The Role of Training Effectiveness in Enhancing Online Teaching Competence and Professional Development: A SEM Approach

S. M. Kaunain Abidi[1]*, Azra Ishrat[1], Masood H. Siddiqui[2], Anjali Singh[1], Shagufta Ali[3], Naghma Ali[3]

[1]Amity University, Lucknow, Uttar Pradesh, India, [2]Department of Statistics, University of Lucknow, Lucknow, Uttar Pradesh, India, [3]United Institute of Management, Prayagraj, Uttar Pradesh, India. *Email: s.abidi@s.amity.edu

ABSTRACT

This study examines the role of training effectiveness in enhancing online teaching competence and professional development among educators, addressing the growing demands of digital education. Using a quantitative research design, data were collected from 603 in-service teachers in India and analyzed through Structural Equation Modeling. The study explores how individual, learning, and organizational performance outcomes of training influence professional development via the mediating role of online teaching competence. Findings revealed that individual and organizational performance positively predicted online teaching competence, with organizational performance exerting the strongest influence. Conversely, learning performance showed a slight negative relationship, suggesting gaps between theoretical training and practical application. Online teaching competence significantly enhanced all dimensions of professional development, emphasizing its pivotal role in sustaining educators' growth. The study highlights the need for practice-oriented, contextually relevant training and institutional support mechanisms to empower digitally competent educators and promote inclusive, adaptive, and high-impact online teaching practices.

Keywords: Training Effectiveness, Online Teaching Competence, Professional Development, Teacher Capacity Building
JEL Classifications: I23, J24, O15

1. INTRODUCTION

The digital transformation of education has accelerated rapidly, particularly in the wake of global disruptions such as the COVID-19 pandemic. As educational institutions transition toward hybrid and fully online learning models, there is an urgent need to strengthen the competencies of educators to teach effectively in digital environments. In this evolving context, training effectiveness has emerged as a critical driver in building future-ready online teaching competence and ensuring sustained professional development among educators. Effective employee training is essential for equipping teaching professionals with the skills and attitudes necessary for adapting to technological change (Dusadee and Piriyasurawong, 2020). Training not only enhances individual performance and learning outcomes but also contributes to overall organizational performance, aligning

educator's capabilities with institutional goals. However, the true measure of training success lies in its long-term impact—especially how well it supports educators in developing core online teaching competencies and engaging in continuous professional development (Rienties et al., 2023). This study seeks to examine these relationships through a robust statistical framework using Structural Equation Modeling (SEM).

Prior research has largely focused on isolated aspects of training, such as its short-term benefits or implementation efficiency. There remains a significant gap in understanding how the effectiveness of training programs cascades into improved online teaching competence and ultimately leads to more structured and meaningful professional development activities. To address this gap, the current study adopts a comprehensive model that integrates constructs such as Employee Training Effectiveness

(Lim et al., 2007), Learning Performance, Individual Performance, and Organizational Performance as predictors of Online Teaching Competence (Cui and Yin, 2023). The latter, in turn, is hypothesized to influence the key dimensions of professional development, including Planning, Executing, and Evaluating. The theoretical underpinnings of this research are rooted in adult learning theory, professional learning communities, and the technology acceptance model (TAM). Together, these frameworks provide a lens to understand how training influences behavioural intention, skill acquisition, and sustained performance in online teaching settings. Educators, particularly in K-12 and higher education sectors, require more than just functional knowledge of technology—they must possess the pedagogical agility to plan, deliver and assess instruction in virtual formats.

Moreover, professional development is no longer a one-time event but a continuous, self-reflective process. The study acknowledges this evolution and explores how online teaching competence mediates the relationship between training effectiveness and various facets of professional growth (Reychav et al., 2023). By doing so, it contributes to both theoretical enrichment and practical guidance for policymakers, instructional designers, and educational leaders. In sum, this research aims to build a validated, evidence-based model that highlights the role of effective training in preparing educators for the future of digital teaching and learning (Zeehan et al., 2020). Using SEM, the study rigorously tests the relationships among multiple constructs and offers actionable insights into how institutions can design and implement training programs that yield long-term benefits. The findings are expected to guide institutional strategies for investing in people, processes, and platforms that collectively foster educational innovation and excellence in online teaching.

2. LITERATURE REVIEW

The current research investigates the role of training effectiveness in shaping future-ready online teaching competence and professional development among educators. As digital transformation reshapes the education landscape, educators are increasingly required to integrate technology into their instructional practices. This shift necessitates continuous capacity-building through training programs that not only enhance individual skills but also align with institutional objectives. However, the long-term impact of training on professional development outcomes remains underexplored (Copur-Gencturk et al., 2024). To bridge this gap, this study examines how constructs such as Employee Training Effectiveness, Learning Performance, Individual Performance, and Organizational Performance contribute to the development of Online Teaching Competence (Farmer and Ramsdale, 2016), which in turn drives meaningful Professional Development (Hammond et al., 2017). The research is grounded in a Structural Equation Modeling (SEM) framework to empirically validate the hypothesized relationships. The following sections provide a review of the literature related to each construct, setting the foundation for the proposed conceptual model.

