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Developing Innovation, Creativity, and Adaptability Competencies for Primary School Teachers through On-site Professional Development

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Abstract

Background/purpose. Vietnam's educational reforms and the 2018 General Education Curriculum require primary school teachers to possess strong competencies in innovation, creativity, and adaptability. Existing training is often theoretical and detached from classroom practice. This study designs and tests a school-based professional development program based on a competency framework to enhance these skills, aiming to identify key components and evaluate its impact on teachers' professional growth.

Materials/methods. Based on a competency framework developed through theoretical analysis and practical surveys, the authors designed a flexible professional development program delivered at primary schools in a blended format, with 748 teachers participating in a controlled experimental design.

Results. Data were collected before and after the professional development program and analyzed using descriptive statistics, Cronbach's Alpha reliability testing, Exploratory Factor Analysis (EFA), and Pearson correlation analysis. The results indicated that the on-site professional development program had a positive impact, significantly enhancing the manifestation levels of innovation, creativity, and adaptability competencies.

Conclusion. The study demonstrates that a systematically designed school-based professional development program can significantly enhance primary school teachers' competencies in innovation, creativity, and adaptability. By integrating blended learning, collaborative activities, and reflective practice, the program bridges theory and classroom realities, addressing gaps in existing training approaches. Findings provide empirical evidence to support the scaling and institutionalization of competency-based, school-embedded professional development in Vietnam's primary education system.

1. Introduction

In the context of Vietnam's education system undergoing profound transformation under the influence of globalization, digitalization, and the implementation of the 2018 General Education Curriculum, primary school teachers' professional competencies are facing increasingly complex and adaptive demands. Contemporary teachers are required not only to possess solid professional knowledge and pedagogical skills but also to demonstrate the capacity for innovation, creativity, and flexible adaptation to the rapidly evolving educational environment. These competencies are essential for enabling teachers to fulfill the new curriculum's goals of developing learners' qualities and competencies.

However, most current professional development programs remain overly theoretical and content-oriented, offering limited opportunities for teachers to practice and develop competencies in authentic classroom contexts. Training sessions are typically short-term, centrally organized, and lack mechanisms for feedback or follow-up evaluation, creating a substantial gap between what teachers learn and what is required in real classrooms. As a result, many teachers have yet to fully exercise their initiative, creativity, and adaptability in implementing competency-based teaching practices.

In contrast, extensive international research has demonstrated that school-based professional development (SBPD) constitutes an effective and sustainable approach to enhancing teachers' professional competencies. Seminal works by Joyce and Showers (2002), Guskey (2002), Darling-Hammond et al. (2017), and Avalos (2011) emphasize that SBPD not only enables teachers to learn from practice but also fosters professional collaboration, reflective inquiry, and the formation of Professional Learning Communities (PLCs). Learning embedded in professional contexts and collegial interactions provides a foundation for teachers to naturally and sustainably renew their pedagogical thinking and practice.

In Vietnam, although the Ministry of Education and Training (MOET) has introduced several initiatives to promote continuous professional development - such as the Enhancing Teacher Education Program (ETEP), the "Three-Level Core Teacher" model, and regulations under Circular No. 01/2021/TT-BGDĐT-the- the design and implementation of systematic SBPD models remain limited. Existing initiatives are often fragmented and lack a clearly defined competency framework to guide content and methodology. Empirical research evaluating the effectiveness of SBPD programs remains scarce, and many in-school training activities primarily focus on experience sharing or routine meetings, with little linkage to competency-based evaluation or adaptive teaching practices.

To address these gaps, this study seeks to design, implement, and evaluate a school-based professional development program for primary school teachers grounded in a competency framework encompassing innovation, creativity, and adaptability. The program aims to foster a collaborative professional learning environment within schools, where teachers engage in learning through practice, peer collaboration, reflection, and pedagogical innovation.

Accordingly, the study is guided by three key research questions:

1. What are the core components that constitute the competency framework of innovation, creativity, and adaptability for primary school teachers?

2. How should a school-based professional development program be designed—in both content and methodology - to develop these competencies effectively?

3. To what extent is the proposed SBPD model effective in enhancing teachers' innovation, creativity, and adaptability to educational change?

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By integrating contemporary theoretical foundations with large-scale empirical data, the study aims to provide scientific and practical evidence to support the institutionalization of competency-based, school-embedded professional development within Vietnam's primary education system. Ultimately, this research contributes to improving teacher quality and strengthening the capacity for sustainable educational reform in the digital transformation era.

2. Literature Review

According to Nguyen Canh Toan (1996), professional development is "a form of training aimed at enhancing their knowledge and refining professional skills in a field where they have already received foundational training." Unlike initial training, teacher learning is characterized by its focus on continuous updating, a clear orientation, and an organization based on practical needs. Nguyen Ngoc Quang (2002) defines professional development as "a systematic learning activity aimed at responding to changes in work, fostering personal development, and improving the quality of education."

