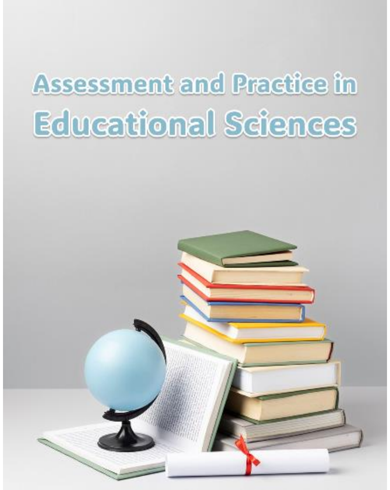
Assessment and Practice in Educational Sciences



Validation of the Technological Training Model for Primary School Teachers Using Structural Equation Modeling

ABSTRACT

This study was conducted with the aim of designing and validating a technological training model for primary school teachers. In today's world, technological transformations have led to fundamental changes in educational structures, highlighting the need to prepare teachers equipped with technology-oriented competencies. Given the lack of comprehensive frameworks in this field, the study focused on identifying 13 key components, including critical and creative thinking, innovative problem solving, ethical responsibility, digital self-awareness, technological knowledge transfer, creation of technology-enhanced learning environments, interaction with technology for social and individual purposes, digital collaboration, mastery of modern tools, technological solution design, application of technology across diverse contexts, awareness of technological change trends, and appropriate technology assessment. The research method was quantitative and descriptive. The statistical population consisted of 850 primary school teachers and educational experts in Kerman Province, and the sample size was determined to be 265 using Cochran's formula. Data were collected through a researcher-developed questionnaire based on a Likert scale. Construct validity was confirmed with RMSEA = 0.063 and CMIN/df = 2.34, and reliability was calculated using Cronbach's alpha (0.74). Data analysis was performed using AMOS software. The results showed that the factor loadings of the components ranged from 0.48 to 0.74, and the t-values were significant ($p < .001$), indicating strong relationships between the components and the main construct of technological training. The model fit indices (CMIN/df = 2.34 and RMSEA = 0.063) confirmed the high validity of the proposed framework. This three-level model, integrating psychological, pedagogical, and technical dimensions, offers a more comprehensive structure than previous studies and can serve as a basis for educational policymaking, improving teaching quality, and preparing teachers for the digital age. It is recommended that this framework be incorporated into Iran's curriculum programs to reduce challenges related to technology integration.

Keywords: Technological training, curriculum programs, primary school teachers

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Article type:
Original Research

Article history:
Received 15 September 2025
Revised 06 December 2025
Accepted 09 December 2025
Initial Publish 06 January 2026
Published online 01 March 2026

How to cite this article:
Shamsi Gooshki, S., Kamyabi, M., Soltani, A., & Manzari Tavakoli, A. (2026). Validation of the Technological Training Model for Primary School Teachers Using Structural Equation Modeling. *Assessment and Practice in Educational Sciences*, *4*(2), 1-13. https://doi.org/10.61838/japes.176

Introduction

The rapid acceleration of technological change in recent decades has transformed not only economic structures but also educational systems, compelling a fundamental rethinking of how teachers are prepared for their instructional and professional roles. The increasing complexity of digital environments, artificial intelligence (AI), data-driven learning systems, and immersive virtual ecosystems has pushed teacher education programs worldwide to integrate technological competencies as core components rather than supplemental skills. Scholars have noted that technology is no longer a neutral tool but an active agent shaping pedagogical practices, cognitive processes, and the sociocultural experiences of learners (1, 2). This shift demands that teachers acquire the capacity to evaluate, adopt, and meaningfully integrate technological solutions into their teaching, while also cultivating the critical, ethical, and reflective skills necessary to manage the challenges posed by emerging digital transformations (3, 4).

Educational researchers increasingly highlight the gap between the fast-paced evolution of digital technologies and the relatively slow adaptation of teacher preparation programs. Several studies emphasize that technology education must evolve beyond instrumental training and instead nurture adaptive expertise, digital literacy, and ethical awareness among teachers (5, 6). These dimensions have become crucial as classrooms shift toward blended, virtual, and AI-enhanced modalities. The emergence of the metaverse, immersive simulations, and advanced interactive environments further underscores the necessity of integrating technological competencies into teacher training pipelines (7). Such developments illustrate that technology does not simply supplement pedagogical processes but reshapes them profoundly by altering how students interact with knowledge, peers, and their environment.