2.1. Employee Training Effectiveness
Employee training effectiveness refers to the degree to which a training program meets its objectives by enhancing the knowledge,

skills, and attitudes of participants (Sitzmann and Weinhardt, 2018). Effective training initiatives are designed to address specific performance gaps and are closely aligned with organizational goals. (Aziz, 2015) emphasized that training should not be a generic exercise but must consider learner's needs, the relevance of content, and the transferability of knowledge into practice. In the context of education, training effectiveness takes on a more dynamic role (Lim et al., 2007). With the rise of digital learning environments, training must prepare educators not only for content delivery but also for technology integration, online engagement, and assessment. Research suggests that training effectiveness depends heavily on design, delivery methods, trainer expertise, and post-training reinforcement (Rovai, 2000). Furthermore, training outcomes are typically evaluated in terms of learning performance, job behaviour changes, and improvements in individual and organizational performance.

2.1.1. Learning performance
Learning performance refers to the extent to which participants acquire and apply the knowledge and skills from a training program. It is a key indicator of training success and is often used to assess cognitive, behavioural, and affective learning outcomes (Tshukudu, 2014). In an educational context, learning performance among teachers can manifest through improved lesson planning, use of pedagogical strategies, and classroom engagement. Several studies have highlighted the importance of self-efficacy, motivation, and the learning environment in shaping learning performance (Abun et al., 2022). Teachers who perceive training as relevant and applicable tend to perform better, especially in rapidly evolving online learning scenarios. Moreover, digital training modules, when interactive and learner-centered, significantly improve learning performance outcomes among educators (Bragg et al., 2021).

2.1.2. Individual performance
Individual performance captures how well an employee or educator fulfills their job responsibilities post-training. In teaching, this includes instructional delivery, content accuracy, student engagement, and adaptability. Studies indicate a direct link between effective training and enhanced individual performance (Mehale et al., 2021). When educators are equipped with the latest technological and pedagogical tools, they demonstrate higher confidence and proficiency in online teaching environments. Furthermore, individual performance is influenced by the perceived usefulness and ease of use of the training content, especially in digital learning platforms (Pratiwi and Waluyo, 2023). Teachers who believe that training enhances their efficiency are more likely to engage in and benefit from training programs, leading to improved instructional performance in virtual classrooms.

2.1.3. Organizational performance
Organizational performance in educational settings refers to the collective outcomes resulting from improved teacher competencies, such as increased student achievement, teacher retention, and institutional reputation. According to (Kali Palindangan et al., 2022), when training outcomes align with strategic organizational goals, performance improves at all levels. Recent studies reveals that training programs designed with institutional goals in

mind—such as digital transformation, curriculum reform, or inclusive education—yield better organizational performance (Irfan et al., 2023). Educational institutions that invest in structured training programs are more agile, adaptable, and competitive in the shifting landscape of online education. Organizational support also plays a vital role in enhancing the impact of training. Managers, school leaders, and administrators who actively promote and reward professional learning contribute significantly to sustained improvements in performance (Leary et al., 2020).

2.2. Online Teaching Competence

Online teaching competence is defined as the educator's ability to effectively plan, implement, and evaluate instruction in digital or blended learning environments (Bragg et al., 2021). It encompasses pedagogical knowledge, technological proficiency, communication skills, and adaptability. With the global push toward digital education, online teaching competence has become a core professional requirement. (Pulham and Graham, 2018) conceptualized online teaching competence as a multi-dimensional construct including instructional design, use of learning management systems (LMS), student engagement strategies, and online assessment techniques. Teachers with high competence are not only proficient with tools but also capable of creating inclusive and interactive online learning experiences. Studies have shown that competence in online teaching is positively associated with professional confidence, student outcomes, and instructional innovation (Farmer and Ramsdale, 2016). Moreover, training programs that include hands-on, context-relevant digital pedagogy modules are more effective in fostering teaching competence (Wallace et al., 2023).

2.3. Professional Development

Professional development (PD) refers to ongoing, job-embedded learning activities that enhance teachers' instructional practices and professional growth. According to (Shakuna et al., 2013), effective professional development is reflective, collaborative, data-driven, and aligned with educational standards. In the context of online education, PD must also be flexible, technology-oriented, and continuous. PD is increasingly recognized as a strategic tool for educational reform and innovation. Research indicates that teachers engaged in structured PD demonstrate improved instructional techniques, better classroom management, and higher student achievement (Copur-Gencturk et al., 2024). The integration of technology in PD, such as webinars, online courses, and peer networks, has also expanded access and relevance for educators. (Masters et al., 2010) identify planning, executing, and evaluating as the key phases of PD. Planning involves setting learning goals and identifying training needs. Execution refers to the actual participation in training activities, while evaluation focuses on assessing the impact and refining future efforts. Together, these stages form a cyclical model of professional growth that supports lifelong learning among educators.

The literature reflects that the effectiveness of training influences not only individual learning and performance but also the development of core teaching competencies and sustained professional growth. The Technology Acceptance Model (TAM) and Adult Learning Theory provide theoretical grounding for this framework. TAM posits that perceived usefulness and ease of use influence the acceptance and application of technology (Hossain et al., 2024), while adult learning theory emphasizes relevance, experience, and self-direction (Schroeder et al., 2023). These theories converge in the context of online education, where training programs must be designed to meet adult learners' expectations and technological requirements. When educators perceive training as useful, relevant, and practical, they are more likely to develop online teaching competence and engage in meaningful professional development. Furthermore, Structural Equation Modeling (SEM) offers a robust methodological approach to test these relationships simultaneously. SEM allows researchers to examine both direct and indirect effects among constructs, providing a holistic understanding of how training inputs translate into professional outcomes.