In the current context of educational reform, professional development is no longer limited to providing new knowledge but also encompasses the development of action competencies, including critical thinking, innovation, creativity, and the ability to adapt to diverse teaching environments. Recent studies have also emphasized that professional development should shift from a knowledge-transmission model to a competency-based framework. According to Guskey (2002), an effective professional development program must ensure changes at three levels: (i) teachers' knowledge and skills; (ii) beliefs and attitudes; and (iii) professional classroom practices.

In Vietnam, legal documents such as Circular No. 01/2021/TT-BGDĐT clearly define the role of continuous professional development in building the teaching workforce, emphasizing the design of professional development content and programs based on teachers' needs and practical conditions, while also encouraging autonomy, creativity, and lifelong learning among educators.

2.1. The Concept of On-site Professional Development for Primary School Teachers Based on a Competency-based Approach

On-site professional development (commonly referred to as school-based professional development or on-site training) is a form of training conducted directly within teachers' workplaces, specifically, in the schools where they are employed. This approach has gained prominence in recent decades and has been adopted across many countries as an effective and sustainable strategy for developing teachers' professional competencies.

Internationally, the on-site professional development approach is closely associated with concepts such as school-based professional development, peer coaching, mentoring, lesson study, and professional learning communities (PLCs). Studies consistently emphasize that teachers' professional competencies should develop in authentic classroom contexts, supported by colleagues and school leadership. Darling-Hammond et al. (2017) stress that effective professional development programs must be closely linked to classroom practice, incorporate professional collaboration and long-term support, and place teachers at the center of competency development. The authors note that a competency-based approach enables teachers to develop reflective capacity —the ability to systematically analyze and evaluate their own teaching practices to draw lessons, make adjustments, and enhance future effectiveness. This process involves reviewing pedagogical actions before, during, and after teaching; questioning the rationale for those actions; evaluating outcomes and gaps; and seeking solutions for improvement. Such reflective engagement also strengthens teachers' problem-solving abilities and fosters creative innovation, qualities essential in modern education.

According to Joyce & Showers (2002), on-site professional development is characterized by collaboration, in-situ practice, direct and iterative feedback in real-world settings, thereby deepening

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knowledge acquisition and fostering professional skills. Lieberman and Miller (2001) emphasize that "school-based professional development enables teachers not only to acquire knowledge but also to shape an innovative mindset through learning with colleagues, reflective practice, and continuous improvement." Beatrice Avalos (2011) affirms that on-site professional development is most effective when it is tailored to the school's practical needs, supported by leadership, and designed to enable teachers to learn from their own experience.

In Vietnam, Nguyen Duc Chinh (2012) views on-site professional development as a form of professional growth that closely connects theory with practice, leverages schools' internal strengths, and promotes teachers' professional autonomy. This model is not merely a matter of convenience in location. However, it represents a professional development philosophy grounded in the principles of learning from work, learning through work, and learning with colleagues. It encompasses a range of activities, including lesson-study-based professional meetings, extended subject-group sessions, in-house workshops, demonstration teaching, peer support, and the development of school-based learning communities.

In the context of general education curriculum reform toward competency and character development, teacher professional development, particularly for primary teachers, has been addressed through on-site, competency-based approaches in various policy documents and programs. According to the Ministry of Education and Training (2019), within the framework of the Enhancing Teacher Education Program (ETEP), lesson study-based professional activities are an effective form of on-site professional development. This model has been implemented in many primary schools, enabling teachers to develop competencies through practice, reflection, and professional collaboration. Models such as Professional Learning Communities (PLCs) and lesson study-based professional activities are recognized as key strategies for sustainable teacher competency development.

Nguyen Thi Hanh (2020), in her study on primary teacher professional development in Bac Giang province, emphasized that on-site activities, such as cluster-based professional meetings, demonstration teaching, and peer feedback, help teachers improve their teaching capacity and adapt to the new curriculum. Likewise, Nguyen Van Cuong et al. (2021) reported in their evaluation of competency-based teacher development within the Primary Education Project for Disadvantaged Children (RGEP) that on-site professional development bridges the gap between theory and practice, especially in under-resourced contexts. Nevertheless, researchers have also noted persistent challenges, including the shortage of skilled core trainers to facilitate on-site activities (Nguyen Thi Thuy, 2022), the absence of robust assessment mechanisms for school-level professional learning (Pham Hong Van, 2020), and the underdeveloped culture of professional sharing in certain schools.

Nguyen Anh Tuan (2022) proposed measures to manage competency-based primary teacher professional development at the district level, emphasizing on-site training as a practical solution. In addition, Nguyen Thi Thu Thuy et al. (2021) proposed a lesson-study-based professional development model to foster integrated teaching competencies, demonstrating the feasibility and practical effectiveness of competency-based on-site training.

