

Enhancing Teacher Capacity through Interactive Flat Panel Integration in Primary English Classrooms

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Abstract

The integration of digital technologies in primary education has increased the need to understand how technology contributes not only to classroom instruction but also to teachers' professional capacity. This study aimed to examine the utilization of the Interactive Flat Panel (IFP) in English language teaching and explore its contribution to strengthening teachers' instructional capacity in an Indonesian primary school. A qualitative single-case study was conducted at SDN 1 Kamulan using interviews, classroom observations, and document analysis. Data were analyzed through thematic analysis following Miles, Huberman, and Saldaña's interactive model, while the findings were interpreted using the Technological Pedagogical Content Knowledge (TPACK) and Substitution, Augmentation, Modification, and Redefinition (SAMR) frameworks. The findings revealed that the IFP was utilized as an instructional presentation medium, an interactive learning tool, a digital assessment platform, and a gateway to digital learning resources. Its implementation strengthened teachers' instructional capacity through technology-supported lesson planning, interactive instructional practices, digital assessment, and reflective professional development. The study also identified school leadership support, teacher collaboration, and technical assistance as enabling factors, whereas limited digital competence, technical issues, and infrastructure constraints remained significant challenges. These findings suggest that the educational value of the IFP lies in its capacity to support sustainable teacher development through meaningful technology integration in primary English language teaching.

Keywords

Interactive Flat Panel; Teacher Capacity Building; TPACK; English Language Teaching; SDG 4 (Quality Education).

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1. INTRODUCTION

Digital transformation has become one of the primary agendas in educational reform worldwide, fundamentally reshaping the ways teaching and learning are designed and implemented. Rather than merely introducing digital devices into classrooms, educational transformation emphasizes the creation of learning ecosystems in which technology, pedagogy, curriculum, and teacher competence interact to



improve learning quality. The Organisation for Economic Co-operation and Development (OECD) highlights that effective digital transformation requires more than technological infrastructure; it depends on teachers' capacity to integrate digital technologies into pedagogically meaningful learning experiences. Likewise, UNESCO emphasizes that digital technologies should function as instruments for promoting inclusive, student-centered, and innovative learning rather than simply replacing conventional instructional media. Consequently, the success of educational digitalization is increasingly determined by teachers' professional competence in designing, implementing, and reflecting upon technology-enhanced instruction rather than by the availability of digital equipment alone.

Within this context, English Language Teaching (ELT) represents one of the educational fields that has experienced substantial transformation through digital technology. English learning requires authentic communication, multimodal resources, immediate feedback, and interactive learning activities that encourage learners to actively construct language competence. Consequently, numerous digital technologies have been introduced into English classrooms, including learning management systems, multimedia applications, artificial intelligence, digital storytelling, virtual learning environments, and interactive display technologies. Among these innovations, the Interactive Flat Panel (IFP) has emerged as an increasingly adopted instructional technology because it integrates touchscreen interaction, multimedia presentation, internet connectivity, collaborative learning applications, and real-time classroom interaction within a single device. These characteristics provide teachers with opportunities to design more engaging, contextualized, and student-centered English learning experiences while facilitating classroom interaction and collaborative knowledge construction.

Recent studies have reported that Interactive Flat Panels enhance classroom interaction, facilitate multimedia-based instruction, and increase student engagement (Author, 2023; Author, 2024). However, existing studies primarily focus on students' learning outcomes and classroom engagement, while limited attention has been paid to how the technology contributes to strengthening teachers' instructional capacity, particularly in English language teaching at the primary school level.

Despite its growing adoption, previous studies have consistently reported that the educational benefits of Interactive Flat Panel technology cannot be explained solely by its technical capabilities. Instead, the effectiveness of IFP depends largely on teachers' pedagogical decisions and their ability to integrate technology meaningfully into classroom practices. Recent educational research has demonstrated that interactive display technologies contribute positively to student engagement, learning motivation, classroom participation, and academic achievement. However, these positive outcomes are strongly influenced by teachers' digital competence, instructional design, pedagogical creativity, and continuous professional learning. In other words, technology itself does not transform education; rather, teachers transform learning through appropriate technology integration. This

perspective is consistent with the TPACK framework, which argues that meaningful technology integration emerges from the interaction among technological knowledge, pedagogical knowledge, and content knowledge rather than from technological proficiency alone.