2.3.1. Hypothesis development

H_1: Training Effectiveness (Individual performance) significantly impacts online teaching competence

H_2: Training Effectiveness (Learning performance) significantly impacts online teaching competence

H_3: Training Effectiveness (Organizational performance) significantly impacts online teaching competence

H_4: Online teaching competence significantly impacts professional development (executing)

H_5: Online teaching competence significantly impacts professional development (evaluating)

H_6: Online teaching competence significantly impacts professional development (planning).

3. RESEARCH METHODOLOGY

This chapter presents the research design and methodology adopted for the study exploring the influence of training effectiveness on online teaching competence and professional development. A quantitative approach using Structural Equation Modeling (SEM) was employed to analyze the interrelationships among the constructs. This chapter outlines the participants involved, the procedure followed, the instruments used for data collection, the sampling strategy adopted, and the demographic characteristics of the sample, providing a comprehensive framework to ensure methodological rigor.

3.1. Participants

The study targeted in-service educators currently engaged in teaching roles across various school levels from various cities across India, specifically Bengaluru, Delhi, Chennai, Hyderabad, Mumbai, and Kolkata (Haque and Patel, 2018). Participants were selected from a diverse educational ecosystem that included both public and private institutions. The rationale behind selecting this group lies in their direct involvement with recent training interventions and digital pedagogical practices, making them ideal respondents for assessing training effectiveness and its outcomes. To ensure a holistic understanding, the sample included educators with varied professional backgrounds. Participants differed in terms of gender, teaching experience, academic qualifications, age, and the level of learners they taught. This diversity allowed the study to capture several perceptions and practices related to

training and online teaching, enabling the findings to be more representative of the broader teaching population.

3.2. Procedure

The research followed a systematic process beginning with the development and validation of a structured questionnaire. Ethical clearance was obtained prior to data collection to ensure adherence to the research integrity and participant rights. All respondents were informed about the voluntary nature of the study, the confidentiality of their responses, and the intended academic purpose of the research. Informed consent was collected digitally before the survey. To enhance clarity and reliability, the survey instrument was pilot-tested with a small group of educators. Feedback from the pilot phase confirmed that the items were well suited to the target audience, requiring no additional adaptation. Once finalized, the questionnaire was distributed online through institutional mailing lists, professional educator forums, and targeted educational networks. The digital format was chosen to facilitate ease of access, especially for educators familiar with online platforms due to recent shifts in teaching modalities.

3.3. Instrument

The data for this study were collected using a structured questionnaire comprising items adapted from established, validated scales. The instrument was designed to measure three major constructs: Employee Training Effectiveness, Online Teaching Competence, and Professional Development. The first construct, Employee Training Effectiveness, was measured using a scale developed by (Aziz, 2015). This scale assesses participants' perceptions of how effective their recent training experiences have been in enhancing their instructional capabilities. The rationale for selecting this scale stems from its contextual relevance in evaluating the alignment of training content with job roles, the clarity of delivery, and the practical utility of the skills gained. Online Teaching Competence was assessed using a scale developed by (Yang and Du, 2024), which focuses on teachers' proficiency in planning, delivering, and assessing instruction in digital environments. This construct is central to the research objective, as it captures educators' preparedness for the demands of online teaching. The scale includes dimensions such as digital literacy, instructional design, learner engagement, and adaptability—key skills for future-ready educators. The third construct, Professional Development, was operationalized using a framework adapted from (Shakuna et al., 2013). This scale encompasses three critical stages: planning, executing, and evaluating professional growth initiatives. Planning relates to setting goals and identifying areas for improvement; executing includes active participation in learning and training activities; and evaluating pertains to reflective practices and measuring impact. This framework aligns well with the study's goal of examining the long-term developmental outcomes of training programs. All items were measured using a seven-point Likert scale ranging from strongly disagree to strongly agree, allowing for quantitative analysis of participants' attitudes and experiences.

3.4. Sampling

The study employed a purposive sampling technique to ensure the inclusion of educators who had relevant experience with online teaching and exposure to professional training initiatives. The sampling strategy was guided by the need to include participants who could provide informed perspectives on the constructs being studied. This non-probability sampling method was deemed appropriate given the specific focus of the research on educators actively engaged in digital teaching contexts. The sample was drawn from a network of educators located in metropolitan areas where access to infrastructure, digital tools, and professional training opportunities is relatively high. This ensured that the participants had adequate exposure to the dynamics of online education and professional development frameworks, making their responses relevant and valuable to the study.

3.5. Data Collection and Sample

Data collection was conducted over a predefined period using an online questionnaire. The decision to use an online format was based on the familiarity of participants with digital platforms and the geographic dispersion of the target population. Online distribution also allowed for efficient administration and real-time data monitoring. The demographic characteristics of the final sample reflected a balanced representation across the key variables.

In total, responses from approximately 603 educators were obtained. Participants came from diverse urban centers known for their educational infrastructure and training initiatives. The sample included both early-career and experienced educators, providing a comprehensive view of how training effectiveness influences various career stages. Respondents also varied in their academic qualifications, from bachelor's to master's degrees, and taught across all major school levels from early childhood to senior secondary. This variation in demographic and professional backgrounds enriched the dataset and enabled nuanced analysis of the relationships among the constructs. It also ensured that the findings could be interpreted across multiple contexts and stakeholder groups, strengthening the generalizability of the research.

