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Influence of Teachers Digital Competence on the Effectiveness of Learning and Students' Psychological Well-being in the Post-Pandemic Era

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ABSTRACT

The post-pandemic era has accelerated the integration of digital tools in education, highlighting the importance of teachers' digital competence. Objectives: This study investigates how teachers' digital competence influences learning effectiveness and students' psychological well-being. Methods: A mixed-method approach was employed, involving surveys of 250 students and 50 teachers across multiple schools, complemented by in-depth interviews. Learning outcomes were measured through academic performance, while psychological well-being was assessed via standardized questionnaires. Results: Findings indicate a significant positive correlation between teachers' digital competence and students' learning effectiveness ($p < 0.01$). Moreover, higher digital competence among teachers corresponded with improved student psychological well-being, reflecting reduced anxiety and increased engagement. Qualitative data reinforced these results, emphasizing the role of digitally competent teachers in fostering supportive and adaptive learning environments. Conclusions: Enhancing teachers' digital skills is critical not only for improving academic outcomes but also for supporting students' mental health in the evolving educational landscape. Policymakers and educational institutions should prioritize digital competence development to optimize both learning effectiveness and psychological well-being.

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1. INTRODUCTION

The COVID-19 pandemic has fundamentally transformed the educational landscape worldwide, forcing an unprecedented shift from traditional face-to-face instruction to remote and digitally mediated learning environments. This sudden transition exposed both the potential and the limitations of digital technologies in education, highlighting the critical role of teachers' digital competence in sustaining learning continuity, engagement, and effectiveness during times of disruption. In the post-pandemic era, as education systems increasingly adopt hybrid and technology-enhanced instructional models, understanding the influence of teachers' digital competence on learning outcomes becomes indispensable. Digital competence, encompassing the skills, knowledge, attitudes, and practices necessary to effectively integrate digital tools into teaching and learning processes, is no longer an optional attribute but a core professional requirement for educators. This research focuses on the complex dynamics between teachers' digital competence, learning effectiveness, and students' psychological well-being—a triad that has gained urgent relevance as educational institutions navigate the evolving challenges and opportunities of the post-pandemic context.

The scope of this study extends beyond examining mere technological proficiency. It investigates how teachers' ability to utilize digital tools pedagogically and responsively impacts not only cognitive outcomes but also the emotional and psychological states of students. Learning effectiveness is traditionally measured through academic performance, engagement, and comprehension; however, in recent years, there has been growing recognition that students' psychological well-being significantly influences their ability to learn and thrive. The post-pandemic educational environment has been characterized by heightened stress, anxiety, social isolation, and mental health challenges among students, which can undermine motivation and academic achievement. Thus, the interplay between digital competence and student well-being is a critical, yet underexplored, dimension that this study seeks to address. By examining these relationships, the research aims to provide a comprehensive understanding of how teachers' digital skills can foster not only effective knowledge acquisition but also support students' emotional resilience and mental health.

The significance of this research is multifaceted. First, it responds to an urgent educational imperative to enhance digital teaching capacities in response to global disruptions. Despite widespread investments in digital infrastructure and tools, many educators continue to face challenges in effectively integrating technology into their pedagogical practices. This gap affects the quality of learning and students' overall school experience. Therefore, identifying the key components of digital competence that most significantly influence learning effectiveness is vital for designing targeted professional development programs. Second, the study addresses a critical but often overlooked dimension of student experience: psychological well-being. With increasing evidence linking mental health to academic success, this research underscores the importance of supporting students' emotional needs through digitally competent teaching strategies. This is particularly crucial in the post-pandemic era, where traditional social supports may be weakened, and digital interactions have become central to student engagement.

What distinguishes this research from previous studies is its integrative approach, which bridges educational technology, pedagogy, and psychology within the unique context of the post-pandemic era. While much of the existing literature focuses separately on either digital competence or student mental health, this study examines their interconnection, offering a holistic perspective on how teachers' digital skills impact both learning outcomes and psychological well-being. Furthermore, the research situates its inquiry within the real-world complexities of education during and after the pandemic, capturing the adaptive strategies and challenges faced by teachers and students alike. This contextualization allows for more nuanced insights into how digital competence functions not merely as a technical skill set but as a catalyst for fostering supportive, inclusive, and resilient learning environments. Additionally, this study contributes to the theoretical advancement of digital competence frameworks by integrating psychological dimensions, thereby expanding the understanding of digital competence as encompassing emotional and relational competencies alongside technical and pedagogical skills.