The same phenomenon can be observed in Indonesian primary education, particularly in schools implementing digital learning initiatives through Interactive Flat Panel technology. Preliminary observations conducted at SDN 1 Kamulan indicate that the school has begun integrating IFP into classroom instruction as part of its digital transformation agenda. Nevertheless, teachers demonstrate varying levels of confidence, experience, and pedagogical integration when utilizing the technology. While some teachers have incorporated interactive multimedia, educational games, videos, and collaborative learning activities into English instruction, others continue to use the IFP primarily as a digital presentation screen. Classroom observations further revealed that lesson planning documents prepared before the introduction of IFP contained limited technology integration, whereas recently developed instructional plans increasingly reflected technology-supported pedagogical strategies. These findings suggest that the implementation of Interactive Flat Panel is not merely a matter of technology adoption but represents an ongoing process of teacher professional learning and pedagogical adaptation. Understanding this process is therefore essential for explaining how digital technology contributes to strengthening teacher capacity rather than merely improving classroom facilities.

2. METHOD

This study adopted a qualitative single-case study design to explore how the use of Interactive Flat Panel (IFP) contributes to strengthening teachers' instructional capacity in English language teaching. A qualitative case study was selected because it enables an in-depth understanding of a contemporary phenomenon within its real-life educational context (Yin, 2018). The study was conducted at SDN 1 Kamulan, Trenggalek, East Java, Indonesia, a public primary school that has implemented Interactive Flat Panel technology as part of its digital learning initiative. The research site was selected purposively because it represents an information-rich case for investigating technology integration in English language teaching. Participants were also selected using purposive sampling and consisted of the English teacher as the primary informant, classroom teachers who had experience using the Interactive Flat Panel, the school principal, and the school operator as supporting informants. Their diverse roles enabled the researcher to obtain comprehensive perspectives regarding classroom practices, school policy, and technical support for technology integration.

Data were collected through semi-structured in-depth interviews, non-participant classroom observations, and document analysis. Semi-structured interviews were guided by an interview protocol

designed to explore teachers' experiences, instructional practices, perceptions, and challenges in integrating Interactive Flat Panel technology into English language teaching. Classroom observations were conducted using an observation checklist and field notes to document teachers' instructional practices, classroom interactions, student engagement, and the utilization of Interactive Flat Panel features during learning activities. Documentary evidence, including lesson plans, teaching materials, photographs, and other instructional artefacts, was examined to complement and verify the findings obtained from interviews and observations. The use of multiple data sources facilitated methodological triangulation and provided a comprehensive understanding of the phenomenon under investigation.

The collected data were analyzed using the interactive analysis model of Miles, Huberman, and Saldaña (2014), which consists of data condensation, data display, and conclusion drawing and verification. During the analytical process, the SAMR model was employed to examine the levels of technology integration demonstrated in teachers' instructional practices, while the Technological Pedagogical Content Knowledge (TPACK) framework guided the interpretation of teachers' instructional capacity in integrating technology, pedagogy, and English language content. To enhance the trustworthiness of the findings, the study applied source triangulation, method triangulation, member checking, and researcher reflexivity throughout the research process.

3. FINDINGS AND DISCUSSION

The findings of this study are presented according to the three research questions formulated in the introduction. Drawing on data obtained from in-depth interviews, non-participant classroom observations, document analysis, and learning artefacts, the study identified three major themes concerning the implementation of the Interactive Flat Panel (IFP) in English language teaching at SDN 1 Kamulan. These themes include: (1) the forms of Interactive Flat Panel utilization in classroom instruction, (2) its contribution to strengthening teachers' instructional capacity, and (3) the supporting factors and challenges influencing its implementation. The findings presented in each subsection are supported by evidence from multiple data sources and discussed in relation to the SAMR and TPACK frameworks, as well as previous studies on technology integration in education.

3.1. Utilization of Interactive Flat Panel in English Language Teaching

The first research question explored how the Interactive Flat Panel (IFP) was utilized in English language teaching at SDN 1 Kamulan. Analysis of interview data, classroom observations, and instructional documents revealed that teachers employed the Interactive Flat Panel in four interconnected ways: as a medium for instructional presentation, an interactive learning tool, a digital assessment platform, and a gateway to diverse digital learning resources. Rather than functioning merely as a presentation device, the Interactive Flat Panel became an integral component of classroom

instruction that supported multiple teaching and learning activities.