4. DATA ANALYSIS AND INTERPRETATION

Table 1 shows a total of 603 respondents participated in the study. In terms of gender distribution, 51.41% of the participants were male (n = 310), while 48.59% were female (n = 293), indicating a nearly balanced representation. The age distribution revealed that the largest proportion of respondents (24.88%) fell within the 25-35 years age group, followed by 21.56% aged 35-44 years, 19.90% aged 45-55 years, 18.73% aged 55 and above, and 14.93% under 25 years. Regarding the city of residence, participants were fairly evenly distributed across six major metropolitan areas, with Bengaluru accounting for the highest proportion at 17.41%, followed by Delhi, Hyderabad, Mumbai, and Kolkata each representing 16.59%, and Chennai at 16.25%. In terms of educational qualifications, the majority of respondents held a Master's degree (51.57%), followed by Bachelor's degree holders (48.42%). Teaching experience among participants was also diverse, with 26.53% having 0-5 years of experience, 24.88% with 6-10 years, 24.04% with 11-15 years, and 24.55% with 16 years and above, suggesting a well-balanced range of professional experience. Lastly, participants were engaged in teaching across

various educational levels: 21.56% at the Primary/Elementary level, 20.73% at Middle school, 19.57% at Higher Secondary school, 19.07% each at Early Childhood (preschool) and Senior Secondary School, reflecting a wide coverage of teaching grades in the study sample.

The measurement model in Table 2 demonstrates satisfactory reliability and validity across all constructs, confirming that the instrument reliably measures the latent variables in the study. The construct loadings for all items ranged from 0.713 to 0.896, exceeding the recommended threshold of 0.70 (Hair et al., 2017), which indicates strong indicator reliability. Specifically, the construct E showed loadings between 0.735 and 0.896, with a composite reliability (CR) of 0.777, average variance extracted (AVE) of 0.571, and Cronbach's alpha of 0.795, demonstrating acceptable internal consistency and convergent validity. Similarly, the constructs EV, IP, LP, OP, OTC, and P exhibited CR values above the 0.7 benchmark, ranging from 0.722 to 0.884, with AVE values exceeding the minimum threshold of 0.50, confirming the convergent validity for each construct. For instance, LP recorded the highest CR at 0.867 and an AVE of 0.621, indicating robust reliability and that over 62% of the variance in indicators is captured by the latent construct.

Cronbach's alpha values for all constructs were consistently above 0.70, further supporting the internal consistency of the scales. The Variance Inflation Factor (VIF) values for all indicators were below 3, ranging from 1.099 to 2.765, indicating no significant multicollinearity concerns among the measurement items. In summary, the measurement model provides strong evidence of construct reliability and validity, establishing a sound foundation for testing the structural relationships among the constructs in the subsequent analysis.

Table 1: Demographic profile

Demographics	Subcategory	Frequency	Percentage
Gender	Male	310	51.41
	Female	293	48.59
Age	Under 25	90	14.93
	25-35 years	150	24.88
	35-44 years	130	21.56
	45-55 years	120	19.90
	55 and above	113	18.73
City of residence	Bengaluru	105	17.41
	Delhi	100	16.59
	Chennai	98	16.25
	Hyderabad	100	16.59
	Mumbai	100	16.59
	Kolkata	100	16.59
Education Level	Bachelor's degree	292	48.42
	Master's degree	311	51.57
Teaching Experience	0-5 years	160	26.53
	6-10 years	150	24.88
	11-15 years	145	24.04
	16 years and above	148	24.55
Grade level you teach	Early childhood (preschool)	115	19.07
	Primary/Elementary school	130	21.56
	Middle school	125	20.73
	Higher Secondary School	118	19.57
	Senior Secondary School	115	19.07

The Fornell-Larcker criterion in Table 3 was applied to further evaluate the discriminant validity among the latent constructs. According to this criterion, the square root of each construct's Average Variance Extracted (AVE) should exceed its correlations with all other constructs, indicating that a construct shares more variance with its indicators than with other constructs. In the presented matrix, the diagonal elements represent the square roots of the AVE for each construct, with values ranging from 0.651 to 0.688. These values are consistently higher than the off-diagonal correlations in the corresponding rows and columns, confirming the discriminant validity across the model. For example, for the construct E, the square root of AVE is 0.686, which is greater than its correlations with all other constructs, such as 0.629 with EV and 0.371 with P.

Similarly, the construct LP shows a square root of AVE of 0.688, surpassing its correlations with other constructs like 0.641 with IP and 0.582 with P, further supporting distinctiveness. Even the constructs with moderate correlations, such as OP and OTC, maintain discriminant validity as their square roots of AVE (0.651

Table 2: Measurement model

Construct	Item code	Construct loadings	Composite reliability	AVE	Cronbach alpha	VIF
E	E1	0.841	0.777	0.571	0.795	1.178
	E2	0.746				2.042
	E3	0.896				2.11
	E4	0.735				1.989
EV	EV1	0.763	0.852	0.591	0.852	1.467
	EV2	0.742				2.474
	EV3	0.771				2.223
	EV4	0.795				2.228
IP	IP1	0.845	0.815	0.597	0.819	1.515
	IP2	0.777				2.205
	IP3	0.788				2.321
LP	LP1	0.781	0.867	0.621	0.867	2.391
	LP2	0.85				2.383
	LP3	0.745				1.998
	LP4	0.771				2.105
OP	OP1	0.749	0.795	0.563	0.795	1.67
	OP2	0.767				1.714
	OP3	0.735				1.667
OTC	OTC1	0.713	0.722	0.546	0.739	1.592
	OTC2	0.756				1.738
	OTC3	0.754				1.649
	OTC4	0.872				1.359
	OTC5	0.714				1.099
P	P1	0.874	0.884	0.605	0.886	2.765
	P2	0.835				2.692
	P3	0.716				2.622
	P4	0.73				2.605
	P5	0.721				2.749