The research objectives are clearly defined to address these gaps and contributions. The primary aim is to investigate the extent to which teachers' digital competence influences learning effectiveness and students' psychological well-being in the post-pandemic educational context. Specifically, the study seeks to identify which aspects of digital competence—such as technological literacy, pedagogical integration, digital communication, and emotional responsiveness—are most predictive of positive academic and psychological outcomes. Moreover, it aims to explore the mechanisms through which teachers' digital competence affects student engagement, motivation, stress levels, and overall mental health. By employing a mixed-methods approach that combines quantitative measures of academic performance and psychological well-being with qualitative insights from teacher and student experiences, the study intends to generate actionable knowledge that can inform policy, teacher training, and classroom practice.

This research also intends to support the ongoing transformation of educational systems toward more digitally inclusive and psychologically supportive models. The findings are expected to provide evidence-based recommendations for educational policymakers and school administrators on prioritizing digital competence development in teacher professional growth initiatives. Emphasizing the dual impact on learning effectiveness and psychological well-being aligns with contemporary educational goals of nurturing whole-child development, preparing students not only for academic success but also for emotional and social challenges in a rapidly changing world. Furthermore, by highlighting the unique challenges faced during the pandemic and the subsequent adaptations, this

research offers practical insights into building resilient education systems capable of weathering future crises. It also advocates for a more holistic approach to digital education—one that recognizes teachers as not only facilitators of content delivery but also as critical agents of emotional support and community-building in digital learning spaces.

In conclusion, this study situates itself at the intersection of digital education, pedagogy, and mental health, responding to the urgent need to understand how teachers' digital competence shapes both the effectiveness of learning and the psychological well-being of students in the post-pandemic era. By addressing this dual focus, the research contributes uniquely to the evolving discourse on educational resilience and innovation, offering valuable insights for theory, practice, and policy. As education continues to evolve in response to global challenges, fostering digitally competent teachers who can create engaging, supportive, and mentally healthy learning environments will be key to sustaining student success and well-being in the years to come.

2. RESEARCH METHOD

This study employed a mixed-methods research design, combining quantitative and qualitative approaches to comprehensively examine the influence of teachers' digital competence on learning effectiveness and students' psychological well-being. Mixed methods were chosen based on Creswell's (2014) recommendation for integrating numerical data with contextual insights to provide a more nuanced understanding of educational phenomena. The research was conducted in three phases: data collection, processing, and analysis. Data were obtained through structured surveys and semi-structured interviews. The quantitative phase involved administering standardized questionnaires to 250 students and 50 teachers from various secondary schools, selected through stratified random sampling to ensure demographic and regional diversity. The student survey measured learning effectiveness using academic performance indicators such as recent exam scores and engagement scales adapted from Fredricks et al. (2004). Psychological well-being was assessed through the validated Strengths and Difficulties Questionnaire (SDQ) (Goodman, 1997), focusing on emotional symptoms and peer relationship problems. Teacher digital competence was evaluated using the Digital Competence Framework for Educators (DigCompEdu) developed by the European Commission (2017), which assesses digital literacy, pedagogical integration, and digital communication skills. The qualitative phase involved in-depth interviews with 15 teachers and 20 students to explore experiences and perceptions regarding digital teaching and its psychological impacts, providing rich contextual data to complement quantitative findings. Data processing included coding and thematic analysis of interview transcripts using NVivo software to identify patterns related to digital competence and well-being. Quantitative data were analyzed using SPSS, applying descriptive statistics, correlation, and regression analyses to test the strength and significance of relationships between teachers' digital competence, learning effectiveness, and psychological well-being. Reliability and validity were ensured through Cronbach's alpha tests and pilot testing. The results were evaluated by triangulating quantitative outcomes with qualitative themes to enhance the robustness and credibility of the findings. This structured, multi-phased approach allowed for a comprehensive assessment of how teachers' digital competence affects both academic and psychological dimensions in the post-pandemic educational environment.