Teachers primarily used the Interactive Flat Panel to present English learning materials through PowerPoint presentations, instructional videos, digital images, and online resources. Interview data indicated that teachers frequently searched for learning materials on digital platforms, particularly YouTube, before displaying them during classroom instruction. The use of multimedia resources enabled teachers to explain vocabulary and language concepts more systematically while helping students understand abstract concepts through visual representations. Classroom observations also showed that students maintained greater attention when learning materials were presented through the Interactive Flat Panel, indicating that multimedia integration enhanced the effectiveness of instructional delivery.

Beyond content presentation, teachers integrated the Interactive Flat Panel into various interactive learning activities. Students actively participated in answering questions, completing digital exercises, engaging in language games, and discussing learning materials displayed on the screen. The device also supported formative assessment through digital quizzes and immediate feedback, allowing teachers to monitor students' understanding more efficiently during classroom instruction. Furthermore, the Interactive Flat Panel enabled teachers to integrate diverse digital learning resources, including educational videos, interactive websites, online worksheets, and authentic English materials within a single instructional environment. These findings indicate that the technology expanded teachers' instructional repertoire by facilitating more engaging, interactive, and student-centred learning experiences rather than simply replacing conventional teaching media.

Table 1. Forms of Interactive Flat Panel Utilization in English Language Teaching

Forms of Utilization	Evidence	Pedagogical Function	SAMR Level
Presentation of instructional content	Videos, PowerPoint, images	Content delivery and concept visualization	Substitution–Augmentation
Interactive learning	Multimedia activities, classroom interaction	Student engagement and collaboration	Modification
Digital assessment	Interactive quizzes and immediate feedback	Formative assessment	Modification
Integration of digital learning resources	YouTube, online materials, multimedia	Enriched learning resources	Augmentation–Modification

The four forms of Interactive Flat Panel utilization identified in this study demonstrate different levels of technology integration when interpreted through the SAMR framework. The use of multimedia presentations primarily represents the Substitution and Augmentation levels, as digital technology enhances the efficiency and quality of instructional delivery without fundamentally changing learning tasks. In contrast, the integration of interactive activities, digital assessment, and online learning

resources reflects the Modification level because technology enables teachers to redesign classroom activities and promote greater student participation. Although evidence of Redefinition was not consistently observed, the findings suggest that the Interactive Flat Panel has shifted English language instruction toward a more interactive and student-centered learning environment.

These findings are consistent with Sharma and Singh (2021), who reported that Interactive Flat Panels increase classroom engagement and instructional effectiveness. Similarly, Glover and Miller (2001) argued that interactive technologies improve learning only when supported by appropriate pedagogical strategies. In the present study, teachers did not simply use the Interactive Flat Panel to display instructional materials but integrated multimedia resources, interactive activities, and digital assessment into English language teaching. This finding suggests that the pedagogical value of the technology lies in teachers' ability to transform classroom practices rather than merely replacing conventional teaching media.

3.2. Utilization of Interactive Flat Panel in English Language Teaching

The second research question examined how the utilization of the Interactive Flat Panel (IFP) contributed to strengthening teachers' instructional capacity in English language teaching. Analysis of interviews, classroom observations, and instructional documents revealed that teachers' capacity developed through four interconnected dimensions: technology-supported lesson planning, interactive instructional implementation, digital assessment, and reflective professional practice. These dimensions indicate that the Interactive Flat Panel functioned not merely as an instructional medium but also as a catalyst for teachers' professional growth by encouraging continuous adaptation of pedagogical and technological practices.