Meanwhile, psychological and sociocultural perspectives on education stress that technological integration affects not only learning outcomes but also identity formation, motivation, social behavior, and collaborative patterns among students (2, 8). Teachers must therefore develop the expertise to navigate a multidimensional technological landscape in which cognitive, emotional, and social variables interact with digital tools in complex ways. Research grounded in educational psychology suggests that teachers who possess stronger technological pedagogical knowledge are better equipped to foster student engagement, agency, and autonomy in digital learning environments (1, 9). Consequently, teacher education models must emphasize the cultivation of digital self-awareness, the ability to create technological learning environments, and the capacity to adapt instruction to the distinct affordances of emerging technologies.

Alongside these developments, global evidence demonstrates that teachers' professional development increasingly depends on continuous exposure to technology-enabled learning opportunities. Studies in low- and middle-income contexts have documented that teacher development programs benefiting from technological tools enhance instructional quality, support reflective practice, and reduce barriers to professional growth (10). Moreover, systematic reviews show that teachers' attitudes, skills, and beliefs regarding technology deeply influence the success of technological adoption in the classroom (9, 11). As such, multimodal and multi-level frameworks of teacher education are required to account for contextual disparities, resource availability, and cultural dynamics that affect the integration of digital innovations in different educational settings.

Researchers have also highlighted the importance of aligning technological training with labor market expectations. Modern economies increasingly demand workers with digital, analytical, and creative problem-solving skills (12, 13). This alignment is especially significant for primary school teachers, who play a foundational role in preparing students for the technological demands of future workplaces. Studies indicate that effective career and technical education—anchored in digital competencies—has positive long-term impacts on students' professional trajectories and academic outcomes (12, 13). Therefore, teacher education must directly address the technological skills that students are expected to develop in the twenty-first century, ensuring that educators themselves are capable of modeling, applying, and teaching these competencies.

Parallel to labor market considerations, philosophical and historical analyses of instructional design emphasize the need for coherent theoretical foundations in the integration of technology into educational systems. Foundational works caution that technological innovations must be contextualized within broader pedagogical aims and human development frameworks to avoid superficial or fragmented implementation (14). This perspective reinforces the idea that technological training for teachers must be multi-dimensional, bridging technical proficiency with pedagogical reasoning, ethical decision-making, and a deep understanding of learners' psychological needs (15, 16).

The emergence of artificial intelligence in education has intensified these concerns. AI-driven educational tools have the potential not only to personalize learning but also to monitor cognitive patterns, automate assessments, and shape instructional decisions (3, 17). However, scholars warn that AI literacy is essential for teachers to critically engage with these tools and avoid ethical risks such as algorithmic bias, reduced teacher autonomy, and over-reliance on automation (3, 18). Teacher education must, therefore, incorporate AI literacy as a central competency, preparing educators to collaborate effectively with intelligent systems while maintaining human-centered pedagogical values.

Although global frameworks for AI-integrated education are emerging, research demonstrates considerable variation in how national systems conceptualize and implement technological training for teachers. Studies conducted in Korea, for example, show that AI education in middle school technology courses requires explicit scaffolding, ongoing teacher support, and organizational readiness (19). Similarly, phenomenographic research in K–12 contexts illustrates that teachers' conceptions of AI significantly shape their instructional practices and their willingness to experiment with digital tools (8). These findings highlight the necessity of context-specific models that address the unique cultural, curricular, and institutional factors influencing teacher readiness for technological integration.

Within the Iranian context, research on technological, scientific, and vocational education underscores considerable gaps between existing teacher preparation programs and the technological competencies required for modern learning environments. Studies show that educators often lack structured opportunities for technology-centered pedagogical development, resulting in inconsistent implementation and limited confidence in digital instructional practices (20-22). Furthermore, philosophical analyses of Iran's formal education system indicate that despite policy emphasis on scientific and technological advancement, practical mechanisms for supporting teacher technological training remain underdeveloped (4, 21). These challenges suggest a clear need for rigorous, empirically validated frameworks that can guide educational policymakers, training institutions, and teacher educators in designing coherent technological training pathways.

Recent studies in the Iranian educational sector also highlight the spiritual, ethical, and cultural dimensions of technological education, emphasizing the need for balanced models that integrate values-based instruction with digital innovation (5, 6). This perspective aligns with broader trends in global educational discourse, which increasingly recognizes the interplay between ethical digital citizenship, responsible technology use, and social-emotional learning (1, 7). Therefore, any comprehensive model of technological teacher training must incorporate not only technical and pedagogical competencies but also ethical reasoning, critical thinking, and awareness of the sociocultural impact of technology.

