. Policymakers need to consider embedding technology-enhanced language learning frameworks, particularly for Arabic as a first and additional language, within curriculum standards, accreditation criteria, and school evaluation protocols.

Furthermore, the conclusions highlight a clear need for structured, leadership-led implementation models that prioritise the monitoring of professional development, guarantee equitable access to resources, and systematically assess pedagogical outcomes. Education authorities and governing bodies should mandate continuous, contextually relevant professional development programmes that directly support the effective integration of technology into Arabic language education. Additionally, policy frameworks must commit to dedicated, long-term funding for infrastructure upkeep, software upgrades, and staff capacity building to ensure these initiatives deliver meaningful, sustainable impact. This calls for a fundamental policy shift — moving away from viewing educational technology as a supplementary tool, and instead recognising it as a vital, integrated element of contemporary teaching practice and strategic school improvement planning.

Ultimately, education stakeholders need to emphasize developing evaluation structures that consistently capture learner outcomes, instructional methods, and Organizational preparedness markers. Regular, evidence-based evaluation will support iterative refinement of language lab initiatives and ensure alignment with broader educational goals, including learner autonomy, differentiated instruction, and inclusive access to high-quality language learning opportunities.

10. Limitations and Future Research

While this case study offers valuable insights into the implementation and use of a technology-enhanced language lab in a UAE private school, several limitations should be acknowledged:

- Contextual specificity: The study focused on a single, pioneering institutional context within the UAE, which limits the transferability of findings to other educational settings or national systems. However, it offers a practical model for schools considering similar initiatives, particularly in multilingual or Gulf regional contexts.
- Methodological scope: The predominantly qualitative, context-specific methodology prioritized the perceptions and experiences of participants. Although this approach provided rich, nuanced data, future research would benefit

from incorporating quantitative measures of student language performance, engagement metrics, and technology usage patterns — as advocated in recent regional studies (e.g., Ahmed & Nasser, 2022; Aljanahi & Al-Issa, 2023).

- Temporal limitations: Data collection occurred over a four-month period, limiting the ability to observe long-term adoption patterns, institutional normalization, and sustained impacts on student achievement and teacher practice. A longitudinal, mixed-methods study would provide deeper insight into the sustainability and scalability of such interventions, addressing recommendations from Alhashmi and Elyas (2022) regarding EdTech sustainability.
- While this study captured valuable perspectives from teachers, leaders, and three purposively selected students representing diverse language backgrounds and proficiency levels, the scale of student participation remained limited. Future research could expand this component by engaging a larger cohort of students through additional interviews, focus groups, or learner surveys. This would allow for a more comprehensive, representative understanding of student attitudes toward language lab use, perceived benefits, challenges, and preferences, aligning with recent calls for learner-centered EdTech research in Arab educational contexts (Jwaifell & Gasaymeh, 2023).

In conclusion, addressing these limitations through broader, longitudinal, and learner-centred research will be essential in advancing evidence-based, sustainable models for technology-supported Arabic language education in multilingual contexts.

11. Suggested Areas for Future Research

- Multi-school comparative case studies across the UAE or GCC to identify common enablers, challenges, and models for best practice.
- Longitudinal studies measuring language proficiency growth, confidence in speaking and listening, and sustained student engagement.
- Investigations into student perceptions and experiences with language lab activities and technologies.
- Evaluations of professional development models for technology-supported language teaching in Arabic as a first and additional language.
- Studies exploring the scalability of language lab initiatives in government, international, and bilingual schools.

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This study was conducted with full ethical approval from the school's leadership team. All participants gave informed consent, and the study followed ethical guidelines aligned with best practices in educational research.

Appendix A: Sample Informed Consent Form for Teachers and School Leaders

Participant Consent Form (Teachers and School Leaders)

Research Study Title:

Technology-Enhanced Language Learning: A Case Study of a Language Lab Initiative in the UAE

Principal Researcher:

Researcher's Name

School Name

Purpose of the Study:

This study aims to explore the implementation and impact of a technology-enhanced Arabic language lab on teaching and learning practices in a private K–12 school in the UAE.

