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Enhancing Teacher Self-Efficacy in Online Learning Through the Technological Pedagogical Content Knowledge (TPACK) Framework: Insights from The National Christian College (NCLC) Marikina

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Abstract — success, as well as efficacy beliefs related to determination, passion, assurance, and instructional behavior. It enables teachers to effectively handle challenges and failures, resulting in higher job satisfaction, lower job-related stress, and better management of student misbehavior. The Covid-19 pandemic in 2020 presented a potential risk to teacher self-efficacy due to the sudden global transition from in-person to online learning. This study sought to determine the role of the Technological Pedagogical Content Knowledge (TPACK) framework in developing and enhancing teacher self-efficacy in the National Christian Life College (NCLC) in Marikina to achieve conditions for effective teaching and learning.

This study utilized an explanatory sequential mixed-method approach to determine (1) the level of NCLC teachers' self-efficacy in online learning, (2) their knowledge of TPACK components, (3) the relationship between their self-efficacy and TPACK knowledge, and (4) measures to enhance their efficacy. The study began with a quantitative survey of NCLC teachers, followed by one-to-one semi-structured interviews with selected survey respondents and online learning specialists. The mixed interpretation of the quantitative and qualitative study was observed through the side-by-side joint display. The literature review was then used to support the mixed interpretation, leading to conclusions and recommendations for improving teacher self-efficacy with the TPACK framework.

The research findings indicate that NCLC teachers have (1) a "Quite A Bit" rating in self-efficacy, (2) a "Very Good" rating in TPACK, (3) a correlation matrix of linear, strong, positive, relationship between teacher self-efficacy and TPACK, and (4) a strong need for support and a positive affective state to improve their self-efficacy in online learning.

Keywords — Teacher self-efficacy; Technological Pedagogical Content Knowledge (TPACK) Framework; Online Learning; Online Teaching, Online Distance Learning

I. Introduction

The Covid-19 pandemic brought unprecedented disruption to education worldwide. According to UNESCO (2020), over 1.6 billion learners across 190 countries were affected by school closures, leading to what was described as "education in emergency." Online learning, once considered an alternative or supplementary form of instruction, suddenly became the primary

mode of delivery (Dhawan, 2020; Pokhrel & Chetri, 2021). This transition was hailed as a potential "panacea" in times of crisis, as it enabled learning continuity, but it also raised critical concerns about equity, teacher preparedness, and instructional quality. Historically, distance education emerged in the late 20th century with advances in computer technology, the internet, and the World Wide Web, making learning more accessible and flexible for those unable to attend traditional classrooms (Siemens et al., 2015). However, the abrupt scale and pace of online learning during the pandemic created challenges that extended beyond mere access to digital tools.

Teacher self-efficacy (TSE) became a central issue in this context. Defined as teachers' beliefs in their ability to influence student learning, motivation, and classroom outcomes (Tschannen-Moran & Hoy, 2001; Mojavezi & Tamiz, 2012), self-efficacy is a strong predictor of instructional quality and professional well-being. Teachers with high self-efficacy demonstrate stronger resilience, lower stress levels, higher job satisfaction, and greater capacity to manage classroom challenges (Caprara et al., 2006; Klassen & Chiu, 2010). However, the abrupt shift to online learning disrupted teachers' confidence and created anxiety, particularly for those with limited experience in digital pedagogy (Ramirez-Hurtado et al., 2021). Ertmer and Ottenbreit-Leftwich (2010) stressed that technical skills alone are insufficient; teachers must also feel confident in applying their knowledge to support student learning effectively. Thus, enhancing self-efficacy in online teaching requires both knowledge development and psychological support.

The Technological Pedagogical Content Knowledge (TPACK) framework, first conceptualized by Mishra and Koehler (2006), offers a holistic model for teacher competence. TPACK emphasizes the integration of technology (TK), pedagogy (PK), and content knowledge (CK) to create effective teaching strategies in technology-rich environments. As Schmid et al. (2020) argued, TPACK is one of the most important models for describing teachers' competencies in teaching with technology. Research has shown that teachers with stronger TPACK skills also tend to report higher levels of self-efficacy (Abbitt, 2011; Lin & Zheng, 2015). However, there is limited literature linking TPACK and teacher self-efficacy within the Philippine context, especially among private Christian colleges adapting to post-pandemic realities.