Additionally, AI-driven research in teacher professionalization emphasizes the role of digital tools in empowering educators through personalized support, adaptive feedback systems, and automated performance monitoring (23, 24). However, these studies also reveal that technological empowerment requires intentional training, robust digital self-efficacy, and a deep understanding of the limitations and potentials of AI systems (17, 18). Teachers who are not adequately trained may experience increased anxiety, reluctance, or misapplication of technological tools, widening the gap between policy objectives and classroom realities.

The literature further underscores the importance of developing students' creativity, teamwork, and problem-solving skills through AI-supported projects, which strengthens the argument that teachers must first be equipped with advanced technological pedagogies (25). Research in educational social psychology confirms that teachers' beliefs, attitudes, and motivational orientations significantly influence their adoption of technology-based practices, reinforcing the need for comprehensive models that address both cognitive and affective components of technological training (2). Moreover, technological challenges in teacher education programs reveal the necessity of designing more resilient, adaptive, and evidence-based professional training systems (26).

Given these global and national trends, the development of validated models for technological training becomes essential for building instructional capacity, enhancing learning outcomes, and aligning education with the realities of the digital era. However, existing studies point to the absence of integrated, empirically tested frameworks that combine psychological, pedagogical, and technical competencies necessary for preparing teachers for the demands of contemporary education (15, 27, 28). This gap justifies the need for rigorous model development and validation grounded in the contextual needs of Iranian primary educators.

Therefore, the aim of this study is to design and validate a comprehensive structural model of technological training for primary school teachers.

Methods and Materials

The present study employed a quantitative descriptive research design with a structural modeling approach, aiming to examine and validate the structural model of technological training for primary school teachers. The components of the main construct were identified through an extensive review of theoretical and empirical studies in the field of educational technology and teacher professional development. The statistical population consisted of primary school teachers and educational experts who were actively involved in technology-enhanced education and technological training initiatives. These individuals were selected from elementary schools and educational administration offices across various districts of Kerman Province. Based on preliminary estimations, the accessible population comprised 850 eligible participants. To determine an appropriate sample size for structural equation modeling, Cochran's formula was applied, resulting in a required sample of 265 participants. This sample was considered adequate for estimating path coefficients, evaluating factor loadings, and ensuring sufficient statistical power for model testing.

Data were gathered using a researcher-developed questionnaire designed to assess the level and quality of the identified components of technological training. The instrument was constructed based on a five-point Likert scale ranging from "very low" to "very high," allowing for a nuanced measurement of participants' perceptions and competencies across the thirteen dimensions of the model. To evaluate the construct validity of the questionnaire, structural equation modeling was employed. The Root Mean Square Error of Approximation (RMSEA) was calculated at 0.063, and the chi-square to degrees-of-freedom ratio (CMIN/df) was 2.34. Both indices fall within acceptable thresholds, indicating that the measurement model holds adequate construct validity. Reliability was assessed using Cronbach's alpha, which yielded a coefficient of 0.74. This value reflects a satisfactory level of internal consistency among questionnaire items and supports the stability of the instrument for use in further analyses.

Data analysis was conducted using structural equation modeling to test the hypothesized relationships between the components of technological training and the overarching construct. This analytical approach enabled the estimation of factor loadings, evaluation of model fit indices, and verification of the structural coherence of the proposed three-level model. AMOS software served as the primary analytical tool due to its advanced capabilities in confirmatory factor analysis and structural path modeling. Through this approach, the study was able to assess the strength and significance of the relationships within the model and determine the adequacy of the final validated framework for technological training among primary school teachers.

Findings and Results

Table 1 presents the descriptive statistics for the 13 components of technological training.