Participation Details:

If you agree to participate in this study, you may be asked to take part in:

- A semi-structured interview (approx. 30–45 minutes)
- Optional classroom observation sessions
- Follow-up discussion or clarification if necessary

Confidentiality and Data Use:

- Your participation is entirely voluntary.
- You may withdraw from the study at any time without consequence.
- All data collected will be anonymized. Pseudonyms will be used in all publications or presentations.
- Audio recordings (where applicable) will be securely stored and used solely for research purposes.

I confirm that I have read and understood the information above. I agree to participate in this study under the conditions described.

Participant's Name: _____

Signature: _____

Date: _____

Researcher's Signature: _____

Date: _____

Appendix B: Sample Parental Consent Form for Student Participation

Parental Consent Form (for Student Participation)

Research Study Title:

Technology-Enhanced Language Learning: A Case Study of a Language Lab Initiative in the UAE

Principal Researcher:

Researcher's Name School Name

Purpose of the Study:

This research investigates the educational impact of a newly implemented Arabic language lab on student learning experiences and outcomes.

What Participation Involves:

If you consent, your child may be invited to:

- Participate in a focus group discussion (15–20 minutes)
- Engage in short recorded speaking or reading tasks
- Allow their recorded responses to be used anonymously for analysis

Ethical Assurance:

- Your child's participation is completely voluntary.
- You or your child may withdraw at any time with no impact on school experience.
- No identifying information will be published.
- All responses will be anonymized and used solely for academic research.

I have read the information above and give permission for my child to participate in this research study. I understand that participation is voluntary and that my child's privacy will be protected.

Child's Name: _____

Parent/Guardian's Name: _____

Signature: _____

Date: _____

Appendix C: Interview Protocols

C.1 School Leaders Interview Protocol

Purpose:

To explore leadership perspectives on the rationale, implementation process, challenges, and perceived outcomes of the language lab initiative.

Key Questions:

1. Can you describe the school's objectives for introducing the language lab?
2. What factors influenced the decision to invest in this technology-enhanced environment?
3. How would you evaluate the implementation process so far?
4. What challenges have emerged during the integration of the language lab into the curriculum?
5. How have students and teachers responded to the new technology-enhanced language learning activities?
6. What measures have been taken to ensure sustainability and ongoing professional development for teachers?
7. In your view, what has been the most significant outcome of this initiative for language education in the school?
8. Are there plans to expand or further develop the language lab initiative in the future?

C.2 Teachers Interview Protocol

Purpose:

To gather teacher insights on their experiences using the language lab, perceived benefits and challenges, and its influence on teaching and learning practices.

Key Questions:

1. How would you describe your experience using the language lab with your students?
2. What types of activities or tasks have you found most effective in this environment?
3. How has the language lab influenced student engagement and participation in your classes?
4. What impact, if any, has it had on your assessment of students' speaking and listening skills?
5. Have you encountered any challenges in integrating the technology into your lessons? If so, what were they?
6. How has the school supported your professional development in using the language lab tools?
7. In your opinion, what improvements could be made to enhance the effectiveness of the language lab?

C.3 Students Interview Protocol

Purpose:

To capture student perceptions of their experiences using the language lab, its influence on their language learning, and their engagement with technology-enhanced tasks.

Key Questions:

1. How do you feel about using the language lab for your Arabic lessons?
2. Can you describe one activity or task in the lab that you particularly enjoyed or found useful?
3. How has working with podcast recordings and video tasks helped you improve your speaking or listening skills?
4. Do you feel more confident speaking Arabic since using the language lab? Why or why not?
5. What challenges, if any, have you experienced when using the lab's technology?
6. How do you think the language lab is different from your regular classroom lessons?
7. If you could change or add something to the language lab experience, what would it be?