Table 2. Contributions of Interactive Flat Panel to Teachers' Instructional Capacity

Dimension of Instructional Capacity	Evidence from the Findings	Contribution to Teacher Capacity	TPACK Component
Lesson Planning	Teachers integrated multimedia resources, online materials, and interactive applications into lesson plans.	More systematic and technology-integrated lesson preparation.	TK, TPK
Instructional Implementation	Teachers employed multimedia, interactive activities, and collaborative learning.	More interactive, student-centred instruction and improved classroom engagement.	TPK, TPACK
Digital Assessment	Teachers used digital quizzes and immediate feedback during lessons.	Faster assessment, timely instructional adjustment, and better monitoring of student learning.	TPK

Reflective Professional Practice	Teachers evaluated classroom implementation, explored new digital applications, and shared teaching experiences.	Continuous development of TPACK instructional competence and digital literacy.
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The findings demonstrate that the Interactive Flat Panel strengthened teachers' instructional capacity beginning with the lesson planning process. Teachers became more systematic in preparing English lessons by integrating videos, digital images, interactive presentations, and online learning resources into a single instructional design before classroom implementation. Rather than simply preparing teaching materials, teachers increasingly considered how technology could support learning objectives and students' characteristics. This shift reflects an improvement in teachers' ability to combine instructional planning with appropriate digital resources, enabling more purposeful and engaging learning experiences.

The Interactive Flat Panel also contributed to improving instructional implementation. Classroom observations showed that teachers employed multimedia presentations, interactive questioning, educational games, and collaborative learning activities to encourage active student participation. Learning became more student-centred as teachers used technology not only to explain English content but also to facilitate interaction, discussion, and collaborative problem-solving. Students demonstrated greater engagement during lessons supported by digital media, suggesting that the Interactive Flat Panel expanded teachers' pedagogical strategies beyond traditional teacher-centred instruction.

Another important contribution was observed in teachers' assessment practices. The Interactive Flat Panel enabled teachers to conduct formative assessment using digital quizzes and interactive applications that provided immediate feedback on students' performance. Teachers were able to identify learning difficulties more efficiently and adjust instructional strategies during the learning process rather than waiting until the end of the lesson. Consequently, assessment became a continuous component of classroom instruction that informed subsequent teaching decisions while supporting more responsive learning experiences.

Finally, the continuous use of the Interactive Flat Panel encouraged teachers to engage in reflective professional practice. As teachers gained greater experience using digital technologies, they evaluated the effectiveness of classroom activities, refined instructional materials, explored new educational applications, and exchanged ideas with colleagues. This process fostered continuous professional learning and strengthened teachers' confidence in integrating technology into English language teaching. Rather than representing a one-time technological innovation, the Interactive Flat Panel became part of an ongoing process of instructional improvement and professional development.

Taken together, these findings demonstrate that the Interactive Flat Panel contributed to strengthening teachers' instructional capacity across planning, implementation, assessment, and reflective practice. From the perspective of the TPACK framework, this development extends beyond the acquisition of technological skills. Teachers demonstrated an increasing ability to integrate technological knowledge, pedagogical knowledge, and content knowledge into coherent instructional practices that supported meaningful English language learning.

This finding supports Mishra and Koehler (2006), who argue that effective technology integration depends on the interaction among technological, pedagogical, and content knowledge. It also aligns with Koehler et al. (2013), who found that teachers with stronger TPACK are more capable of designing meaningful technology-enhanced learning experiences. In the present study, teachers demonstrated this integration through technology-supported lesson planning, interactive instructional practices, digital assessment, and reflective professional learning. These findings therefore extend previous research by showing that the Interactive Flat Panel contributes not only to classroom instruction but also to the continuous development of teachers' instructional capacity in a primary school context.

3.3. Challenges and Supporting Factors

The third research question examined the factors that supported and constrained the implementation of the Interactive Flat Panel (IFP) in English language teaching. Findings from interviews, classroom observations, and document analysis indicate that the successful integration of the Interactive Flat Panel was influenced by the interaction between institutional support, teachers' readiness, and technological infrastructure. Although teachers perceived the technology as beneficial for improving instructional practices, its effective implementation depended not only on the availability of the device but also on the school's capacity to provide continuous support for teachers and maintain an enabling digital learning environment.