This study addresses this gap by examining the role of TPACK in enhancing teacher self-efficacy in online learning at the National Christian Life College (NCLC) in Marikina. Specifically, it aimed to determine the levels of teacher self-efficacy and TPACK knowledge, analyze the correlation between the two, and identify strategies for improving teacher confidence and competence. The study is significant for teachers seeking to strengthen their professional practice, administrators developing institutional training programs, policymakers designing post-pandemic education reforms, and researchers contributing to the growing field of TPACK and teacher self-efficacy.

II. Methodology

This study employed an explanatory sequential mixed-methods design (Capulso et. al. 2024) , beginning with a quantitative phase followed by a qualitative phase to provide deeper insights. The quantitative component involved a survey administered to NCLC teachers, while the qualitative component consisted of semi-structured interviews with selected respondents and online learning specialists. Data integration was achieved through side-by-side joint display and interpretation, allowing for convergence and complementarity of findings.

Participants included 45 teachers from NCLC, representing both full-time and part-time faculty who had taught during the Covid-19 online learning transition. Purposive sampling was used for the survey, while criterion-based sampling guided the selection of interviewees to ensure diverse perspectives. Ethical approval was secured from the institution, and informed consent was obtained from all participants. Participation was voluntary, and anonymity and confidentiality were guaranteed.

Data collection tools included three instruments. First, the Teacher Self-Efficacy Scale (adapted from Tschannen-Moran & Hoy, 2001) measured teachers' beliefs across domains of instructional strategies, student engagement, classroom management, and technology use. Second, the TPACK Survey (adapted from Schmidt et al., 2009) assessed knowledge in the seven domains of the framework: technological knowledge (TK), pedagogical knowledge (PK), content knowledge (CK), technological pedagogical knowledge (TPK), pedagogical content knowledge (PCK), technological content knowledge (TCK), and integrated TPACK. Third, a semi-structured interview guide explored teacher experiences, challenges, coping mechanisms, and professional development needs during online learning.

Quantitative data were analyzed using descriptive statistics and Pearson correlation to examine relationships between self-efficacy and TPACK. The qualitative data were transcribed and coded using thematic analysis (Braun & Clarke, 2006), allowing for the identification of recurring themes. The results from both phases were then integrated to produce a comprehensive interpretation of the findings.

III. Results and Discussion

The findings are organized around the levels of teacher self-efficacy, TPACK knowledge, the correlation between the two, and insights from qualitative interviews.

Teachers reported a "Quite a Bit" level of self-efficacy in online learning, with an overall mean score of 3.8 out of 5. Among the sub-dimensions, the highest ratings were observed in student engagement and instructional strategies, suggesting that teachers felt confident in motivating learners and designing online lessons. Lower ratings were recorded in online classroom

management, reflecting difficulties in maintaining discipline and handling distractions in virtual settings.

Regarding TPACK knowledge, teachers demonstrated a "Very Good" level, with an overall mean score of 4.1 out of 5. Content knowledge (CK) and pedagogical knowledge (PK) received the highest ratings, consistent with teachers' strong foundations in their subject areas and pedagogy. Technological knowledge (TK) and full TPACK integration, however, received lower ratings, indicating the need for further training in effectively merging technology with pedagogy and content.

A Pearson correlation analysis revealed a strong, positive, and statistically significant relationship between teacher self-efficacy and TPACK ($r = .71$, $p < .01$). This indicates that teachers with higher TPACK proficiency also reported higher self-efficacy in online teaching, confirming the theoretical link between the two constructs.