Table 3: Discriminant validity of Fornell and Larker

	E	EV	IP	LP	OP	OTC	P
E	0.686						
EV	0.629	0.668					
IP	0.544	0.597	0.673				
LP	0.585	0.538	0.641	0.688			
OP	0.375	0.524	0.529	0.653	0.651		
OTC	0.356	0.549	0.427	0.661	0.671	0.688	
P	0.371	0.454	0.482	0.582	0.538	0.573	0.668

and 0.688, respectively) exceed the correlations with related constructs. Overall, the Fornell-Larcker criterion results reinforce the HTMT findings, demonstrating adequate discriminant validity and confirming that each construct uniquely captures its intended theoretical domain within the model.

Table 4 shows the Heterotrait-Monotrait (HTMT) ratio was assessed to evaluate the discriminant validity among the latent constructs. HTMT values below the conservative threshold of 0.85 suggest that the constructs are empirically distinct and measure different concepts. In this analysis, all HTMT values ranged between 0.286 and 0.682, well below the 0.85 cutoff, confirming strong discriminant validity among the constructs. For instance, the highest HTMT value of 0.682 was observed between LP (likely a learning-related construct) and P (possibly professional development), indicating a moderate but distinct relationship. Other notable HTMT values include 0.679 between IP and P, and 0.677 between E and P, further supporting the constructs' relatedness but clear differentiation. Lower HTMT values, such as 0.286 between OP and IP and 0.325 between OP and EV, reinforce that constructs like OP are conceptually distinct from others. Overall, the HTMT results provide compelling evidence that the constructs in the model are reliably discriminant, supporting the validity of the measurement framework before proceeding to test the structural relationships.

The structural model analysis in Table 5 revealed significant relationships among the constructs, supporting all the proposed hypotheses. Specifically, Individual Performance (IP) positively influenced Online Teaching Competence (OTC) with a path coefficient of 0.32 (t = 3.416, P = 0.001), indicating that improved instructional practices enhance online teaching competence. Figure 1 interestingly shows, Learning Performance (LP) showed a small but statistically significant negative effect on OTC ($\beta = -0.057$, t = 3.315, P = 0.001), suggesting potential complexities or contextual factors affecting this relationship. Organizational Performance (OP) had the strongest positive effect on OTC ($\beta = 0.899$, t = 25.136, P < 0.001), highlighting its critical role in shaping teaching competence in online environments. Furthermore, OTC significantly predicted Executing (E) ($\beta = 0.56$), Evaluation (EV) ($\beta = 0.49$), and

Professional Development (P) ($\beta = 0.673$), all with highly significant t-values (all P < 0.001). These findings reveals that higher online teaching competence enhances perceived training effectiveness, evaluation processes, and engagement in professional development activities. Overall, the model demonstrated strong predictive power and confirmed the central role of online teaching competence as a mediator between instructional and performance factors and professional growth outcomes.

5. DISCUSSION

The current study investigated the influence of training effectiveness on online teaching competence and professional development through a Structural Equation Modeling (SEM) framework. Six hypotheses were proposed to test the direct and indirect relationships among the constructs, informed by theories of adult learning, the Technology Acceptance Model (TAM), and professional learning communities (Acosta-Enriquez et al., 2025). The results of the SEM analysis provided valuable insights into the interrelationships among individual performance, learning performance, organizational performance, online teaching competence, and the three dimensions of professional development: executing, evaluating, and planning. The findings confirmed that Individual Performance (IP) significantly influenced Online Teaching Competence (OTC), supporting H_1. This result aligns with previous literature indicating that when teachers' instructional capabilities improve following training, they become better equipped to navigate digital teaching environments (Wallace et al., 2023). Improved individual performance likely manifests through better lesson planning, effective use of digital tools, and enhanced engagement strategies, thereby contributing positively to online teaching competence. This finding reinforces the importance of focusing on the behavioural outcomes of training, as changes in job-related behaviours directly translate into improved competencies within specific teaching contexts.