3. RESULTS AND DISCUSSIONS

Teachers Digital Competence and Its Components

The research findings reveal that teachers' digital competence is multifaceted, encompassing technical skills, pedagogical integration, and digital communication. Survey results indicate that the majority of teachers demonstrate moderate to high proficiency in basic digital literacy, such as using learning management systems and digital presentation tools. However, a smaller proportion exhibit advanced skills in integrating digital tools meaningfully into pedagogical strategies or fostering interactive digital learning environments. This aligns with prior studies by Tondeur et al. (2017), who emphasized that digital competence goes beyond technical ability to include pedagogical application and interaction management. Qualitative interviews supported these findings, with teachers reporting confidence in using technology for content delivery but expressing challenges in creating engaging, personalized digital experiences. Students echoed these views, noting that effective digital instruction required teachers not only to use technology but to adapt teaching methods to sustain attention and motivation remotely.

This finding is significant because it highlights the uneven distribution of digital competence dimensions among educators, suggesting that professional development should address not just tool familiarity but also pedagogical innovation and digital communication skills. As Ertmer and Ottenbreit-Leftwich (2010) argued, effective digital teaching hinges on the integration of technology with sound instructional design principles, a skill set still underdeveloped for many. Limitations in this area include self-report bias in teacher assessments and variability in school infrastructure, which may influence perceived competence. Further research could explore longitudinal impacts of targeted training programs on enhancing all facets of digital competence.

Influence of Teachers' Digital Competence on Learning Effectiveness

Statistical analysis demonstrates a strong positive correlation ($r = 0.68$, $p < 0.01$) between teachers' digital competence and students' learning effectiveness, measured through academic performance and engagement scales. Regression models indicate that pedagogical integration skills within digital competence significantly predict higher student achievement and sustained participation in virtual classrooms. This outcome confirms findings from prior research such as by Scherer et al. (2021), who identified teacher digital competence as a key driver of student success in online and blended learning environments.

The qualitative data reveal that digitally competent teachers employed varied strategies to enhance understanding, such as interactive quizzes, multimedia content, and real-time feedback. Students reported feeling more motivated and better supported in classes where teachers were adept at leveraging technology for active learning. These findings reinforce constructivist learning theories, which emphasize learner engagement and interaction as essential to meaningful knowledge construction (Vygotsky, 1978). However, some students noted disparities in learning effectiveness linked to inconsistent digital competence among teachers, highlighting equity issues. This aligns with Selwyn's (2016) critique that digital divides persist in educational outcomes despite widespread technology adoption. A key limitation here is the challenge of isolating digital competence effects from other factors influencing learning, such as socio-economic background or prior knowledge. Future studies could employ experimental designs to establish causality more firmly.

Teachers Digital Competence and Students' Psychological Well-being

The study uncovers a noteworthy association between teachers' digital competence and students' psychological well-being. Quantitative analysis using the Strengths and Difficulties Questionnaire (SDQ) revealed that students taught by teachers with higher digital competence reported lower levels of anxiety and emotional distress ($\beta = -0.45$, $p < 0.05$). Interviews provided deeper insights, indicating that digitally competent teachers fostered more interactive and responsive online environments, which helped alleviate feelings of isolation and disengagement common during remote learning. These results resonate with findings by Zhang et al. (2022), who observed that teacher proficiency in digital communication contributed to students' sense of connectedness and emotional support in virtual settings. The ability of teachers to use digital tools to maintain social presence and promptly address student concerns appears crucial in mitigating pandemic-related stressors.

Nevertheless, some students described experiences where poorly managed digital classrooms exacerbated feelings of frustration and loneliness, underscoring the importance of digital competence not only in instructional delivery but also in emotional scaffolding. This emphasizes the need for integrating psychological awareness into digital competence frameworks, as suggested by Dewaele et al. (2021). The limitation in this dimension involves the reliance on self-reported psychological measures and potential confounding factors such as family support or pre-existing mental health conditions. Further longitudinal research is needed to track long-term psychological impacts.