Table 1. Descriptive Statistics of Study Components

Component	Mean	Standard Deviation	Minimum	Maximum
Critical and Creative Thinking	3.87	0.62	2.40	4.90
Innovative Problem Solving	3.94	0.58	2.60	4.95
Ethical Responsibility in Technology Use	4.01	0.55	2.70	4.90
Digital Self-Awareness	3.89	0.61	2.50	4.85
Technological Knowledge Transfer	3.76	0.67	2.20	4.80
Technological Learning Environments	3.55	0.71	2.10	4.75
Interaction with Technology for Social and Personal Goals	4.08	0.53	2.90	4.95
Digital Collaboration Skills	3.92	0.59	2.55	4.88
Mastery of Modern Tools	3.84	0.66	2.30	4.90
Technological Solution Design	3.79	0.68	2.25	4.85
Technology Application in Various Contexts	3.88	0.63	2.40	4.92
Awareness of Technology Trends	3.60	0.70	2.00	4.70
Technology Evaluation and Selection	3.90	0.57	2.60	4.85

All mean values exceed 3.50, indicating consistently high levels of the competencies among the sample of 265 teachers and educational experts. The highest mean score is observed for interaction with technology for social and personal goals (M = 4.08, SD = 0.53), reflecting participants' strong inclination toward purposeful and meaningful technology engagement. In contrast, the lowest mean is associated with technological learning environments (M = 3.55, SD = 0.71), suggesting that teachers feel comparatively less confident in creating technology-rich instructional settings. Standard deviations range from 0.53 to 0.71, indicating moderate variability in responses. Minimum and maximum observed values also demonstrate that respondents covered the full range of the Likert scale, confirming the sensitivity of the measurement instrument and the diversity of technological skills within the sample.

Table 2. Correlation Matrix Among Study Components

Component	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Critical & Creative Thinking	1												
2. Innovative Problem Solving	.62	1											
3. Ethical Responsibility	.58	.55	1										
4. Digital Self-Awareness	.54	.50	.57	1									
5. Knowledge Transfer	.48	.52	.49	.45	1								
6. Learning Environments	.41	.44	.43	.39	.47	1							
7. Social–Personal Tech Interaction	.66	.63	.59	.57	.52	.46	1						
8. Digital Collaboration	.55	.58	.52	.51	.49	.45	.61	1					
9. Mastery of Modern Tools	.53	.56	.48	.52	.58	.47	.60	.57	1				
10. Tech Solution Design	.57	.59	.54	.50	.56	.49	.63	.58	.62	1			
11. Tech Application	.59	.61	.57	.53	.49	.45	.64	.59	.58	.63	1		
12. Awareness of Tech Trends	.42	.45	.40	.41	.43	.46	.48	.44	.46	.45	.47	1	
13. Tech Evaluation	.56	.58	.55	.54	.51	.46	.62	.58	.57	.61	.59	.48	1

Table 2 displays the correlation coefficients among the 13 components of technological training. All correlations are positive and statistically meaningful, ranging from .39 to .66, suggesting cohesive relationships among the constructs. The strongest correlation emerges between critical & creative thinking and interaction with technology (.66), indicating that teachers who perceive themselves as strong critical thinkers also tend to engage actively with technology for social and personal aims. Similarly, innovative problem solving shows high correlations with mastery of modern tools (.56) and technology solution design (.59), highlighting the interconnected nature of problem-solving ability and practical implementation skills. The weakest correlation appears between awareness of technology trends and digital self-awareness (.41), demonstrating that being aware of emerging technologies does not necessarily translate directly into personal digital confidence. Overall, the correlation matrix provides robust preliminary evidence supporting the internal consistency and interrelatedness of the components measured in the model.

Table 3. Reliability and Construct Validity Indices

Measure	Value	Interpretation
Cronbach's Alpha	0.74	Acceptable Internal Consistency
Composite Reliability (CR)	0.78	Satisfactory Reliability
Average Variance Extracted (AVE)	0.51	Acceptable Convergent Validity
RMSEA	0.063	Acceptable Fit
CMIN/df	2.34	Acceptable Fit

Table 3 demonstrates that the measurement instrument used in this study exhibits acceptable reliability and strong construct validity. The Cronbach's alpha coefficient of 0.74 indicates that the internal consistency among the 13 components is satisfactory for research purposes. Composite Reliability (CR = 0.78) further supports the adequacy of reliability levels across the construct. The Average Variance Extracted (AVE = 0.51) surpasses the commonly recommended threshold of 0.50, providing evidence of convergent validity, meaning that the items successfully capture the variance of the intended latent construct. Additionally, the structural equation modeling fit indices, including RMSEA = 0.063 and CMIN/df = 2.34, fall well within acceptable limits, confirming that the measurement model is statistically sound and theoretically coherent. These findings collectively validate the suitability of the instrument for modeling technological training among primary educators.

