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Validation of the Curriculum Model for Research-Oriented Teacher Education at Farhangian University

ABSTRACT

The objective of this study was to validate the curriculum model for research-oriented teacher education at Farhangian University by examining its content validity and evaluating the adequacy of its core domains, including knowledge, attitude, skills, and institutional facilities, based on expert judgments and inferential statistical analysis. This study employed a quantitative survey design for the purpose of validating the proposed curriculum model developed during the qualitative phase of the research. The study population consisted of experts in curriculum planning, primary education, and experienced sixth-grade teachers, from whom twelve individuals were selected using purposive sampling based on their academic qualifications and professional experience. Data were collected using a researcher-developed questionnaire consisting of eleven items derived from the components of the proposed curriculum model, covering the domains of knowledge, attitude, skills, and institutional facilities. The questionnaire was designed using a Likert-type response format and its face and content validity were confirmed by subject matter experts. The reliability of the instrument was assessed using Cronbach's alpha coefficient, which yielded a value of 0.92, indicating high internal consistency. Data analysis was conducted using the content validity ratio (CVR) method based on Lawshe's formula, as well as inferential statistical tests including the one-sample t-test and Pearson correlation coefficient, using statistical software. The results of the content validity analysis showed that all components of the proposed curriculum model achieved CVR values above the minimum acceptable threshold, confirming their validity. The one-sample t-test results indicated that the mean scores for the knowledge ($M = 3.42$, $t = 3.65$, $p < 0.001$), attitude ($M = 3.63$, $t = 6.89$, $p < 0.001$), and skill ($M = 3.25$, $t = 6.17$, $p < 0.001$) domains were significantly higher than the hypothetical criterion mean, indicating strong validation and acceptance of these domains. In contrast, the facilities domain showed a significantly lower mean score ($M = 1.09$, $t = -34.51$, $p < 0.001$), indicating insufficient institutional support relative to the expected standard. The findings confirm the overall validity and structural adequacy of the proposed curriculum model for research-oriented teacher education, particularly in terms of its knowledge, attitudinal, and skill components, while highlighting the need to strengthen institutional facilities and infrastructure to support effective implementation of the model at Farhangian University.

Keywords: Teacher education, research-oriented teacher, curriculum validation, curriculum model, Farhangian University, action research, teacher professional development

Introduction

Teacher education systems worldwide are undergoing profound transformation in response to the increasing complexity of educational environments, rapid technological advancement, and the growing demand for adaptive, reflective, and research-oriented teachers capable of responding effectively to emerging educational challenges. Contemporary educational paradigms emphasize that teachers must move beyond the traditional role of knowledge transmitters and instead function as reflective practitioners, critical thinkers, and educational researchers who actively investigate their own teaching practices to improve student learning outcomes and educational quality (1, 2). This shift reflects the broader transition from teacher-centered instructional models to learner-centered and inquiry-based approaches, in which teachers play a central role in generating knowledge, evaluating instructional effectiveness, and contributing to continuous educational improvement. In this context, the concept of the teacher as a researcher has gained increasing prominence, as it aligns with contemporary demands for professional autonomy, pedagogical innovation, and evidence-based practice in education systems globally (3, 4).

The emergence of research-oriented teacher education is rooted in constructivist and pragmatic educational philosophies, which emphasize active knowledge construction, reflective inquiry, and continuous professional development. Pragmatism, in particular, views knowledge as dynamic and evolving, and positions inquiry and experience as central mechanisms for learning and professional growth (5, 6). Within this philosophical framework, teachers are expected to engage in systematic investigation of their instructional practices, analyze classroom phenomena, and develop contextually appropriate solutions to educational challenges. This perspective aligns closely with action research traditions, which conceptualize teachers as active agents of change who generate practical knowledge through systematic inquiry and reflection (7, 8). Action research provides a structured process through which teachers can identify problems, implement interventions, evaluate outcomes, and refine their practices based on empirical evidence and critical reflection.

Action research has been widely recognized as a powerful mechanism for enhancing teacher professional development, improving instructional quality, and fostering reflective practice. It enables teachers to bridge the gap between theory and practice by applying research principles directly within classroom contexts, thereby enhancing pedagogical effectiveness and student learning outcomes (9, 10). Furthermore, action research promotes professional autonomy, critical thinking, and lifelong learning among teachers, which are essential competencies in contemporary educational environments characterized by uncertainty and rapid change (11, 12). By engaging in systematic inquiry, teachers develop a deeper understanding of teaching and learning processes, enabling them to design more effective instructional strategies and respond adaptively to diverse learner needs.