Many academic works have examined the current state of teacher professional development and proposed solutions tailored to practical needs. Nguyen and Sit (2024) found that although Vietnamese teachers actively participate in professional development activities such as subject group meetings and lesson study, the effectiveness of these activities still depends heavily on institutional support and regional conditions. Challenges include disparities in access to resources, technological capacity, and career orientation.

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2.2. Competency Framework for Innovation, Creativity, and Adaptability of Primary School Teachers through On-site Professional Development

Creativity in teaching involves innovating instructional methods to suit real-world contexts. The competency for innovation and creativity is demonstrated when teachers flexibly apply modern teaching methods, such as project-based learning, integrated instruction, and experiential learning, in ways tailored to the classroom, local community, and individual students' characteristics. Rather than strictly following the textbook, teachers can adjust lesson content and activity organization to stimulate students' thinking, autonomy, and engagement. For example, instead of teaching only theoretical content in a Science lesson on environmental protection, the teacher might organize activities in which students create recycled products from local waste materials. Creativity here lies not only in the content but also in classroom organization, open-ended questioning, and the selection of appropriate teaching aids.

Rapid adaptability to change requires an open mindset and a willingness to learn. A primary school teacher needs to be flexible and ready to adapt to changes in curriculum, technology, teaching methods, and social circumstances. In particular, the implementation of the 2018 General Education Curriculum, with its emphasis on developing students' qualities and competencies, has posed new challenges for teachers. Teachers with an open mindset continually improve their personal competencies, seek out new educational resources, engage in self-directed learning through online courses (MOOCs) and professional seminars, and remain willing to change established professional habits to pursue improvement.

The competency framework for innovation, creativity, and adaptability of primary school teachers through on-site professional development is structured across three levels:

Competency Group	Basic Level	Intermediate Level	Proficient Level
Innovation and Creativity in Teaching	– Implement lesson plans according to provided guidance. – Apply some basic active teaching techniques (e.g., games, discussions). – Identify mismatches in the teaching process.	– Flexibly adjust teaching activities to match the specific characteristics of the class and students. – Integrate interdisciplinary content, linking lessons with local contexts. – Adjust core elements (objectives, methods) to suit class needs.	– Design creative lessons incorporating technology and open educational resources. – Develop innovative teaching models with creativity and scalability. – Redesign the entire teaching process to match specific contexts and learner profiles.
Adaptability to Change	– Accept changes in curriculum and textbooks. – Participate in required training sessions. – Make creative use of available materials and resources.	– Proactively seek learning opportunities through online platforms. – Explore and update new teaching methods for classroom application. – Design positive learning activities that engage students effectively.	– Develop long-term self-improvement plans. – Lead innovation in professional activities, sharing and disseminating creative ideas within the school. – Integrate resources, technology, and real-life contexts into lesson plans.

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2.3. Professional Development Program for Enhancing Innovation, Creativity, and Adaptability Competencies

In the context of implementing the 2018 General Education Curriculum (GEC 2018), the role of primary school teachers has become increasingly broad and complex, requiring them not only to possess strong subject expertise but also to develop the capacity for innovative thinking, creativity in organizing learning activities, and flexible adaptation to the rapidly changing educational environment. From the perspective of Continuous Professional Development (CPD), current teacher training programs should aim to cultivate core competencies for 21st-century educators, such as innovation and creativity, adaptability to change, lifelong learning, and digital literacy (Nguyen Thi Thu Ha & Tran Thi Phuong, 2023).

Several representative professional development programs currently implemented in Vietnam illustrate practical efforts to shape these competencies. First, the Regular Professional Development Program for the 2022–2026 period, organized under Circular No. 01/2021/TT-BGDĐT, has shifted its focus from knowledge transmission to competency development. Its content includes not only subject-specific modules but also soft and digital skills, as well as active teaching methodologies. Second, the "three-tier core teacher training" model (implemented by the Ministry of Education and Training in collaboration with Viettel and the World Bank) has a multiplier effect, emphasizing practical competencies such as flexible lesson design and the organization of learner-centered classes tailored to student capabilities and local contexts (MOET, 2021). Finally, the Enhancing Teacher Education Program (ETEP), funded by the World Bank, has contributed to improving the capacity of both teacher educators and school teachers through the development of a professional competency framework and a blended learning system (World Bank, 2020).

Moreover, several teacher competency development models have served as benchmarks for the design of training programs. Among them is UNESCO's TPD@Scale initiative-a systemic approach aimed at scaling up teacher capacity development while ensuring personalization, particularly in resource-constrained settings (UNESCO, 2022). Additionally, the P21 Framework for 21st Century Learning and the ISTE Standards for Educators are recognized as theoretical foundations for identifying the core competency domains that teachers need to develop, including critical thinking, creativity, technological proficiency, and adaptability in digital education environments (Partnership for 21st Century Skills, 2019; ISTE, 2022).