Thematic analysis of interviews generated four major themes. First, institutional support as backbone highlighted how NCLC's holistic support—technical, socio-emotional, spiritual, and professional—enabled teachers to regain confidence during the abrupt shift to online learning. Second, dynamic growth of self-efficacy showed how teachers' confidence evolved through mastery experiences, vicarious learning, verbal encouragement, and positive affective states, consistent with Bandura's (1997) sources of self-efficacy. Third, professional learning communities (PLCs) emerged as vital, as teachers supported one another, shared resources, and collaborated to overcome challenges. Finally, continuous training needs underscored teachers' desire for ongoing professional development focused on TPACK competencies and emerging technologies.

When integrated, the quantitative and qualitative results converged. The statistical correlation between TSE and TPACK was reinforced by narratives describing how improvements in technological and pedagogical integration directly enhanced teachers' confidence. Conversely, teachers who struggled with technology integration expressed lower self-efficacy, highlighting the mutual reinforcement of the two constructs.

Discussion

The findings confirm that teacher self-efficacy plays a crucial role in online learning success, consistent with earlier research (Tschannen-Moran & Hoy, 2001; Caprara et al., 2006). Although NCLC teachers reported moderately high levels of self-efficacy, the initial transition to online learning disrupted confidence and created anxiety. Institutional support, including training, mentoring, and socio-emotional assistance, proved critical in rebuilding teacher confidence, echoing Singh and Hardaker's (2014) argument that a whole-school approach is essential in times of educational disruption.

The strong positive correlation between TPACK proficiency and self-efficacy underscores the importance of integrating technology, pedagogy, and content knowledge. This finding is consistent with Abbitt (2011) and Lin and Zheng (2015), who demonstrated that TPACK competence enhances teachers' beliefs in their ability to teach effectively. Importantly, the results show that TPACK development is dynamic. Teachers initially acquired basic technological skills but gradually built stronger integration competencies through practice, workshops, and collaboration. Zhang and Tang's (2021) model of evolving TPACK competencies is supported by this progression.

The study also highlights that online learning during the pandemic presented both familiar benefits and recurring challenges. Teachers and students appreciated the flexibility, accessibility, and enriched teaching methods provided by online platforms, consistent with earlier studies (Dhawan, 2020; Siemens et al., 2015). At the same time, issues such as equity, access to resources, student isolation, and difficulties in authentic assessment persisted (Arkorful & Abaidoo, 2015; DeCoito & Estaiteyeh, 2022). While these challenges were not unique to the pandemic, the speed of the transition exacerbated their impact, underscoring the need for systemic preparedness and continuous faculty development.

The implications of this study are manifold. For practice, teachers must continuously refine their TPACK competencies while building resilience and confidence in technology-rich environments. For institutional leadership, professional learning communities and ongoing faculty development programs are essential strategies for sustaining teacher growth. For policymakers, embedding TPACK competencies into teacher training and curriculum standards will ensure long-term preparedness for blended and online learning modalities. Finally, for researchers, the findings open avenues for examining the mediating role of teacher self-efficacy between TPACK and student learning outcomes, an area that remains underexplored.

IV. Conclusion

Teacher self-efficacy is the measure of a teacher's expectation of his ability and agency to affect student motivation (Mojavezi & Tamiz, 2012) and learning (Corry & Stella, 2018; Tschannen-Moran et al., 1998); teacher's efficacy beliefs for determination, passion, assurance, and instructional behavior (Tschannen-Moran & Hoy, 2001); and teachers' well-being and capacities to cope and thrive in the face of challenges and failures, resulting in higher levels of job satisfaction, lower levels of job-related stress, and lesser difficulties in dealing with students' misbehaviors (Caprara et al., 2006). It was put at risk when the Covid-19 pandemic emerged in 2020 resulting in an abrupt worldwide transition from face-to-face to online learning. The sudden change challenged both novice and seasoned teachers across ages.