The development of research-oriented teachers is closely linked to curriculum design in teacher education programs, as curriculum structures play a fundamental role in shaping teachers' knowledge, attitudes, skills, and professional identity. Curriculum theory emphasizes that effective teacher education curricula must integrate theoretical knowledge, practical experience, reflective practice, and research competence in a coherent and systematic manner (13, 14). Such curricula must provide opportunities for pre-service teachers to develop research skills, engage in inquiry-based learning, and critically analyze educational practices. Reflective practice, critical friendship, and collaborative inquiry are particularly important components of teacher education curricula, as they foster professional dialogue, self-evaluation, and continuous improvement (15, 16).

Within the Iranian educational system, Farhangian University has been established as the primary institution responsible for preparing qualified teachers to meet the needs of the national education system. The mission of Farhangian University emphasizes the development of competent, reflective, and research-oriented teachers capable of contributing to educational innovation and improvement (17). This institutional mission reflects national educational priorities that emphasize teacher

professionalism, evidence-based teaching, and continuous professional development. However, achieving these goals requires carefully designed curricula that explicitly incorporate research training, reflective practice, and inquiry-based learning. Curriculum models designed for teacher education must therefore address not only content knowledge and pedagogical skills but also research competence, critical thinking, and professional reflection (18, 19).

Despite the recognized importance of research-oriented teacher education, several challenges have been identified in the implementation of teacher researcher programs. Studies have shown that teachers often face barriers such as lack of institutional support, insufficient research training, limited access to resources, and inadequate integration of research components into teacher education curricula (20, 21). These barriers may hinder teachers' ability to engage effectively in research activities and limit the impact of teacher researcher programs on educational practice. Furthermore, gaps between theoretical training and practical application may reduce the effectiveness of teacher education programs in developing research-oriented competencies (22). Addressing these challenges requires systematic curriculum design and validation to ensure that teacher education programs effectively develop research competence and reflective practice among pre-service teachers.

The concept of the teacher researcher has been increasingly explored in educational research, highlighting its significance in improving instructional quality and fostering professional development. Research-oriented teachers are characterized by their ability to critically analyze educational practices, conduct systematic inquiry, and apply research findings to improve teaching and learning processes (23, 24). Such teachers contribute to the development of professional knowledge and enhance educational effectiveness by integrating research and practice. The teacher researcher approach also promotes professional empowerment, as teachers become active contributors to educational knowledge rather than passive consumers of externally generated theories (7, 10).

The development and validation of curriculum models for research-oriented teacher education require rigorous methodological approaches to ensure their theoretical soundness, practical relevance, and empirical validity. Curriculum validation involves systematic evaluation of curriculum components, including objectives, content, teaching methods, assessment strategies, and institutional support structures, to ensure alignment with educational goals and professional standards (25, 26). Validation processes typically involve expert evaluation, empirical testing, and statistical analysis to confirm the appropriateness and effectiveness of curriculum models. Such validation is essential to ensure that curriculum models effectively prepare teachers to meet contemporary educational demands.

Furthermore, contemporary developments in educational technology and artificial intelligence have introduced new opportunities and challenges for teacher education. Emerging technologies have transformed teaching and learning processes, requiring teachers to develop new competencies related to digital literacy, data analysis, and technology integration (3). Teacher education curricula must therefore incorporate these competencies to prepare teachers for technologically advanced educational environments. In addition, performance appraisal systems and institutional evaluation mechanisms play a critical role in ensuring the quality and effectiveness of teacher education programs (19). These systems provide feedback that supports curriculum improvement and professional development.

The integration of research competence into teacher education curricula also contributes to the development of future skills, including critical thinking, problem-solving, innovation, and adaptability. These competencies are essential for teachers working in complex and rapidly changing educational environments (2). Research-oriented teacher education enables teachers to continuously evaluate their practices, respond to emerging challenges, and contribute to educational innovation. Moreover, research competence enhances teachers' professional identity and supports their ongoing professional growth (8).