From both a practical perspective and a theoretical orientation, the current trend in professional development program design is toward modular, theme-based structures that can be tailored to individual teacher competencies. Such programs are not limited to a sequence of traditional lectures but incorporate experiential learning, peer feedback practice, and the creation of tangible outputs such as digital learning resources, integrated lesson plans, and differentiated instructional designs, ensuring a sustainable connection between theory and practice (Nguyen Van Cuong, 2023). Furthermore, the integration of blended learning modalities-online, on-site, and project-based-enables teachers not only to develop individual competencies but also to foster professional learning communities within their institutions.

Based on the principles of CPD and professional competency development within the new general education curriculum, primary school teacher professional development programs can be designed in a modular, theme-based format aligned with core competencies. Each module should be designed with clear objectives, high applicability, and flexibility for implementation within subject groups, school clusters, or as part of on-site training:

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Training Topics	Core Content	Target Competencies to be Developed	Implementation Format
Innovating Classroom Organization in Primary Education	– Design competency - oriented learning activities. – Organize active learning environments.	Develop innovation competencies in classroom organization and flexible lesson adjustment.	Professional group meetings on lesson study; group discussions.
Designing Creative Learning Materials and Integrated Lessons	– Create digitalized and personalized learning materials. – Design lessons linked to real-life contexts and cross-disciplinary content.	Develop creativity in lesson and material design, as well as integrated teaching.	Design workshops; experience sharing; peer review and feedback.
Differentiation and Adaptation to the 2018 General Education Curriculum	– Analyze curriculum by region. – Design flexible lesson plans suited to student characteristics.	Developing the capacity to adapt to the new general education program and learner characteristics in diverse contexts	Thematic sessions on differentiation; developing locally adapted lesson plans.
Applying Technology and Digital Tools in Teaching	– Use educational software (Padlet, ClassPoint, Quizziz). – Teach with technology and open educational resources.	Develop competencies in innovation and creativity in modern technology-based teaching.	Hands-on practice; resource sharing; group project work.
Building and Operating Professional Learning Communities at the School Level	– Establish school-based learning community models. – Manage knowledge and foster cross-disciplinary professional development.	Develop collaboration and adaptability competencies through on-site professional learning.	Cluster-based professional meetings; school-based group learning.

3. Methodology

The study was conducted using an applied experimental design to verify the effectiveness of the school-based professional development program in enhancing primary school teachers' competencies, including: (1) innovation and creativity in teaching (DMST), (2) adaptability to change (TU).

3.1. Program Design and Experimental Implementation

The program is designed on theoretical foundations and practical surveys within a specific competency domain and includes a sequence of learning activities that closely connect theory and practice. The study content is flexibly integrated between professional learning, scenario-based learning, collaborative learning, and professional critique. In this, professional learning helps teachers

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consolidate core professional knowledge and skills; scenario-based learning helps teachers handle real pedagogical situations in digital environments; collaborative learning encourages exchange and peer support; and professional critique provides opportunities for teachers to self-assess and improve their professional competence through discussion, feedback, and experience sharing.

The program was piloted over three months in several primary schools in Hanoi city and Thanh Hoa province, with varying facilities, staff, and school/class sizes, to test its suitability and feasibility for implementation across various educational contexts. During implementation, the research team provided professional support, supplied instructional materials, monitored progress, and collected quantitative and qualitative data to evaluate changes in teachers' professional competence before and after participating in the program.

3.2. Participants and Sampling Method

A total of 748 primary school teachers participated in the program. It was divided into two groups: the experimental group (E-group), which received the new professional development program, and the control group (C-group), which did not participate in the program. A stratified random sampling approach was used to ensure representativeness across geographic region, teaching experience, and school size. Teachers in the experimental group attended all training sessions, on-site practice activities, and professional learning meetings aligned with the program's objectives.

3.3. Measurement Tools and Survey Procedure

The survey instrument consisted of 17 observed variables, evenly distributed across three competency domains, and was constructed using a 5-point Likert scale. The questionnaire was pilot-tested with 60 primary school teachers to refine wording and ensure clarity and contextual relevance to the Vietnamese educational setting.

The reliability analysis indicated that Cronbach's Alpha coefficients for all variable groups ranged from 0.78 to 0.89, exceeding the acceptable threshold of 0.70. This result demonstrated high internal consistency and confirmed that the measurement scale met the requirements for subsequent Exploratory Factor Analysis (EFA).

3.4. Data Analysis

Data were collected in two main phases:

Instrument development and pilot testing: Based on theoretical foundations and expert consultations, the research team developed a survey instrument comprising observed variables that reflected three core competency domains: innovation, creativity, and adaptability. A pilot study involving 120 primary school teachers was then conducted to refine the scale's content, language, and reliability.

Primary survey: The finalized questionnaire was administered to 748 primary school teachers from two provinces, Hanoi and Thanh Hoa, representing distinct socio-economic contexts in Northern Vietnam. Data were collected through a hybrid approach, combining face-to-face and online (Google Forms) formats to ensure completeness and accuracy of responses.