Appendix D: Data Analysis Process Outline

D.1 Data Preparation

- All interview recordings with school leaders, teachers, and students were transcribed verbatim.
- Field notes from classroom observations were typed and organized by session.
- Digital artifacts (e.g., student-created podcasts, video projects) were catalogued for contextual reference but not formally coded.

D.2 Coding Process

Thematic analysis was employed following Braun and Clarke's (2006) six-phase framework:

Phase 1: Familiarization with Data

- Read and re-read interview transcripts, observation notes, and reflective memos.
- Noted initial ideas and patterns emerging from the data.

Phase 2: Generating Initial Codes

- Conducted open coding using NVivo qualitative analysis software.
- Created descriptive and interpretive codes (e.g., "student confidence," "teacher digital competence," "leadership support").

Phase 3: Searching for Themes

- Collated codes into potential themes across data sets.
- Mapped relationships between codes, identifying recurrent patterns such as:
    - *Enhanced learner engagement through technology*
    - *Professional development needs*
    - *Leadership influence on EdTech sustainability*

Phase 4: Reviewing Themes

- Reviewed coded extracts and thematic groupings for coherence and relevance.
- Refined or collapsed overlapping themes.

Phase 5: Defining and Naming Themes

- Finalized theme definitions and names to accurately reflect participants' experiences and study objectives.
- Generated thematic descriptions for use in the findings section.

Phase 6: Producing the Report

- Selected illustrative quotations from participants to support each theme.
- Integrated thematic findings into the discussion in alignment with existing literature.

D.3 Trustworthiness Measures

To enhance the study's credibility and dependability:

- Member checks were conducted with participants to verify accuracy of interview transcripts and interpretations.
- Peer debriefing sessions with an academic colleague helped validate theme development.
- An audit trail documenting coding decisions and theme refinements was maintained.

Appendix E: Coded Data Extracts (Samples)

The following excerpts illustrate how interview and observation data were coded and organized under key thematic categories. These samples were selected for their representativeness of the broader data set.

Code Key:

Code	Description
Student Confidence	Expressions of increased confidence in speaking and listening.
Digital Task Engagement	Positive engagement with technology-based activities.
Increased Student Participation	Notable improvement in active participation due to digital tools.
Speaking Confidence	Growth in oral language confidence through tech use.
Teacher Digital Competence	Teachers' skills and comfort with digital tools.
Need for Training	Requests or recognition of professional development needs.
Teacher Support Requirements	Instances where technical or pedagogical support was needed.
Tech Confidence	Teachers' ease or hesitation in using technology.
Leadership Support	Institutional backing for EdTech integration.
Policy Alignment	Adjustments made to schedules, curriculum, or policies.
Leadership Encouragement	Positive reinforcement from leadership for tech use.
Teacher Motivation	Impact of leadership actions on teacher willingness to innovate.

E.1 Theme: Enhanced Learner Engagement Through Technology

Student Interview (ASL Stream)

"I liked making the sports commentary video because it was fun and I could listen to myself speaking Arabic. I felt more confident after seeing the video."

Code: Student Confidence / Digital Task Engagement

Teacher Interview

"Since introducing the podcast activities, even my quieter students are participating more. They like hearing their own recordings and trying again to improve."

Code: Increased Student Participation / Speaking Confidence

E.2 Theme: Professional Development Needs

Teacher Interview

"At first, I wasn't comfortable using the video software. I needed training to learn how to plan lessons with these tools effectively."

Code: Teacher Digital Competence / Need for Training

Observation Note (Lab Session)

Teacher asked for technical support midway through the activity. Some hesitation visible when handling the podcast recorder.

Code: Teacher Support Requirements / Tech Confidence

E.3 Theme: Leadership Influence on EdTech Sustainability

Leader Interview

"It's not just about having devices. We had to adjust timetables and offer dedicated training slots so teachers could embed these tools in their lessons."

Code: Leadership Support / Policy Alignment

Teacher Interview

"When the principal encouraged us and gave time for practice, I felt more motivated to use the lab regularly."

Code: Leadership Encouragement / Teacher Motivation

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