Educational psychology and learning theory further emphasize the importance of active engagement, inquiry-based learning, and reflective practice in teacher education. Effective learning environments support active participation, critical thinking, and

collaborative learning, which are essential for developing research competence and professional expertise (27, 28). Constructivist learning environments, in particular, promote inquiry, reflection, and knowledge construction, which align closely with the objectives of research-oriented teacher education (14). Such environments enable teachers to develop the cognitive, affective, and practical competencies required for effective professional practice.

Qualitative and mixed-methods research approaches have been widely used in curriculum development and validation studies to identify curriculum components and evaluate their effectiveness (29). These approaches enable researchers to explore complex educational phenomena, identify curriculum needs, and develop contextually appropriate curriculum models. Furthermore, curriculum design must consider ethical principles, professional standards, and institutional contexts to ensure its effectiveness and sustainability (30, 31). Ethical and professional considerations are essential for ensuring the credibility and legitimacy of curriculum models.

Given the importance of research-oriented teacher education and the central role of curriculum design in developing research competence, it is essential to develop and validate curriculum models that effectively prepare teachers to function as researchers within educational contexts. Although previous studies have explored teacher researcher programs and curriculum design, there remains a need for empirically validated curriculum models specifically designed for research-oriented teacher education at Farhangian University. Such models must be grounded in theoretical principles, aligned with institutional goals, and validated through rigorous empirical methods to ensure their effectiveness and applicability.

Therefore, the aim of this study is to validate the curriculum model for research-oriented teacher education at Farhangian University.

Methods and Materials

This study employed a quantitative survey design to validate the proposed curriculum model for research-oriented teacher education developed at Farhangian University. The quantitative phase was conducted following the completion of the qualitative stage, during which the conceptual components and structural dimensions of the proposed curriculum model were identified and theoretically elaborated. The purpose of the quantitative phase was to empirically examine the validity and acceptability of the model by soliciting expert judgment and assessing the extent to which the model components were considered appropriate, relevant, and applicable within the institutional and pedagogical context of teacher education. The survey method was selected because it enables systematic collection of expert evaluations and provides a structured basis for statistical validation of theoretical models, particularly in curriculum design research.

The study population consisted of national experts in curriculum planning, primary education, and teacher education, as well as experienced and specialized sixth-grade primary school teachers who possessed substantial professional experience and familiarity with curriculum implementation and pedagogical research practices. These participants were selected because they represent key stakeholders with both theoretical expertise and practical experience in curriculum development and teacher education. A purposive sampling strategy was employed to ensure that participants possessed the necessary academic qualifications, professional expertise, and familiarity with curriculum design and teacher education systems. The final sample included twelve experts who met the inclusion criteria, which consisted of holding advanced academic degrees in curriculum planning or education, possessing significant teaching or research experience, and demonstrating familiarity with teacher training curricula and research-oriented pedagogical practices.

The selection of twelve expert participants was consistent with methodological recommendations for expert validation studies, particularly those involving content validity assessment using Lawshe's content validity ratio method. Expert-based validation is widely recognized as an appropriate approach for evaluating conceptual and structural models in educational

research, especially when the objective is to assess theoretical adequacy, structural coherence, and practical feasibility. The participants were informed of the study objectives and procedures, and their voluntary participation ensured that the data collected reflected informed and professional judgments regarding the proposed curriculum model.

Data were collected using a researcher-developed questionnaire designed specifically for validating the proposed curriculum model for research-oriented teacher education. The questionnaire was constructed based on the findings of the qualitative phase of the study, during which the key components, dimensions, and structural elements of the curriculum model were identified and organized. The development of the questionnaire involved translating qualitative findings into measurable indicators and constructing items that reflected the essential characteristics and structural integrity of the proposed model.

The questionnaire consisted of eleven items designed to evaluate the validity, relevance, and appropriateness of the curriculum model components. These items were organized to reflect the key domains of the curriculum model, including knowledge, attitudes, skills, and institutional facilities within Farhangian University. These domains represent the core elements required for preparing research-oriented teachers, encompassing cognitive competence, professional dispositions, research skills, and institutional support structures. Each item was designed to assess expert agreement regarding the necessity and appropriateness of specific curriculum elements and structural relationships within the proposed model.

The questionnaire employed a three-point Likert-type scale consisting of “high,” “moderate,” and “low” response options, enabling participants to express their level of agreement regarding each model component. The use of a three-point scale was consistent with content validation methodologies, particularly those involving expert evaluation of conceptual models. In addition to this scale, certain aspects of the questionnaire were also designed based on Likert-type response formats to capture nuanced expert judgments regarding curriculum components across the identified domains.