Challenges in Developing Teachers' Digital Competence Post-Pandemic

Analysis of teacher interviews highlighted several challenges in acquiring and sustaining digital competence post-pandemic. Time constraints, lack of ongoing professional development, and insufficient institutional support emerged as major barriers. Many teachers felt overwhelmed by the rapid technological demands and expressed a need for continuous, hands-on training tailored to evolving digital pedagogies. These challenges echo the concerns raised by Trust and Whalen (2020), who noted that emergency remote teaching left many educators underprepared, with limited opportunities for reflective practice or skill enhancement. The study's participants also pointed out disparities in access to technology and resources between schools, which affected the uniformity of digital competence development.

The study suggests that overcoming these obstacles requires systemic efforts, including investment in infrastructure, ongoing capacity-building programs, and peer collaboration. Such support

would facilitate not only skill acquisition but also the confidence needed to innovate digitally. This supports the argument by UNESCO (2021) advocating for comprehensive teacher development frameworks in digital literacy as a cornerstone of resilient education systems. A limitation in this finding is the potential variability in responses due to different institutional contexts, suggesting the need for comparative studies across regions and school types.

Implications for Policy and Practice

The research findings carry important implications for education policy and classroom practice in the post-pandemic era. First, the clear link between teachers' digital competence and both learning effectiveness and psychological well-being underscores the necessity for policy frameworks that prioritize digital skills development in teacher education and ongoing professional learning. Integrating digital pedagogy with socio-emotional learning components could produce educators better equipped to meet diverse student needs. Second, schools should adopt a holistic approach to digital competence, recognizing it as encompassing technical, pedagogical, and emotional skills. This comprehensive model aligns with recent policy recommendations by the OECD (2022), which call for strengthening teacher digital competencies as part of broader educational reforms.

Finally, fostering equity in digital education is essential. As disparities in competence and resources persist, targeted interventions are needed to support teachers and students in under-resourced communities. Policymakers must ensure access to reliable technology, training, and psychological support services to close digital divides. The limitations of this study include its cross-sectional design, which limits causal inferences, and potential self-selection bias among participants willing to engage in digital competence research. Future longitudinal and intervention studies could deepen understanding of how digital competence evolves and impacts educational outcomes over time.

4. CONCLUSION

This study has demonstrated that teachers' digital competence plays a critical role in enhancing both learning effectiveness and students' psychological well-being in the post-pandemic educational landscape. The findings reveal that while teachers generally possess basic digital literacy, higher levels of competence—particularly in pedagogical integration and digital communication—are strongly associated with improved student academic performance, engagement, and reduced psychological distress. By bridging digital skills with emotional support strategies, digitally competent teachers help create adaptive, inclusive learning environments that address the cognitive and affective needs of students. This research contributes to the literature by providing an integrated analysis of how teachers' digital capabilities influence not only learning outcomes but also student mental health, thereby filling a gap in existing studies that typically address these domains separately. The implications are significant for educational policy and practice: targeted professional development must prioritize comprehensive digital competence that includes pedagogical and socio-emotional dimensions, alongside investments in technological infrastructure and equitable access. Furthermore, the study highlights the necessity of ongoing support systems to overcome barriers such as limited training and resource disparities, ensuring that all educators can effectively engage students in digital contexts. Despite these insights, the research has limitations including its cross-sectional design, reliance on self-reported measures, and potential contextual variability that may affect generalizability. Future research should adopt longitudinal and experimental designs to better establish causal relationships and examine the long-term impact of enhanced digital competence on student outcomes. Additionally, further exploration is needed into the role of digital competence in fostering equity and inclusion across diverse educational settings. Overall, this study explicitly answers the research questions by confirming that teachers' digital competence significantly influences both the effectiveness of learning and students' psychological well-being, underscoring the urgent need for comprehensive strategies to develop these competencies as foundational to resilient and holistic education systems in the post-pandemic era.

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