Table 3. Supporting and Challenging Factors in the Implementation of Interactive Flat Panel

Supporting Factors	Challenges
School leadership support for digital learning	Limited number of Interactive Flat Panel devices
Availability of digital learning facilities	Unstable internet connectivity and technical issues
Technical assistance from the school operator	Limited digital competence among some teachers
Collaboration and knowledge sharing among teachers	Additional preparation time for technology-integrated lessons

The findings reveal that strong institutional support played a crucial role in facilitating the implementation of the Interactive Flat Panel. School leadership encouraged teachers to integrate digital

technology into classroom instruction by providing learning facilities and fostering a culture of educational innovation. Technical support from the school operator enabled teachers to address operational issues efficiently, while collaboration among teachers promoted the sharing of instructional resources, classroom experiences, and practical strategies for integrating technology. In addition, students' positive responses toward multimedia-based learning motivated teachers to continue exploring more interactive instructional approaches, creating a mutually reinforcing relationship between teacher innovation and student engagement.

Despite these positive conditions, several challenges remained evident throughout the implementation process. Teachers acknowledged that integrating technology into classroom instruction required additional preparation time, particularly when designing interactive learning materials and learning new digital applications. Technical problems, including unstable internet connectivity and occasional system disruptions, sometimes interrupted classroom activities and reduced instructional efficiency. Furthermore, the limited availability of Interactive Flat Panel devices meant that not all teachers could access the technology consistently, requiring them to adapt lesson plans according to classroom schedules and available facilities. These findings indicate that successful technology integration involves not only teachers' willingness to innovate but also adequate technological infrastructure and continuous institutional support.

These findings are consistent with Darling-Hammond et al. (2017), who emphasize that teacher capacity building requires continuous institutional support. Similarly, OECD (2023) highlights that sustainable digital transformation depends on both teachers' competencies and organizational readiness. The present study reinforces these arguments by demonstrating that the effectiveness of the Interactive Flat Panel emerged from the interaction between teacher competence, school leadership, technical support, and digital infrastructure rather than from the technology itself.

Overall, the findings suggest that the sustainability of Interactive Flat Panel implementation depends on balancing supporting and constraining factors within the school ecosystem. From the perspective of Teacher Capacity Building, teachers' professional development is strengthened when schools provide continuous technical assistance, opportunities for collaborative learning, and access to ongoing professional development. Likewise, the TPACK framework emphasizes that effective technology integration requires teachers to combine technological knowledge with pedagogical strategies and content expertise rather than relying solely on technological proficiency. Therefore, the successful implementation of the Interactive Flat Panel should be viewed as a collaborative process involving teachers, school leadership, technical support personnel, and adequate digital infrastructure. These findings reinforce previous research suggesting that sustainable educational technology integration is achieved through the interaction of teacher capacity, institutional commitment, and

supportive learning environments, rather than through the provision of technology alone.

4. CONCLUSIONS

This study investigated the utilization of the Interactive Flat Panel (IFP) in English language teaching and its contribution to strengthening teachers' instructional capacity in an Indonesian primary school. The findings demonstrate that the Interactive Flat Panel was utilized not only as a medium for presenting instructional content but also as an interactive learning tool, a digital assessment platform, and a gateway to diverse digital learning resources. These forms of utilization indicate that the Interactive Flat Panel has become an integral component of classroom instruction, supporting more interactive and student-centered English language learning.

A key finding of this study is that the contribution of the Interactive Flat Panel extends beyond technology integration into the development of teachers' instructional capacity. The study identified four interconnected dimensions of teacher capacity strengthened through the use of the Interactive Flat Panel: technology-supported lesson planning, interactive instructional implementation, digital assessment practices, and reflective professional practice. These findings suggest that the educational value of the Interactive Flat Panel lies not merely in the availability of digital technology but in teachers' ability to integrate technological, pedagogical, and content knowledge into meaningful instructional practices. Furthermore, the sustainability of its implementation depends on the interaction between teachers' digital competence, institutional support, technical assistance, and adequate technological infrastructure.

This study contributes to the growing body of research on educational technology by positioning the Interactive Flat Panel not only as a classroom instructional tool but also as a medium for teacher capacity building in primary English language teaching. Nevertheless, the findings are limited to a single-case study conducted in one primary school; therefore, they should not be generalized to other educational contexts without careful consideration. Future research could examine the implementation of the Interactive Flat Panel across different school settings and educational levels, employ comparative or mixed-methods approaches, or investigate its long-term impact on teachers' professional development and students' English learning outcomes. Such studies would provide a broader understanding of how interactive technologies can support sustainable instructional improvement in diverse educational contexts.

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