The face validity and content validity of the questionnaire were established through expert review by specialists in curriculum planning and teacher education. These experts evaluated the clarity, relevance, and representativeness of the questionnaire items and confirmed that the items adequately reflected the conceptual dimensions of the proposed curriculum model. Content validity was further examined using the content validity ratio method, which provides a quantitative measure of expert agreement regarding the essentiality of each item. This method ensures that the questionnaire items accurately represent the construct being measured and that the model components are theoretically and practically justified.

The reliability of the questionnaire was assessed using Cronbach’s alpha coefficient, which measures the internal consistency of the instrument. The calculated Cronbach’s alpha value was 0.92, indicating a high level of internal consistency and reliability. This result demonstrates that the questionnaire items were highly coherent and consistently measured the intended constructs related to the validation of the curriculum model. The high reliability coefficient confirms that the instrument was suitable for use in validating the proposed research-oriented teacher education curriculum model.

The collected data were analyzed using both descriptive and inferential statistical methods to evaluate the validity and structural adequacy of the proposed curriculum model. Initially, descriptive statistics were used to summarize the expert responses and examine the overall patterns of agreement regarding the model components. These descriptive analyses provided insight into the degree of expert support for the proposed curriculum model and its underlying components.

To assess the content validity of the model, the content validity ratio was calculated based on Lawshe’s method. This method quantifies expert agreement regarding whether each item is essential for inclusion in the model. The calculated content validity ratio values were compared with the critical values specified in Lawshe’s table based on the number of expert participants. Items that met or exceeded the minimum acceptable content validity ratio threshold were considered valid and essential components of the curriculum model. This process ensured that the final validated model was grounded in expert consensus and met established methodological standards for content validity.

Inferential statistical analyses were conducted to further examine the empirical validity of the model. A one-sample t-test was used to determine whether the mean ratings of model components differed significantly from the theoretical midpoint of the response scale. This test enabled evaluation of whether expert agreement regarding the curriculum model components was statistically significant, thereby providing empirical support for the model's validity. The use of the one-sample t-test allowed for objective assessment of whether the model components were considered acceptable and appropriate by the expert participants.

In addition, Pearson correlation analysis was conducted to examine the relationships among the different domains of the curriculum model, including knowledge, attitudes, skills, and institutional facilities. This analysis provided insight into the structural coherence and internal consistency of the model by assessing the strength and direction of relationships among its key components. Strong and statistically significant correlations among these domains would indicate that the model represents an integrated and theoretically coherent structure for research-oriented teacher education.

All statistical analyses were conducted using appropriate statistical software, and the results were interpreted based on established statistical significance levels. The combination of content validity analysis, reliability assessment, descriptive statistics, and inferential statistical testing provided a comprehensive evaluation of the proposed curriculum model and ensured its empirical validity, structural integrity, and applicability within the context of teacher education at Farhangian University.

Findings and Results

The results of the content validation of the proposed curriculum model for research-oriented teacher education, based on expert evaluations and the content validity ratio (CVR), are presented in Table 1.

Table 1. Results of Validation of the Proposed Curriculum Model

Element / Item	High Frequency (%)	Moderate Frequency (%)	Low Frequency (%)	CVR
Logic	11 (92%)	1 (8%)	0 (0%)	0.83
Objectives	11 (92%)	1 (8%)	0 (0%)	0.83
Content	10 (83%)	2 (17%)	0 (0%)	0.67
Teaching–Learning Strategies	10 (83%)	2 (17%)	0 (0%)	0.67
Teacher's Role	10 (83%)	2 (17%)	0 (0%)	0.67
Materials and Resources	11 (92%)	1 (8%)	0 (0%)	0.83
Grouping	11 (92%)	1 (8%)	0 (0%)	0.83
Place	10 (83%)	2 (17%)	0 (0%)	0.67
Time	10 (83%)	2 (17%)	0 (0%)	0.67
Evaluation Methods	11 (92%)	1 (8%)	0 (0%)	0.83
Overall Agreement with the Proposed Model	11 (92%)	1 (8%)	0 (0%)	0.83

The results presented in Table 1 indicate a high level of expert agreement regarding the validity and appropriateness of the proposed curriculum model for research-oriented teacher education. Specifically, the majority of experts rated most of the model components at a high level, reflecting strong support for the structural and conceptual adequacy of the model. The elements of logic, objectives, materials and resources, grouping, evaluation methods, and overall agreement with the proposed model each received high ratings from 11 out of 12 experts, representing 92 percent of participants. Only one expert rated these elements at a moderate level, and none of the experts rated them at a low level. The content validity ratio for these components was calculated as 0.83, which exceeds the minimum acceptable threshold based on Lawshe's table for a panel of twelve experts, thereby confirming their strong content validity.