In contrast, the relationship between Learning Performance (LP) and OTC produced an unexpected finding. Although statistically significant, the effect was negative, indicating a potential complexity in how cognitive learning outcomes from training translate into practical online teaching competence. This partially supports H_2, although in a contradictory direction. One possible explanation lies in the overemphasis on theoretical content in training programs, which may not adequately address the practical realities and challenges educators face in digital classrooms. Prior research (Wallace et al., 2023) emphasized the need for interactive, context-relevant, and hands-on training components to improve transferability to practice. The negative
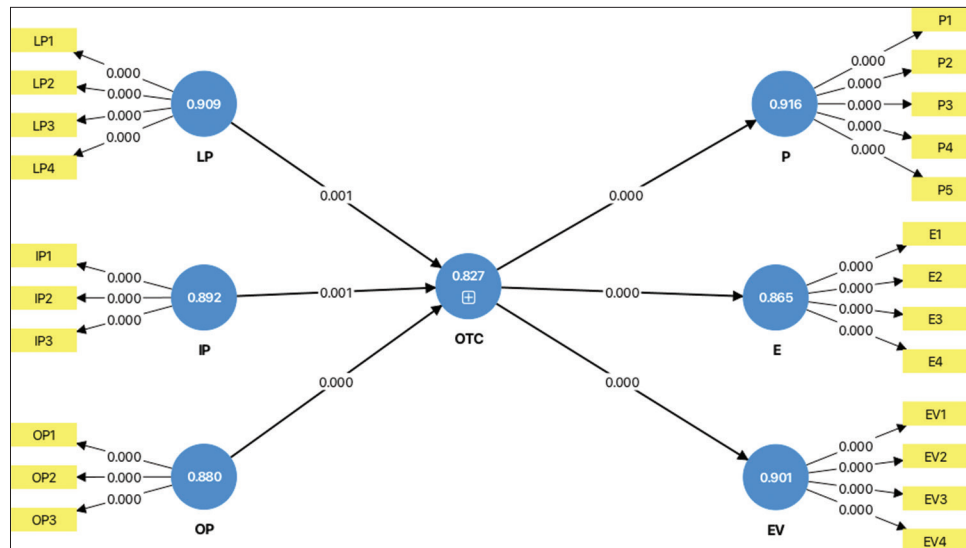
Table 4: Discriminant validity of the HTMT criterion

	E	EV	IP	LP	OP	OTC	P
E							
EV	0.539						
IP	0.523	0.494					
LP	0.567	0.538	0.341				
OP	0.374	0.325	0.286	0.353			
OTC	0.517	0.466	0.493	0.529	0.382		
P	0.677	0.562	0.679	0.682	0.339	0.62	

Table 5: Structural model hypothesis testing and results

Hypothesis	Path	Path co-efficient	SD	T statistics	P-values	Result
H_1	IP -> OTC	0.32	0.041	3.416	0.001	Accepted
H_2	LP -> OTC	-0.057	0.042	3.315	0.001	Accepted
H_3	OP -> OTC	0.899	0.027	25.136	0	Accepted
H_4	OTC -> E	0.56	0.03	14.228	0	Accepted
H_5	OTC -> EV	0.49	0.033	11.598	0	Accepted
H_6	OTC -> P	0.673	0.031	17.465	0	Accepted

Figure 1: Model

relationship may suggest that mere knowledge acquisition without opportunities for applied practice or reflective feedback could be insufficient or even counterproductive in improving actual online teaching competence. The strongest predictor of OTC was Organizational Performance (OP), thereby strongly supporting H_3. This finding is consistent with previous studies (Lay et al., 2020), which argued that organizational support structures, leadership encouragement, and institutional alignment of training programs play a pivotal role in translating training outcomes into effective instructional practices. This indicates that educators' competence in digital instruction is not developed in isolation but is heavily influenced by the systemic and cultural conditions within their institutions. Organizational investment in infrastructure, continuous professional learning communities, and incentives for digital teaching innovation likely foster an environment where teachers feel empowered and supported in applying new competencies.

Regarding the relationship between OTC and professional development dimensions, the study found that OTC positively predicted Executing (E), Evaluating (EV), and Planning (P), confirming H_4, H_5, and H_6. These results shows that as educators' competence in online teaching improves, so too does their engagement with professional development processes. Teachers with strong digital teaching competencies are more likely to proactively plan professional learning, execute training opportunities, and evaluate the outcomes of these initiatives to refine their instructional strategies (Starkey, 2020). The highest path coefficient was observed between OTC and Planning (P), underscoring the vital role of competence in fostering future-focused, reflective professional learning practices. This is consistent with the findings of (Dekker-Groen et al., 2013) (Liang et al., 2020), who noted that effective teaching competencies prompt teachers to regularly identify areas for growth, plan targeted learning goals, and participate in relevant training opportunities. Additionally, the positive relationships with Executing and Evaluating suggest that teaching competence extends beyond instructional delivery and influences how educators engage with broader professional growth activities.

An important rationale for these findings is the integrative role of online teaching competence as a mediator between training outcomes and long-term professional development. In alignment with TAM, when educators perceive their enhanced teaching competencies as useful and aligned with their job demands, their behavioural intention to engage in further professional learning increases (Hammond et al., 2017). Moreover, adult learning theory emphasizes the need for relevance and self-direction, both of which are facilitated when teachers possess strong instructional competencies that allow them to identify personal learning needs and evaluate their progress effectively (Pulham and Graham, 2018). Interestingly, while most relationships followed expected theoretical patterns, the negative coefficient for learning performance calls attention to a critical area for further investigation. This suggests that training programs must balance cognitive knowledge transfer with practical, skills-based application. As prior studies (Zeehan et al., 2020) have emphasized, technology training for educators must move beyond content delivery to include modeling of instructional practices, simulated teaching exercises, and mentorship to bridge the gap between knowing and doing in digital learning environments.

Another important implication of the findings is the demonstrated primacy of organizational factors over individual-level predictors in shaping teaching competence. This aligns with contemporary perspectives on educational change management, which emphasize the collective, systemic nature of professional development initiatives (Cui and Yin, 2023). Institutional commitment, supportive leadership, and the provision of relevant digital infrastructure appear to be essential enablers for enhancing educators' online teaching skills and sustaining their professional growth trajectories. In summary, the findings confirm the central role of online teaching competence as a critical mediator linking training effectiveness with ongoing professional development activities. The results also underscore the need for contextually grounded, practically oriented training interventions and highlight the substantial influence of organizational performance on the development of digital teaching competence. These insights contribute to a growing body of evidence supporting integrated,

competency-based, and systemically supported professional learning models for educators in the digital age.