This study sought to determine the role of the Technological Pedagogical Content Knowledge (TPACK) framework which is regarded as "one of the most important models of

describing teachers' competencies for successfully teaching with technology" (Schmid et al., 2020, p.1) in enhancing teacher self-efficacy in the National Christian Life College (NCLC) in Marikina to achieve conditions for effective teaching and learning. It also identified (1) the level of NCLC teachers' self-efficacy in online learning, (2) the level of NCLC teachers' knowledge of the TPACK components, (3) the relationship between the teachers' self-efficacy in online learning and knowledge of the TPACK components, and (4) measures to enhance the efficacy of NCLC teachers in online learning.

This chapter highlights the summary and significance of the research findings and offers recommendations for NCLC/NCLC-MCA school system, future research on teacher self-efficacy and TPACK, educational policy, and the teaching practice.

A. Summary and Significance of the Research Findings

This study's findings can contribute to the fundamental knowledge in the fields of teacher self-efficacy, the TPACK framework, and online learning in the context of the abrupt change to online learning during the Covid-19 pandemic.

Teacher Self-efficacy in Online Learning.

In terms of teacher self-efficacy in online learning, this study found a positive relationship between teacher self-efficacy and technology use in online learning. The quantitative study revealed a "Quite A bit" rating for teacher self-efficacy in online learning, which is the second highest rating. This demonstrates that when teachers rate highly in aspects of online student engagement, online instructional strategies, online classroom management, and computer technology use, their self-efficacy is also high, and vice versa.

Second, this study identified the significance of support in establishing teacher self-efficacy during the early stages of the transition to online learning. The NCLC Marikina's holistic institutional support for teachers' physical, mental, socio-emotional, spiritual, and professional needs became the teachers' self-efficacy backbone. This allowed teachers to re-establish their self-efficacy and gradually recover from the pandemic's initial negative consequences. As Singh and Hardaker (2014) pointed out, developing and maintaining a positive attitude toward online learning requires school leaders to take a whole-school approach in which all stakeholders' voices are heard during the transition to online learning.

Third, this study found that teacher self-efficacy in online learning is a dynamic process. The qualitative study showed how teacher self-efficacy in online learning develops over time during the Covid-19 pandemic. NCLC teachers gradually developed the sources of Bandura's (1997) teacher self-efficacy, which are mastery experiences, vicarious experiences, verbal persuasions, and affective states. The abrupt transition to online learning left teachers feeling uncertain and frustrated, but their self-efficacy grew gradually as institutional and social support was provided. The assistance provided during the early stages of the transition allowed for

vicarious experiences and verbal persuasions, which influenced their positive affective states. Teachers' mastery experiences have gradually grown as they gained more knowledge and experience in the online learning environment. All of the 4 sources of self-efficacies have been developed over time.

Fourth, this study identified teacher self-efficacy in online learning may be inconclusive in terms of demographics. As with earlier research (Mehdinezhad, 2012; Robinia & Anderson, 2010; Lee & Tsai, 2010; Chang et al., 2011; Horvitz et al., 2015; Lumpe et al., 2012), teacher self-efficacy in relation to their demographics and experience variables has been the subject of conflicting conclusions. Integrated quantitative and qualitative studies indicate that in the case of the Covid-19 pandemic, younger teachers are more receptive to change despite having lesser teaching experience than their seasoned counterparts. This may suggest that a teacher's intrinsic motivation, which transcends demographic limitations, may also be a consideration.

In addition, this study found that teacher self-efficacy increases before and after a professional development program that emphasizes online learning. In line with previous research (Lin & Zheng, 2015; Chai et al., 2010), interviews with select teachers and online learning specialists confirm that training and workshops increased their self-efficacy by enabling them to be knowledgeable and competent in the new mode of learning.

Furthermore, this study highlighted the value of professional learning communities (PLC) in increasing teacher self-efficacy in online learning. PLC enabled teachers to rely on each other in an environment where they are free to reflect, communicate, cooperate, and collaborate towards the goal of effective teaching in an online setting, just as NCLC teachers initiated working together to help those who are more challenged in the online transition. Furthermore, PLC enabled teachers to motivate each other to overcome their limitations and develop innovative solutions to improve their teaching practices allowing them to collectively build their self-efficacy (Pokheri & Chetri, 2021).