Similarly, the elements of content, teaching–learning strategies, teacher's role, place, and time also received strong support from the expert panel. In each of these components, 10 experts, representing 83 percent of the participants, rated the elements at a high level, while the remaining two experts, representing 17 percent, rated them at a moderate level. None of the experts

rated these components at a low level. The content validity ratio for these elements was calculated as 0.67, which also exceeds the minimum acceptable threshold for content validity. These findings demonstrate that although slightly fewer experts rated these components at the highest level compared to other elements, the level of agreement remained sufficiently strong to confirm their validity and relevance within the proposed curriculum model.

Overall, the findings demonstrate a consistently high level of expert consensus regarding the structural integrity, conceptual coherence, and practical applicability of the proposed curriculum model. The absence of low-level ratings across all components indicates that none of the model elements were considered inappropriate or invalid by the expert panel. Furthermore, the content validity ratio values for all components exceeded the critical threshold, confirming that each element represents an essential and valid component of the curriculum model. The high level of overall agreement among experts further supports the conclusion that the proposed curriculum model is valid and appropriate for preparing research-oriented teachers within the institutional context of Farhangian University.

The results of the one-sample t-test comparing the mean scores of the curriculum model domains with the predetermined hypothetical criterion are presented in Table 2.

Table 2. One-Sample t-Test Results Comparing Curriculum Model Domains with the Hypothetical Criterion

Domain	Mean	Standard Deviation	Hypothetical Average	Desired Mean	Degrees of Freedom	t Value	Significance Level
Knowledge	3.42	0.89	2.80	3.00	9	3.65	0.001
Attitude	3.63	0.71	2.80	3.00	9	6.89	0.001
Skill	3.25	0.69	2.80	3.00	9	6.17	0.001
Facilities	1.09	0.69	2.80	3.00	9	-34.51	0.001

The results presented in Table 2 indicate that the mean scores of the knowledge, attitude, and skill domains were significantly higher than the hypothetical criterion mean, demonstrating strong expert agreement regarding the adequacy and validity of these domains within the proposed curriculum model. Specifically, the mean score for the knowledge domain was 3.42 with a standard deviation of 0.89, and the obtained t value of 3.65 was statistically significant at the 0.001 level. This finding indicates that the knowledge component of the curriculum model was evaluated positively and considered appropriate and desirable by the expert panel. Similarly, the attitude domain had a mean score of 3.63 and a standard deviation of 0.71, with a t value of 6.89, which was also statistically significant at the 0.001 level. This result demonstrates very strong expert agreement regarding the importance and appropriateness of the attitudinal components embedded in the proposed curriculum model.

The skill domain also demonstrated a statistically significant difference compared with the hypothetical criterion, with a mean score of 3.25, a standard deviation of 0.69, and a t value of 6.17 at the 0.001 significance level. This finding confirms that the skill-related components of the curriculum model were evaluated favorably and considered valid and necessary for preparing research-oriented teachers. In contrast, the facilities domain showed a mean score of 1.09, which was substantially lower than the hypothetical criterion mean, and the obtained t value was -34.51, which was statistically significant at the 0.001 level. This negative and statistically significant result indicates that the facilities domain was evaluated as inadequate relative to the expected standard, suggesting that institutional infrastructure and available resources may not sufficiently support the effective implementation of the proposed research-oriented curriculum model.

Overall, the findings demonstrate that while the knowledge, attitude, and skill domains of the proposed curriculum model were strongly validated and positively evaluated by experts, the facilities domain represents a significant limitation that may hinder effective implementation. These results highlight the structural strength of the curriculum model in terms of conceptual and pedagogical components while simultaneously emphasizing the need for institutional improvement in terms of infrastructure and educational resources to fully support research-oriented teacher education at Farhangian University.