Table 4. Factor Loadings for Study Variables

Component	Main Variable	Factor Loading	T-VALUE	P-VALUE
Critical and Creative Thinking	Technological Training	0.57	8.48	0.00
Innovative Problem Solving	Technological Training	0.63	9.18	0.00
Ethical Responsibility	Technological Training	0.57	8.47	0.00
Digital Self-Awareness	Technological Training	0.58	8.49	0.00
Technological Knowledge Transfer	Technological Training	0.68	6.58	0.00
Technological Learning Environments	Technological Training	0.48	4.12	0.00
Technology Use for Social and Personal Goals	Technological Training	0.74	12.84	0.00
Digital Collaboration Skills	Technological Training	0.58	8.49	0.00
Mastery of Modern Tools	Technological Training	0.68	6.59	0.00
Technological Solution Design	Technological Training	0.67	6.54	0.00
Technology Application in Various Contexts	Technological Training	0.57	8.48	0.00
Awareness of Technology Trends	Technological Training	0.48	4.11	0.00
Technology Evaluation and Selection	Technological Training	0.58	8.48	0.00

Table 4 presents the factor loadings derived from confirmatory factor analysis. All loadings fall within the accepted range of 0.48 to 0.74, demonstrating adequate representation of the latent construct. The strongest loading belongs to technology use for social and personal goals (0.74), indicating that this component is the most influential indicator of technological training in the model. Factor loadings for technological learning environments and awareness of technology trends (both 0.48) are the lowest, though still statistically significant at $p < .001$, suggesting that while these variables contribute to the construct, their influence is comparatively weaker. The T-values range from 4.11 to 12.84, all exceeding the critical threshold, confirming the statistical significance and the robustness of the measurement model. These loading patterns validate the theoretical assumption that technological training is multidimensional and deeply interconnected across cognitive, ethical, and skill-based domains.

Table 5. Model Fit Indices

Fit Index	Obtained Value	Status
CMIN/df	2.34	Acceptable
RMSEA	0.063	Acceptable

Table 5 summarizes the fit indices for the final structural model. The CMIN/df ratio of 2.34 is well below the cutoff value of 3, indicating a good balance between model complexity and observed data. The RMSEA value of 0.063 falls within the acceptable range (≤ 0.08), confirming that the model exhibits a close fit to the population covariance structure. Together, these indices affirm the overall adequacy and soundness of the proposed technological training model, supporting its empirical validity and potential applicability in real educational settings.