The collected data were processed and analyzed using SPSS 26.0. The analytical procedures included:

- Descriptive statistics were employed to identify sample characteristics and examine the distribution trends of mean scores across each competency domain.
- Reliability testing was conducted using Cronbach's Alpha and Item–Total Correlation to assess the internal consistency and stability of the measurement scale.

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- Exploratory Factor Analysis (EFA) was performed to identify the underlying structure of the measurement instrument. The results indicated that KMO = 0.917 (> 0.7) and Bartlett's Test of Sphericity was statistically significant (χ^2 = 9512.63; Sig. = 0.000), confirming the suitability of the data for factor analysis. Three principal factors with the Eigenvalue.

- Pearson correlation analysis: Determining the degree of association between competency domains after intervention.

- Between-group comparison: Independent Samples t-tests to evaluate mean score differences between the experimental and control groups for each competency domain..

3.5. Research Ethics

The study adhered to ethical standards in educational research. All participating teachers were fully informed of the study's purpose, their rights, and responsibilities, and were assured of anonymity and confidentiality. The collected data were used solely for scientific purposes and not for any commercial use.

Table 1. Descriptive Statistics of Survey Variables

Variable Code	Variable	N	Minimum	Maximum	Mean	Std.Deviation
DMST 1	Flexibly adjust teaching activities according to class and student characteristics	748	2	5	3.84	.976
DMST 2	Able to design creative lessons using technology and open educational resources	748	1	5	4.01	.951
DMST 3	Apply integrated, experiential, and project-based methods in actual teaching	748	1	5	3.92	.967
DMST 4	Use active teaching techniques such as games, debates, and simulations	748	2	5	4.05	.948
DMST 5	Able to design lessons linked to real-life situations and local conditions	748	1	5	3.88	.983
DMST 6	Proactively develop creative lesson models with scalability	748	2	5	3.95	.960
TU 1	Proactively update the 2018 General Education Curriculum and new teaching methods	748	1	4	3.76	.991
TU 2	Independently develop self-study and personal	748	2	5	3.82	.975

	professional development plans					
TU 3	Willing to change professional habits to adapt to educational innovation	748	1	5	3.79	.963
TU 4	Use online resources for self-learning and professional improvement	748	1	5	3.88	.957
TU 5	Actively participate in professional learning activities at subject groups and school clusters	748	1	4	3.91	.970
TU 6	Develop a long-term professional development plan for oneself	748	1	5	3.86	.962
UPLH 1	Able to handle conflicts and violations of classroom rules	748	2	5	3.81	.958
UPLH 2	Able to respond when students face psychological difficulties or when classroom activities are disrupted	748	1	5	3.83	.961
UPLH 3	Participate in developing crisis response plans at the subject group or school level	748	2	5	3.80	.966
UPLH 4	Understand and apply appropriate educational risk prevention measures	748	1	5	3.87	.950
UPLH 5	Able to collaborate with colleagues and parents to resolve emergencies in education	748	1	5	3.90	.954

4. Results

4.1. Innovation and Creativity Competency in Teaching

To assess primary school teachers' innovation and creativity in teaching, the authors developed a survey instrument consisting of six observed variables (DMST1–DMST6), reflecting core aspects such as: the ability to adjust teaching activities to suit student characteristics; designing creative lesson plans; flexibly applying active teaching techniques; developing innovative pedagogical solutions; and creating scalable lesson models. The table below presents the variable codes, survey content, and corresponding I-TCC and Cronbach's Alpha indices:

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Table 2. I-TCC and Cronbach's Alpha Results for Developing Teachers' Innovation and Creativity in Teaching through On-site Professional Development

Variable Code	Variable	I-TCC	CAC
DMST 1	Flexibly adjust teaching activities according to class and student characteristics	0.684–0.976	0.938
DMST 2	Able to design creative lessons using technology and open educational resources	0.812–0.985	0.968
DMST 3	Apply integrated, experiential, and project-based methods in actual teaching	0.690–0.969	0.912
DMST 4	Use active teaching techniques such as games, debates, and simulations	0.768–0.981	0.948
DMST 5	Able to design lessons linked to real-life situations and local conditions	0.680–0.832	0.902
DMST 6	Proactively develop creative lesson models with scalability	0.672–0.825	0.901

The table above presents the results of internal consistency testing (Cronbach's Alpha) for the Innovation and Creativity in Teaching (DMST) scale, which consists of six specific components. All survey variables recorded item–total correlation coefficients (I-TCC) exceeding the 0.60 threshold and Cronbach's Alpha coefficients (CAC) ranging from 0.901 to 0.968, indicating high reliability and excellent internal consistency of the scale.