Discussion and Conclusion

The purpose of this study was to validate the curriculum model for research-oriented teacher education at Farhangian University by examining its structural validity and empirical adequacy across the domains of knowledge, attitude, skill, and facilities. The findings demonstrated strong empirical support for the overall validity of the proposed curriculum model, particularly in the domains of knowledge, attitude, and skill, while highlighting important institutional challenges related to facilities. These findings provide important insights into the effectiveness and feasibility of implementing a research-oriented curriculum model in teacher education and contribute to the growing body of literature emphasizing the importance of preparing teachers as reflective practitioners and educational researchers.

The results of the content validity assessment indicated that all components of the proposed curriculum model, including logic, objectives, content, teaching–learning strategies, teacher’s role, materials and resources, grouping, place, time, and evaluation methods, were evaluated positively by experts, with content validity ratio values exceeding the acceptable threshold. This finding demonstrates that the structural elements of the curriculum model are theoretically sound, conceptually coherent, and professionally relevant. The high level of expert agreement confirms that the proposed model reflects essential dimensions required for developing research-oriented teachers. This result is consistent with previous research emphasizing that effective teacher education curricula must integrate research competence, reflective practice, and pedagogical knowledge within a coherent curriculum structure (13, 14). Curriculum validation studies have also emphasized the importance of expert evaluation in ensuring alignment between curriculum components and professional requirements, thereby enhancing curriculum effectiveness and applicability (25, 26).

The strong validation of the logic and objectives components of the model suggests that the curriculum model is grounded in sound theoretical principles and aligned with the mission of teacher education institutions. This finding aligns with previous research emphasizing that clearly defined curriculum objectives are essential for guiding teacher professional development and ensuring alignment between educational goals and instructional practices (18). Research has shown that teacher education programs that explicitly incorporate research-oriented objectives are more effective in developing teachers’ inquiry skills, reflective thinking, and professional competence (1, 2). The validation of the curriculum logic also reflects the integration of constructivist and pragmatic educational principles, which emphasize inquiry, reflection, and experiential learning as central components of teacher education (5, 6).

The positive validation of curriculum content and teaching–learning strategies further confirms that the proposed curriculum model incorporates appropriate pedagogical approaches for developing research competence among pre-service teachers. These findings are consistent with research highlighting the importance of inquiry-based learning, reflective practice, and collaborative learning in teacher education programs (15, 16). Reflective and inquiry-based teaching approaches enable teachers to critically analyze their practices, conduct systematic inquiry, and improve instructional effectiveness. The integration of research-oriented content and pedagogical strategies in teacher education curricula has been identified as a key factor in promoting professional growth, critical thinking, and educational innovation (8, 10).

The validation of the teacher’s role component also reflects the importance of redefining teachers as active researchers and reflective practitioners rather than passive transmitters of knowledge. This finding aligns with the conceptual framework of action research, which positions teachers as agents of change who generate professional knowledge through systematic inquiry and reflection (7, 9). Research-oriented teacher education enables teachers to continuously evaluate their instructional practices, identify areas for improvement, and implement evidence-based interventions. Previous studies have demonstrated that teachers

who engage in research activities exhibit higher levels of professional competence, reflective thinking, and instructional effectiveness (12, 24).

The findings of the one-sample t-test analysis further confirmed the empirical validity of the curriculum model, particularly in the domains of knowledge, attitude, and skill. The knowledge domain showed a mean score significantly higher than the hypothetical criterion, indicating that the curriculum model effectively supports the development of research-related knowledge among pre-service teachers. This finding is consistent with previous research emphasizing that research competence requires a strong foundation in theoretical knowledge, research methodology, and educational theory (29). Teacher education programs that provide comprehensive research training enable teachers to understand research concepts, analyze educational phenomena, and apply research findings to improve teaching practices (23).

The attitude domain demonstrated the highest level of positive evaluation among the curriculum model components, indicating that the proposed curriculum effectively fosters positive attitudes toward research and reflective practice. This finding is particularly significant because attitudes toward research play a critical role in determining teachers' willingness to engage in research activities and apply research findings in educational practice. Previous research has shown that positive attitudes toward research are associated with increased engagement in professional inquiry, reflective practice, and continuous professional development (8, 9). Teacher education programs that promote positive research attitudes contribute to the development of professional identity and lifelong learning competencies (4).