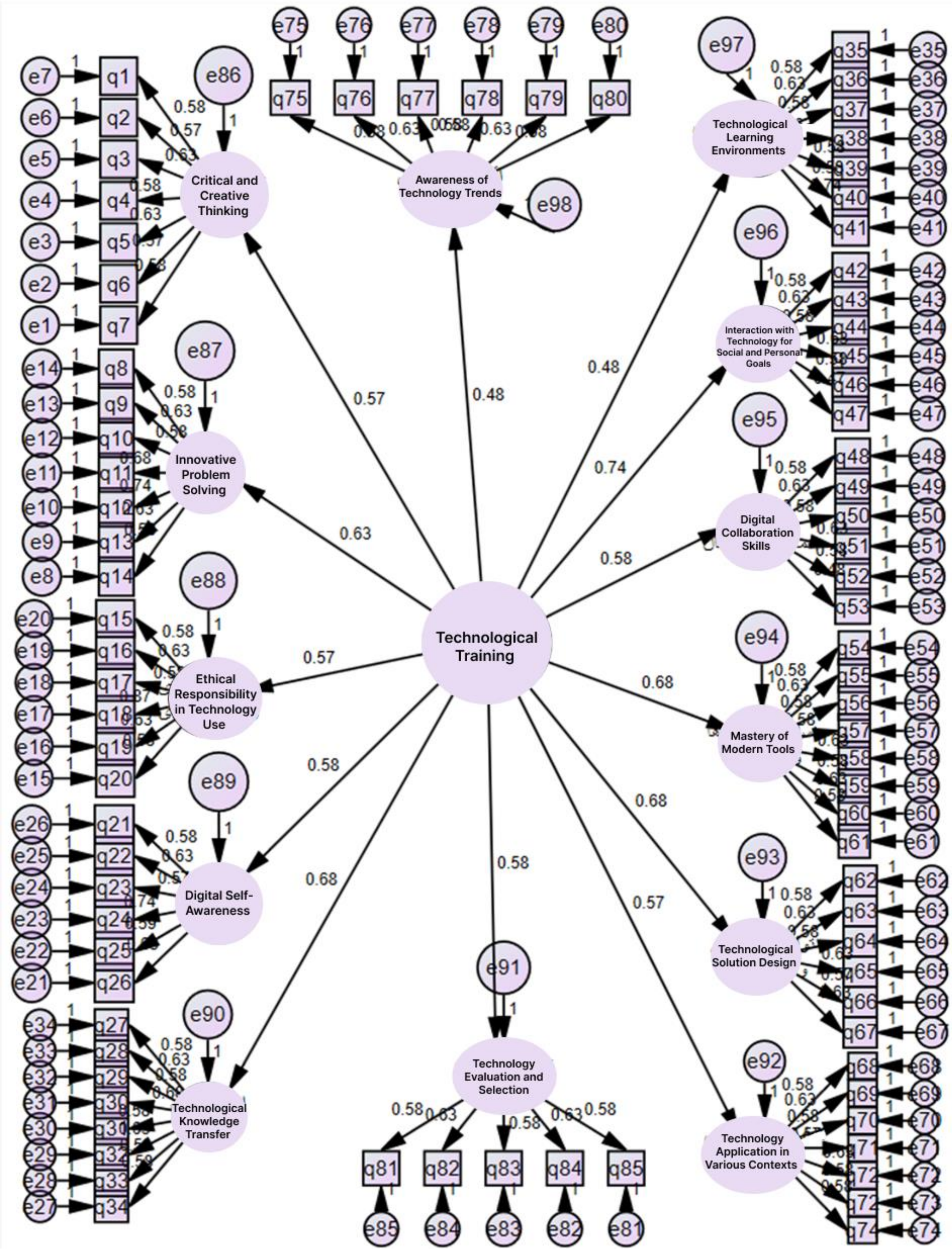

Figure 1. Final Model of the Study

Discussion and Conclusion

The purpose of this study was to design and validate a structural model for technological training among primary school teachers, integrating psychological, pedagogical, and technical competencies. The findings indicated that all 13 identified components significantly contributed to the latent construct of technological training, with factor loadings ranging from 0.48 to 0.74 and model fit indices within acceptable ranges. These outcomes demonstrate that technological training is a multidimensional construct requiring simultaneous development of cognitive, ethical, and technological skills. The results strongly support the hypothesis that teachers' technological preparedness is not limited to operational skills but rather extends to higher-order competencies such as critical thinking, digital self-awareness, innovative problem solving, and ethical responsibility. This interpretation aligns with contemporary literature emphasizing that technology integration in education must be grounded in a holistic understanding of pedagogy, digital culture, and human development (1, 2).

A key finding of this study was the central role of purposeful interaction with technology, which exhibited the highest factor loading in the structural model. This suggests that teachers who actively engage with technology for personal and social goals are more capable of leveraging its pedagogical potential. Previous research supports this interpretation by demonstrating that teachers' intrinsic motivation and active involvement with digital tools predict their classroom technology use, digital creativity, and integration depth (9, 11). Furthermore, the strong loading associated with innovative problem solving reflects the increasing need for teachers to develop adaptive expertise in navigating digital environments, a theme echoed in international studies emphasizing creative decision-making and flexible pedagogical strategies as essential digital-era competencies (3, 5).

Another important result was the significance of ethical responsibility, which emerged as a stable and meaningful component of the technological training model. The high t-values associated with this component suggest that teachers increasingly recognize ethical and moral considerations as integral to technology use, especially in a world shaped by artificial intelligence, algorithmic decision-making, and digital surveillance. This finding resonates with the growing emphasis on digital ethics in teacher education, as highlighted by scholars who argue that ethical literacy is necessary to address online safety, data privacy, misinformation, and the moral complexities of AI integration in schools (1, 3). Similarly, contemporary Iranian studies emphasize that technological education must integrate culturally grounded values and ethical awareness to support holistic human development (6, 22). The convergence of these perspectives reinforces the validity of including ethical responsibility as a core dimension within the technological training model.

Digital self-awareness also demonstrated strong statistical significance, suggesting that teachers who possess a clearer understanding of their digital identity, competencies, and limitations are better prepared to engage effectively with technology in pedagogical contexts. This aligns with findings from international research showing that self-efficacy and reflective digital awareness are among the strongest predictors of classroom technology integration and teacher willingness to experiment with new tools (10, 17). Phenomenographic studies further confirm that teachers' beliefs about their digital capabilities influence how they conceptualize technology's role in education, thereby shaping their pedagogical decisions and openness to innovation (8). The agreement between our findings and previous work reinforces the importance of cultivating digital metacognition among teachers.