Variable DMST 2 – "Able to design creative lessons using technology and open educational resources" – achieved the highest CAC value in the group (0.968), clearly reflecting its stability and strong representativeness for the conceptual structure of this competency domain. In addition, variables DMST 1 and DMST 4 also reached CAC values above 0.94, demonstrating outstanding reliability in measuring specific indicators of innovation and creativity.

Notably, variables DMST 5 and DMST 6, although having the lowest CAC values in the group (0.902 and 0.901, respectively), still exceeded the recommended 0.80 threshold and met the reliability standards for educational research (Nunnally & Bernstein, 1994). This indicates that the indicators related to designing lessons linked to real-life contexts and developing scalable lesson models remain stable and trustworthy.

Overall, the results confirm that the IC competency survey instrument for primary school teachers is highly reliable and well-suited for quantitative research and for evaluating current educational practice.

4.2. Adaptability to Change Competency

Table 3. I-TCC and Cronbach's Alpha Results for Developing Primary School Teachers' Adaptability to Change through On-site Professional Development

Variable Code	Variable	I-TCC	CAC
TU 1	Proactively update the 2018 General Education Curriculum and new teaching methods	0.674–0.974	0.931
TU 2	Independently develop self-study and personal professional development plans	0.712–0.978	0.935

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TU 3	Willing to change professional habits to adapt to educational innovation	0.705–0.971	0.934
TU 4	Use online resources for self-learning and professional improvement	0.697–0.976	0.933
TU 5	Actively participate in professional learning activities at subject groups and school clusters	0.726–0.981	0.936
TU 6	Develop a long-term professional development plan for oneself	0.710–0.973	0.934

The internal consistency test results for the "Adaptability to Change" (TU) competency scale, consisting of six component variables (TU 1- TU 6), indicate that all observed indicators achieved high item-total correlation coefficients (I-TCC), ranging from 0.674 to 0.981- well above the minimum threshold of 0.3 and approaching the "excellent" standard of 0.7 or higher (Nunnally & Bernstein, 1994). This finding reflects a strong relationship between the individual indicators and the overall structure of the competency domain. At the same time, the Cronbach's Alpha coefficients (CACs) ranged from 0.932 to 0.936, all exceeding the 0.9 benchmark, confirming the scale's excellent reliability and robust internal consistency under the survey conditions.

Among these, variable TU 5- "Actively participate in professional learning activities at subject groups and school clusters"-recorded the highest I-TCC (0.726–0.981) and a CAC of 0.936, highlighting the prominent role of collaborative learning in enhancing teachers' professional competencies. Variables TU 2- "Independently develop self-study and personal professional development plans"- and TU 6- "Develop a long-term professional development plan for oneself"- also demonstrated stability and substantial contributions to the overall conceptual framework.

Overall, the findings indicate that the TU competency scale has very high reliability, making it suitable for competency assessment research, the design of professional development programs, and the orientation toward continuous professional growth for primary school teachers in the current context of educational reform.

4.3. Developing Innovation, Creativity, and Adaptability Competencies for Primary School Teachers through On-site Professional Development

Table 4. KMO And Bartlett's Test

Test Index		Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.917
Bartlett's Test of Sphericity	Chi-Square	9512.627
	df	210
	Sig.	0.000

The KMO and Bartlett's Test results for the instrument, comprising 21 observed variables and a sample size of 748, indicate that the dataset meets the conditions for conducting an Exploratory Factor Analysis (EFA). The KMO value was 0.917, falling within the "excellent" range according to Kaiser's (1974) classification, indicating a high degree of sampling adequacy and a potential for a clear factor structure. In addition, Bartlett's Test of Sphericity has a Chi-Square (χ^2) value of 9512.627 with 210 degrees of freedom (df) and a significance level of Sig. = 0.000, indicating statistically significant correlations among the variables. Therefore, all prerequisite conditions for performing EFA were

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satisfied, confirming the construct validity of the instrument for assessing the professional competencies of primary school teachers in this study.

Table 5. Rotated Component Matrix of the EFA

Variable	Component		
	1	2	3
DMST 1. Flexibly adjust teaching activities according to class and student characteristics	0.812		
DMST 2. Able to design creative lessons using technology and open educational resources	0.796		
DMST 3. Apply integrated, experiential, and project-based methods in actual teaching	0.783		
DMST 4. Use active teaching techniques such as games, debates, and simulations	0.768		
DMST 5. Able to design lessons linked to real-life situations and local conditions	0.755		
DMST 6. Proactively develop creative lesson models with scalability	0.742		
TU 1. Proactively update the 2018 General Education Curriculum and new teaching methods		0.801	
TU 2. Independently develop self-study and personal professional development plans		0.788	
TU 3. Willing to change professional habits to adapt to educational innovation		0.774	
TU 4. Use online resources for self-learning and professional improvement		0.765	
TU 5. Actively participate in professional learning activities at subject groups and school clusters		0.759	
TU 6. Develop a long-term professional development plan for oneself		0.751	
UPLH 1. Able to handle conflicts and violations of classroom rules			0.784
UPLH 2. Able to respond when students face psychological difficulties or when classroom activities are disrupted			0.771
UPLH 3. Participate in developing crisis response plans at the subject group or school level			0.765
UPLH 4. Understand and apply appropriate educational risk prevention measures			0.612
UPLH 5. Able to collaborate with colleagues and parents to resolve emergencies in education			0.740

The rotated component matrix (EFA) results with a sample size of 748 provide strong evidence of the suitability and construct validity of the survey instrument measuring three core competency domains, in which the “Adaptability to Change and Lifelong Learning” (TU) competency is clearly represented through six observed variables (TU 1-TU 6).