Role of TPACK Framework in Enhancing Teacher Self-efficacy.

This study confirms the role of the TPACK framework in enhancing teacher self-efficacy in online learning. This research found a positive correlation between teacher self-efficacy and TPACK proficiency. The linear, positive, and strong relationship indicates that as teachers' TPACK levels increase, so does their online learning self-efficacy. Corry and Stella's (2018) review of the literature indicates that researchers continue to investigate how teacher self-efficacy can be measured using the TPACK framework and how TPACK supports teacher self-efficacy development. In light of this study, measuring teacher self-efficacy in online learning implies measuring their TPACK level. In order to increase one's level of teacher self-efficacy in online learning, one may develop TPACK competencies. As teachers increase their TPACK knowledge, their self-efficacy increases as well.

Moreover, this study concluded that TPACK development is a dynamic process. In the early stages of the pandemic, when NCLC teachers abruptly transitioned to the online mode of delivery, the faculty development program that focused on their TPACK development first taught online learning knowledge. When teachers were given the opportunity to enhance their TPACK skills through workshops and actual teaching experiences, this knowledge gradually built the necessary skills for online learning. This demonstrated that teachers' TPACK knowledge, skills, and competencies evolve over time. Therefore there is a need for a continuous faculty development program focusing on TPACK development and enhancement using any of the TPACK development models (Zhang & Tang, 2021).

Online Learning During Covid-19 Pandemic.

Annamalai et al. (2022) and Hodges et al. (2020) found that there is a significant difference between online teaching during the Covid-19 pandemic and online teaching prior to the pandemic, when teachers have sufficient time to plan their teaching techniques. However, this study concludes that implementing online teaching and learning before and during the Covid-19 pandemic presents the same benefits and challenges.

This study found, based on qualitative interviews, that the affordances of online learning prior to the pandemic (Dhawan, 2020; Siemens et al., 2015; Cook & Steinbert, 2013; Amasha et al., 2018), such as accessibility, flexibility, enriched teaching methods, and strategies that promote student motivation and learning, are the same as those of online learning during a pandemic. Moreover, this study identified that the challenges of online learning (United Nations, 2020; Arkorful & Abaidoo, 2015; DeCoito & Estaiteyeh, 2022), such as equity, accessibility, resource allocation, and maintenance, as well as learners' feelings of detachment and isolation, and teacher challenges in teaching preparations and authentic assessment, are the same whether prior to or during the Covid-19 pandemic.

However, what could differ is the preparation phase. The abrupt transition necessitated accelerated training of teachers in online teaching and learning. However, as time passed and teachers acquired the necessary skills and experience in online learning, they too adapted. Therefore, this study concluded that implementing online teaching and learning prior to and during the Covid-19 pandemic presents the same advantages and disadvantages.

V. Recommendations

For the NCLC/NCLC-MCA school system

This study aims to guide the NCLC administration and instructional leaders on action plans that incorporate the TPACK framework in the current blended learning modality. Whether in a face-to-face or online setting, the use of technology enhances students' and teachers' learning

experiences. Therefore, incorporating the TPACK framework in their program will lead to enhanced teaching and learning in the school system.

In addition, the purpose of this study is to also help NCLC-MCA school leaders understand how TPACK-related knowledge, skills, and dispositions lead to increased teacher self-efficacy and facilitate more effective online learning. This suggests that the NCLC-MCA school administrators may examine their strategic plan, the DepEd curriculum emphasizing the 21st century skills of collaboration, communication, creativity, critical thinking, character, citizenship, and computational thinking, as well as the school's mission and vision, to determine how the TPACK framework may align with them. As they assess the needs of all stakeholders, they will be able to evaluate the school's strengths, weaknesses, challenges, and opportunities, and align their whole-school program and teacher professional development program accordingly.