Similarly, the skill domain demonstrated strong empirical support, indicating that the curriculum model effectively develops research skills among pre-service teachers. Research skills, including data collection, analysis, critical reflection, and problem-solving, are essential for enabling teachers to conduct action research and improve instructional effectiveness. This finding aligns with previous studies emphasizing that research competence is a critical component of teacher professional development and educational effectiveness (2, 3). Teacher education programs that incorporate research training and inquiry-based learning enable teachers to develop practical research skills and apply research methods in educational contexts.

However, the facilities domain showed significantly lower scores compared with the hypothetical criterion, indicating that institutional infrastructure and resources may not adequately support the implementation of the research-oriented curriculum model. This finding highlights a critical institutional challenge that may hinder the effectiveness of research-oriented teacher education. Previous research has identified lack of institutional support, insufficient research facilities, and limited access to resources as major barriers to teacher participation in research activities (20, 21). Institutional support, including access to research resources, technological infrastructure, and supportive learning environments, is essential for enabling teachers to engage effectively in research activities.

The inadequacy of facilities identified in this study also reflects broader systemic challenges in teacher education institutions, particularly in developing countries. Research has shown that institutional infrastructure, organizational support, and performance evaluation systems play a critical role in ensuring the effectiveness of teacher education programs (19). Without adequate institutional support, curriculum models may not achieve their intended outcomes, even if they are theoretically sound and pedagogically effective. This finding underscores the importance of aligning curriculum design with institutional capacity and resource availability.

The overall findings of this study support the theoretical and practical importance of research-oriented teacher education and confirm the validity of the proposed curriculum model. The integration of research competence into teacher education curricula is essential for preparing teachers to function effectively in complex and dynamic educational environments. Research-oriented teachers are better equipped to analyze educational problems, develop innovative solutions, and contribute

to educational improvement (11, 28). Furthermore, the development of research competence enhances teachers' professional identity, autonomy, and commitment to continuous professional development (22, 27).

These findings also support contemporary educational theories emphasizing the importance of inquiry, reflection, and knowledge construction in teacher education. Constructivist and pragmatic educational frameworks emphasize the active role of learners in constructing knowledge through inquiry and experience (5). Research-oriented teacher education aligns closely with these theoretical perspectives by promoting active learning, reflective practice, and professional inquiry. The development of research competence enables teachers to adapt to changing educational environments and respond effectively to emerging educational challenges.

Overall, the findings of this study provide strong empirical support for the proposed curriculum model and confirm its theoretical and practical validity. The model effectively addresses key components required for developing research-oriented teachers, including research knowledge, positive research attitudes, and practical research skills. However, the findings also highlight the importance of institutional support and infrastructure in ensuring the effective implementation of research-oriented teacher education curricula.

The study had several limitations that should be considered when interpreting the findings. First, the sample size was relatively small, as the validation process involved a limited number of experts, which may restrict the generalizability of the findings. Second, the study relied primarily on expert evaluation and self-reported questionnaire data, which may be influenced by subjective perceptions and professional biases. Third, the study was conducted within a specific institutional context, which may limit the applicability of the findings to other teacher education institutions. Fourth, the study focused on curriculum validation rather than examining the actual implementation and effectiveness of the curriculum model in practice. Finally, institutional and contextual factors that may influence curriculum implementation were not examined in depth.

Future research should examine the implementation and effectiveness of the proposed curriculum model in real educational settings to assess its impact on teacher professional development and instructional effectiveness. Longitudinal studies should be conducted to evaluate the long-term effects of research-oriented teacher education on teacher performance and student learning outcomes. Future research should also examine institutional factors, including organizational support, infrastructure, and leadership, that influence the implementation of research-oriented curricula. Comparative studies involving multiple teacher education institutions would also provide valuable insights into the generalizability and applicability of the curriculum model.

From a practical perspective, teacher education institutions should integrate research training systematically into teacher education curricula to develop research competence among pre-service teachers. Institutional leaders should provide adequate research facilities, technological infrastructure, and professional support to facilitate research-oriented teacher education. Teacher education programs should also promote reflective practice, inquiry-based learning, and collaborative research activities to enhance teacher professional development. Furthermore, policymakers and educational leaders should align teacher education curricula with institutional capacity and professional standards to ensure effective implementation and sustainability of research-oriented teacher education programs.

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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.

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