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All variables in the TU group demonstrated high factor loadings, ranging from 0.751 to 0.801, well above the minimum threshold of 0.5 and meeting the recommended standard of ≥ 0.7, as reported by Hair et al. (2010). This indicates a substantial degree of convergence between the observed variables and their latent factor, reflecting high consistency in the measurement structure. The TU variables were designed not only to ensure conceptual alignment but also to capture practical aspects of teachers' ability to adapt to rapidly changing educational environments, such as self-learning, professional development, and the adoption of new teaching methods.

Notably, no variables exhibited cross-loadings onto other components, indicating apparent discriminant validity among the model's factors. This is an important characteristic that confirms the theoretical distinctiveness of the TU competency domain relative to the other two domains (IC and UPLH), thereby strengthening the measurement structure's discriminant validity.

Overall, the analysis results indicate that the "Adaptability to Change and Lifelong Learning" competency domain possesses a robust and reliable measurement structure, making it applicable to experimental research and to the design of professional development programs for primary school teachers in the current context of educational transformation. This provides a crucial foundation for implementing training models that enhance teachers' continuous professional growth and flexible adaptability to innovation requirements.

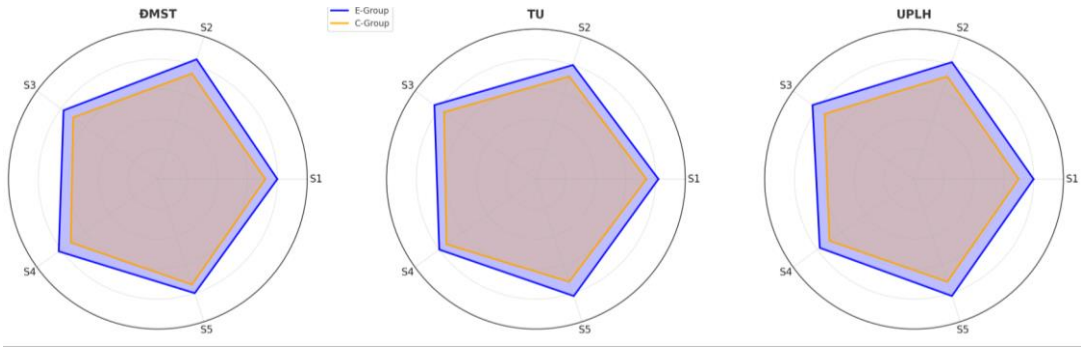

Figure 1. Comparison of Innovation, Creativity, and Adaptability Competencies of Primary School Teachers through On-site Professional Development

The radar chart illustrates apparent differences in the levels of three competency domains between the experimental group (E-Group) and the control group (C-Group). In all three surveyed competencies—Innovation and Creativity in Teaching (DMST), Adaptability to Change and Lifelong Learning (TU), and Flexible Response to School-based Situations and Crises (FRSC) — the E-Group achieved significantly higher mean scores across all component indicators (S1–S5).

Specifically, in the DMST competency, the E-Group's superiority is evident in its ability to design new learning activities and apply active teaching methods. The TU competency also showed consistent improvement in the E-Group, particularly in updating professional knowledge and proactively adjusting teaching methods to meet innovation requirements. Similarly, for the FRSC competency, the E-Group demonstrated stronger abilities in organizing, responding to, and effectively handling urgent educational situations, outperforming the control group.

These findings indicate that the school-based professional development program has had a positive impact on primary school teachers' professional competencies. This provides empirical evidence of the effectiveness of the competency-based professional development model, in alignment with current educational reform orientations. Furthermore, the visual presentation through the radar chart highlights the degree of improvement in each competency, enabling managers and researchers to more easily monitor and evaluate the impact of intervention programs.

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Table 8. Pearson Correlation of Innovation, Creativity, and Adaptability Competencies for Primary School Teachers through On-site Professional Development

		Innovation and Creativity	Adaptability
Innovation and Creativity	Pearson correlation	1	.665**
	Significance (2-tailed)	.000	.000
	N	748	748
Adaptability	Pearson correlation	.665**	1
	Significance (2-tailed)	.000	.000
	N	748	748

The Pearson correlation analysis between the two core competency domains of primary school teachers in the context of school-based professional development revealed a positive and statistically significant relationship (Sig. < 0.01, N = 748). Specifically, the DMST competency showed a strong correlation with the TU competency ($r = 0.665$, $p < 0.01$), reflecting the close link between the ability to innovate teaching methods and the spirit of lifelong learning combined with an open professional mindset.