6. CONCLUSION AND IMPLICATIONS

This study explored the influence of training effectiveness on online teaching competence and its subsequent impact on professional development within the context of a rapidly evolving digital education environment. Using a Structural Equation Modeling (SEM) approach, the research successfully validated a comprehensive framework linking individual performance, learning performance, and organizational performance to online teaching competence, and in turn, to three core dimensions of professional development: planning, executing, and evaluating. The findings confirm that online teaching competence acts as a pivotal mediator in translating training outcomes into meaningful professional growth. Notably, individual performance and organizational performance demonstrated significant positive effects on teaching competence, with organizational performance emerging as the strongest predictor. This highlights the essential role of institutional support, leadership commitment, and infrastructure in enabling educators to effectively apply newly acquired skills in digital teaching contexts. Interestingly, while learning performance showed a statistically significant relationship with online teaching competence, the negative direction of this effect points to potential gaps in the alignment between knowledge acquisition and practical application within current training programs.

The study also revealed that educators with higher online teaching competence are more likely to actively engage in the continuous cycle of professional development, encompassing goal setting, participation in professional learning activities, and reflective evaluation. This underscores the value of competency-based professional development frameworks that are both job-embedded and contextually relevant. Overall, the research contributes important empirical evidence to the growing discourse on digital pedagogy and professional capacity-building in education. It affirms that training interventions alone are insufficient unless supported by organizational commitment and structured opportunities for ongoing professional growth. As educational institutions continue to navigate the complexities of online and blended learning, investing in comprehensive, practice-oriented, and institutionally aligned training models will be crucial in cultivating future-ready educators.

6.1. Implications
The findings of this study carry significant implications for educational policymakers, institutional leaders, and instructional designers. Firstly, the strong influence of organizational performance on online teaching competence highlights the need for systemic support structures, including leadership endorsement, adequate digital infrastructure, and a culture that values continuous learning. Training programs must go beyond theoretical instruction and prioritize practice-based, contextually relevant content to improve the real-world applicability of learning outcomes. Additionally, the unexpected negative relationship between learning performance and teaching competence suggests that

knowledge transfer alone is insufficient without opportunities for applied practice and reflective feedback. Institutions should design cyclical professional development frameworks that integrate goal setting, active participation, and impact evaluation. Furthermore, online teaching competence should be positioned as a strategic institutional goal, fostering professional development initiatives that are sustainable, personalized, and aligned with broader educational transformations. Collectively, these measures can build a digitally competent, future-ready teaching workforce.

6.2. Limitations and Future Research
While this study offers valuable insights into the relationship between training effectiveness, online teaching competence, and professional development, several limitations must be acknowledged. First, the study employed a purposive sampling technique within metropolitan regions, which may limit the generalizability of the findings to rural or resource-constrained educational settings where access to digital infrastructure and professional training opportunities may differ significantly. Second, the reliance on self-reported data introduces the potential for response bias, as participants' perceptions of their competencies and training experiences might not fully reflect their actual practices.

Additionally, the study's cross-sectional design restricts the ability to establish long-term causal inferences. Longitudinal research is recommended to track how training effectiveness influences teaching competence and professional development trajectories over time. Future studies could also explore qualitative perspectives through interviews or focus groups to gain a deeper contextual understanding. Expanding the model to incorporate additional variables such as digital self-efficacy, institutional leadership support, and learner outcomes would further enrich the framework. Lastly, comparative analyses across educational levels or geographic regions could provide nuanced insights into contextual variations affecting digital teaching preparedness and professional growth.

REFERENCES

Abun, D., Natividad, E.B., Nicolas, M.T., Magallanes, T., Mansueto, J.M. (2022), Examining the effect of teacher's self-efficacy on job satisfaction. International Journal of Research in Business and Social Science, 10(8), 338-349.

Acosta-Enriquez, B.G., Arbulu Ballesteros, M., Vilcapoma Pérez, C.R., Huamaní Jordan, O., Martin Vergara, J.A., Martel Acosta, R., Arbulu Perez Vargas, C.G., Arbulú Castillo, J.C. (2025), AI in academia: How do social influence, self-efficacy, and integrity influence researchers' use of AI models? Social Sciences and Humanities Open, 11, 101274.

Aziz, S.F.A. (2015), Developing general training effectiveness scale for the Malaysian workplace learning. Mediterranean Journal of Social Sciences, 6(4S1), 47-56.

Bragg, L.A., Walsh, C., Heyeres, M. (2021), Successful design and delivery of online professional development for teachers: A systematic review of the literature. Computers and Education, 166, 104158.

Copur-Gencturk, Y., Li, J., Cohen, A.S., Orrill, C.H. (2024), The impact of an interactive, personalized computer-based teacher professional

development program on student performance: A randomized controlled trial. Computers and Education, 210, 104963.

Cui, C., Yin, Y. (2023), How professional training impacts teaching innovation among ideological and political teachers: The mediating and moderating role of basic psychological needs satisfaction. Frontiers in Psychology, 14, 1-10.

Dekker-Groen, A.M., Van Der Schaaf, M.F., Stokking, K.M. (2013), A teacher competence development programme for supporting students reflection skills. Teachers and Teaching Theory and Practice, 19(2), 150-171.