Interestingly, the components related to the creation of technological learning environments and awareness of technological change trends showed lower factor loadings compared with other components, though both remained statistically significant. This may indicate that teachers feel less confident in designing complex technology-enhanced instructional settings or in keeping up with rapidly evolving technological advances. Such limitations have been widely documented. Studies show that teachers frequently struggle with the pedagogical orchestration of digital resources, especially in contexts where infrastructure, training, and support systems are inconsistent or insufficient (10, 26). Additionally, research on the metaverse, AI, and advanced digital platforms reveals that the fast pace of technological change often outstrips the capacity of educational institutions to provide timely, relevant professional development (7, 19). Therefore, although teachers value technology and recognize its potential benefits, they may lack the systemic support necessary to translate awareness into practice.

Moreover, the significant contribution of technological knowledge transfer and digital collaboration skills highlights the social dimension of technological training. Teaching is inherently collaborative, and technology-mediated collaboration has become an essential part of modern pedagogy. This finding is consistent with research demonstrating that collaborative learning platforms, networked professional communities, and shared digital workspaces enhance teacher engagement, reflective practice, and innovation (28, 29). Further, the literature on AI-supported professional development suggests that collaborative digital environments enable teachers to exchange ideas, analyze data, and co-design learning experiences more effectively (18, 23). The alignment between these results and prior studies suggests that teacher training programs must incorporate structured opportunities for collaborative technology use.

The validated model also supports the notion that technological training is positioned at the intersection of pedagogical design and workforce preparation. Components such as mastery of modern tools, technological solution design, and application of technology across contexts reflect demands for teachers to prepare learners for digitalized career landscapes. Studies on career and technical education confirm that digital competency and technological adaptability have become prerequisites for success in contemporary labor markets (12, 13). Moreover, data analytics, automation, and AI-driven systems increasingly shape workforce expectations, bridging the gap between technological education and employability (27). Therefore, the model validated in this study has direct implications not only for pedagogical effectiveness but also for broader socio-economic alignment.

The results further reinforce theoretical perspectives that emphasize the need for coherent, historically grounded approaches to technological training. Instructional design theorists argue that technology integration should be situated within long-standing philosophical, epistemological, and methodological traditions rather than treated as a transient trend (14). Similarly, emerging scholarship on technological pedagogy suggests that digital training programs must balance innovation with reflective practice and contextual adaptability (4, 15). The convergence of past and present theoretical insights underscores the necessity of building technology training frameworks that are conceptually robust, culturally sensitive, and empirically validated.

Taken together, the findings demonstrate that the proposed multidimensional model effectively captures the complexity of technological training for teachers. It integrates cognitive, ethical, technical, and social dimensions into a coherent framework supported by empirical evidence and aligned with contemporary literature. The consistency between this study’s results and previous research across global and local contexts strengthens the generalizability and relevance of the model. By offering a rigorously validated structure, the study contributes to a deeper understanding of how teachers can be prepared for the challenges and opportunities of digital-era education and provides a foundation for designing future curriculum reforms, professional training initiatives, and policy interventions.

This study relied on self-reported data, which may introduce bias related to personal perceptions and social desirability. The sample was limited to primary school teachers and educational experts in one province, restricting generalizability to other educational levels or regions. Additionally, the cross-sectional design prevented examination of changes in technological competencies over time.

Future studies should employ longitudinal designs to assess how technological competencies develop across teachers' careers. Expanding the sample to include national or international populations would enhance generalizability. Furthermore, qualitative studies could provide deeper insights into teachers' lived experiences with technology integration and their evolving conceptualizations of digital pedagogy.

Teacher education programs should integrate structured technological training aligned with the validated model, ensuring that cognitive, ethical, and practical dimensions are addressed. Professional development initiatives should incorporate interactive, collaborative, and AI-supported learning environments. Educational policymakers should prioritize infrastructure, support systems, and curriculum reforms that enable sustainable and meaningful integration of technology into teaching practice.

Acknowledgments

We would like to express our appreciation and gratitude to all those who helped us carrying out this study.

Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

All ethical principles were adhered in conducting and writing this article.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

Funding

This research was carried out independently with personal funding and without the financial support of any governmental or private institution or organization.

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