These findings indicate that although the three competency domains have distinct structures, they are harmoniously interconnected and mutually supportive in pedagogical practice. This serves as evidence of the integrated and coherent nature of professional competencies in the context of educational reform, while also suggesting a direction for designing school-based professional development programs following a comprehensive competency model to enhance the quality of the primary school teaching workforce holistically and sustainably.

5. Discussion

The findings of this study confirm that school-based professional development (SBPD)—characterized by its flexibility, practicality, and teacher-centered orientation—offers a practical approach to enhancing teachers' professional competencies in real educational contexts. By combining short, modular training formats with professional learning communities (PLCs), lesson design, and collaborative reflection, the SBPD model enables teachers not only to access new knowledge but also to engage in experiential learning, self-reflection, and continuous professional growth. The study demonstrated that this model effectively improved teachers' innovation, self-directed learning, and flexible response competencies, all of which are essential to meeting the demands of educational reform and digital transformation.

These outcomes are consistent with international findings (Guskey, 2002; Darling-Hammond et al., 2017), which emphasize that professional development is most successful when it is embedded in authentic teaching practice, supported by collaboration and sustained feedback, and oriented toward competency development rather than one-time knowledge transmission. The improvements observed in this study reaffirm that professional learning situated within the school context can bring about more profound and more enduring changes in teachers' practice than traditional, centrally organized training models.

Significantly, the study contributes a localized, empirically validated model of competency-based SBPD tailored to the specific conditions of Vietnamese primary schools. It provides practical evidence that competency development can be achieved even in resource-limited environments by promoting collaborative learning, digital integration, and reflective teaching. This model thus serves as a viable

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framework for institutionalizing professional learning at the school level and aligns with Vietnam's broader goals of educational modernization and teacher empowerment.

However, several challenges were also identified during implementation, including variations in teachers' baseline competencies, limited readiness for participation in some schools, and unequal access to resources across localities. These constraints highlight the need for policy adjustments and differentiated support strategies, including building school-based training capacity, developing instructional leadership, and ensuring equitable investment in teacher professional development.

The implications of this study extend to both practice and policy. Educational leaders and policymakers should formally integrate SBPD into national teacher education strategies, link it to performance evaluation and career progression systems, and provide institutional support for its sustainability. Furthermore, teacher training institutions and universities should collaborate with schools to co-design, monitor, and evaluate SBPD programs, ensuring alignment with teachers' actual needs and classroom realities.

In conclusion, the study provides empirical and contextual evidence for advancing teacher professional development through a competency-based, school-embedded approach. It contributes both theoretically and practically to the discourse on effective teacher learning, offering a foundation for scalable, sustainable, and context-sensitive professional development in Vietnam's evolving education system.

6. Conclusion

The study developed and piloted a school-based professional development program for primary school teachers, focusing on three core competency domains: (1) innovation and creativity in teaching, and (2) adaptability to change. An experimental survey of 748 teachers found that the program had a positive impact, as evidenced by significant improvements in competency levels after the intervention. Reliability indices (Cronbach's Alpha), Exploratory Factor Analysis (EFA), and Pearson correlations all confirmed the construct validity and internal consistency of the competency assessment tool, while also clarifying the close interrelationships among the competency domains developed through school-based training.

Based on the findings, it can be affirmed that school-based professional development is a relevant and practical approach to enhancing the professional competencies of primary school teachers, thereby contributing to the successful implementation of the comprehensive and fundamental reform of general education in the current period.

7. Suggestion

The findings indicate that the school-based professional development model, designed based on the innovation, creativity, and adaptability competency framework, has a significant impact on enhancing primary school teachers' professional competencies. Therefore, educational institutions and management agencies should expand the application of this model while adapting its content and delivery formats to the specific conditions of each locality, ensuring flexibility and alignment with real classroom practice.

It is necessary to strengthen professional learning through lesson study, collaborative learning, and reflective practice, while effectively combining face-to-face and online learning to optimize time and resources. In addition, the use of technology and the exploitation of open educational resources should be encouraged to support teachers in self-directed learning and in innovating teaching methods.

Future research should focus on assessing the long-term impact of the school-based model on teaching quality and teachers' sustainable professional growth, and on piloting its implementation

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across diverse regions—particularly disadvantaged areas—to verify its feasibility and effectiveness on a broader scale.

Declarations

Author Contributions. Khuong: Literature review, conceptualization. Hoa.: methodology, data analysis. All authors: review-editing and writing, original manuscript preparation. All authors have read and approved the final version of the article.

Conflicts of Interest. The author declares no conflict of interest.

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Data Availability Statement. The data used in this research is confidential and thus cannot be shared with third parties.

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