Dusadee, N., Piriyasurawong, P. (2020), Virtual professional training community model for developing digital teacher competencies. Universal Journal of Educational Research, 8(9), 4234-4241.

Farmer, H.M., Ramsdale, J. (2016), Teaching competencies for the online environment. Enseigner les compétences pour l'environnement en ligne. Canadian Journal of Learning and Technology La Revue Canadienne de l'apprentissage et de La Technologie, 42(3), 1-17.

Hair, J., Hollingsworth, C.L., Randolph, A.B., Chong, A.Y.L. (2017), An updated and expanded assessment of PLS-SEM in information systems research. Industrial Management and Data Systems, 117(3), 442-458.

Hammond, L.D., Hyler, M.E., Gardner, M. (2017), Effective Teacher Professional Development in the Evolution of Human and Non-Human Animals. United States: Learning Policy Institute.

Haque, I., Patel, P.P. (2018), Growth of metro cities in India: trends, patterns and determinants. Urban Research and Practice, 11(4), 338-377. doi: 10.1080/17535069.2017.1344727

Hossain, M.A., Tiwari, A., Saha, S., Ghimire, A., Imran, M.A.U., Khatoon, R. (2024), Applying the technology acceptance model (TAM) in information technology system to evaluate the adoption of decision support system. Journal of Computer and Communications, 12(8), 242-256.

Irfan, M., Khurshid, N., Khurshid, J., Khokhar, A.M. (2023), Human resource development and organisational performance: Evidence from Pakistan. SA Journal of Human Resource Management, 21, 1-10.

Kali Palindangan, L., Hatiningsih, N.K., Tjitrosumarto, S. (2022), Factors affecting teacher performance At SDN pondok pucung 05 bintaro. International Journal of Theory and Application in Elementary and Secondary School Education, 4(2), 12-26.

Lay, C.D., Allman, B., Cutri, R.M., Kimmons, R. (2020), Examining a decade of research in online teacher professional development. Frontiers in Education, 5, 573129.

Leary, H., Dopp, C., Turley, C., Cheney, M., Simmons, Z., Graham, C.R., Hatch, R. (2020), Professional development for online teaching: A literature review. Online Learning Journal, 24(4), 254-275.

Liang, X., Collins, L.J., Lenhart, L., Ressa, V. (2020), Instructional change following formative instructional practices professional development. Teacher Development, 24(1), 108-125.

Lim, H., Lee, S.G., Nam, K. (2007), Validating E-learning factors affecting training effectiveness. International Journal of Information Management, 27(1), 22-35.

Masters, J., De Kramer, R.M., O'Dwyer, L.M., Dash, S., Russell, M. (2010), The effects of online professional development on fourth grade english language arts teachers' knowledge and instructional practices. Journal of Educational Computing Research, 43(3), 355-375.

Mehale, K.D., Govender, C.M., Mabaso, C.M. (2021), Maximising training evaluation for employee performance improvement. SA Journal of Human Resource Management, 19, 1-11.

Pratiwi, D.I., Waluyo, B. (2023), Autonomous learning and the use of digital technologies in online English classrooms in higher education. Contemporary Educational Technology, 15(2), 13094.

Pulham, E., Graham, C.R. (2018), Comparing K-12 online and blended teaching competencies: A literature review. Distance Education, 39(3), 411-432.

Reychav, I., Elyakim, N., McHaney, R. (2023), Lifelong learning processes in professional development for online teachers during the Covid Era. Frontiers in Education, 8, 1-16.

Rienties, B., Divjak, B., Eichhorn, M., Iniesto, F., Saunders-Smits, G., Svetec, B., Tillmann, A., Zizak, M. (2023), Online professional development across institutions and borders. International Journal of Educational Technology in Higher Education, 20(1), 1-16.

Rovai, A.P. (2000), Online and traditional assessments: What is the difference? Internet and Higher Education, 3(3), 141-151.

Schroeder, T., Dodds, L., Georgiou, A., Gewald, H., Siette, J. (2023), Older adults and new technology: Mapping review of the factors associated with older adults' intention to adopt digital technologies. JMIR Aging, 6, e44564.

Shakuna, K.S., Mohamad, N., Ali, A.B. (2013), Professional development of teachers scale (DDTS): Using confirmatory factor analysis. International Journal of Science and Research, 5(8), 1510-1515.

Sitzmann, T., Weinhardt, J.M. (2018), Training engagement theory: A multilevel perspective on the effectiveness of work-related training. Journal of Management, 44(2), 732-756.

Starkey, L. (2020), A review of research exploring teacher preparation for the digital age. Cambridge Journal of Education, 50(1), 37-56.

Tshukudu, T.T. (2014), Critical organisational success factors used in the evaluation of training development. Journal of Public Administration and Governance, 4(3), 337.

Wallace, J., Scanlon, D., Calderón, A. (2023), Digital technology and teacher digital competency in physical education: A holistic view of teacher and student perspectives. Curriculum Studies in Health and Physical Education, 14(3), 271-287.

Yang, X., Du, J. (2024), The effect of teacher self-efficacy, online pedagogical and content knowledge, and emotion regulation on teacher digital burnout: A mediation model. BMC Psychology, 12(1), 1-13.

Zeehan, F., Alias, R.A., Tasir, Z. (2020), Discovering digital technology training challenges for future-ready educator: A preliminary study from trainer perspective. Universal Journal of Educational Research, 8(3A), 12-21.