For Future Research in TPACK and Teacher Self-Efficacy

This study may guide future researchers in the following ways:

First, future researchers could use the proposed framework in enhancing teacher self-efficacy beyond the Covid-19 pandemic. They may evaluate the applicability of enhancing teacher self-efficacy through the TPACK framework while removing the aspects of abrupt transitions that resulted in negative dispositions among teachers and assess if it will yield a difference in self-efficacies among teachers.

Second, future researchers may also develop a teacher professional development program using any of the TPACK development approach (Mishra et al., 2013; Rosenberg, 2012) and models (Zhang & Tang, 2021). This researcher would like to recommend the Synthesis of Quality Evidence (SQD) Model (Tondeur et al., 2012) because of its holistic and institutional approach through its three levels of TPACK development, which include levels of preparation, conditions for institutional implementation, and the outermost layer of aligning theory and practice and systematic change at both the micro and institutional levels.

Third, with regard to TPACK assessment among teachers, researchers may wish to conduct a performance-based assessment (Mishra & Koehler, 2006) or a combination of self-report and performance-based assessment (Abbitt, 2011) that can directly assess actual teacher TPACK knowledge and TPACK development over time. This may eliminate the limitations and biases of a self-report TPACK assessment tool.

Next, future research may also examine how the TPACK framework can boost teacher self-efficacy in blended learning environments. As more schools return to face-to-face classroom learning, some schools may have shifted back to traditional set-up but retained their asynchronous activities and educational technologies within a face-to-face setting.

Moreover, future researchers may assess the effectiveness of the TPACK framework in enhancing teacher self-efficacy that results in successful student learning. While research (Harris et al., 2017; Oskay, 2017) confirms that a teacher's TPACK influences student learning, correlations between a teacher's TPACK and teacher self-efficacy were limited in this study. Since this study found a strong correlation between TPACK and teacher self-efficacy, future research may determine if there is also a correlation between TPACK and student learning success.

Related to Educational Policy

Because this study confirms the role of the TPACK framework in enhancing teacher self-efficacy in online learning among NCLC teachers, the Department of Education (DepEd) may wish to revisit the curriculum and see how the TPACK framework aligns to 21st century expectations of learning during the post-Covid-19 pandemic. Further, DepEd officials may initiate and conduct additional research in order to develop a nationwide faculty development program that aims to improve the TPACK skills of teachers in public and private schools. They may provide guidelines and policies, scholarship opportunities, research and development support, evaluation tools, and funding and resources for the implementation of a TPACK development program for teachers.

Moreover, this study may also assist private schools comprising the Philippine Association of Private Schools, Colleges, and Universities, Inc. (PAPSCU), which recommended the TPACK framework as a model for teachers delivering synchronous and asynchronous lessons (Ogena et al., 2020), in planning and implementing a strategic school program designed to improve online learning even after the Covid-19 pandemic. The TPACK framework can serve as a model for developing teacher knowledge and competencies for online, blended, and even face-to-face learning, given that education technology is essential and inevitable in 21st century learning.

Related to Teaching and School Practice

This study aims to benefit practice in the following ways:

First and foremost, is the benefit for our teachers who are at the heart of this study. The purpose of this study is to increase their self-efficacy in online learning using the TPACK framework in order to facilitate effective teaching and learning. A professional development program that enhances their TPACK competencies and builds their self-efficacy means that the future of online and blended teaching heavily depends on them. In order to facilitate effective online teaching and learning, teachers must therefore continue to develop their TPACK competencies and self-efficacy, either individually or as a professional learning community.

Second, this study aims to benefit school leaders and instructional leaders from both public and private institutions by providing a better understanding of the advantages of teaching with technology in the 21st century. Consequently, they would require teachers with a high level of self-efficacy in teaching with technology, whether online or in-person. The TPACK framework will be

helpful in assessing their teachers' level of knowledge in teaching with technology and how it can be improved through action plans and school-wide programs for integrating technology in teaching and learning.

Furthermore, the purpose of this research is to ultimately benefit students, because those whose teachers have a high level of self-efficacy in online learning will have better learning opportunities. As more teachers and schools adopt the TPACK framework, more opportunities for student success may arise.

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