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Teaching Creativity to Teachers in Singapore, Finland, Scotland, Australia, Japan, Malaysia and Iran

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ABSTRACT

The rapid social, technological, and educational transformations of the 21st century have reshaped the role of teachers, positioning creativity as a core professional competency. This study comparatively examines how teacher education systems in Singapore, Finland, Scotland, Australia, Japan, Malaysia, and Iran cultivate creativity and related 21st-century skills among pre-service teachers. A descriptive-analytical comparative design was employed, drawing on national curriculum frameworks, policy documents, institutional reports, and peer-reviewed literature published between 2010 and 2024. Data were analyzed using thematic content analysis to identify recurring patterns in how creativity is conceptualized, embedded, and operationalized within teacher education programs. The analysis yielded six analytically derived themes: integration of creative thinking and problem-solving, theory-practice alignment through structured practicum, reflective and research-informed practice, digital and technology-enhanced pedagogy, institutional and policy support, and experiential learning opportunities. While all countries formally recognize creativity as a priority, differences emerge in the degree of curricular coherence, institutional autonomy, and practical implementation. Convergent patterns include systematic curriculum integration, sustained school-based experiences, and increasing emphasis on digital competence. Divergences reflect contextual variations in governance structures, policy alignment, and cultural interpretations of professional autonomy.

The findings suggest that creativity in teacher education is most effectively fostered through coherent policy frameworks, sustained experiential learning, reflective practice, and meaningful integration of technology. By mapping cross-national patterns, this study provides a systemic perspective on how teacher education programs can move beyond isolated initiatives toward structurally embedded and context-responsive approaches to preparing creative educators. ©authors

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Introduction

Twenty-five years have passed since the beginning of a new century with unprecedented rapid changes sweeping across sectors such as education with increasing vigor. As these changes take place, a perceptible shift has taken place in lifestyles. Gone is the era where the future could be predicted with certainty from data available for the latter (Marsiti, 2023). Technology integration with school systems, increasing complexity in learning and teaching processes, and an imperative to design and implement novel pedagogies constitute only a part of what has changed the face of teaching professionals in this century (Santosa, 2019). In addition, outcomes produced by extant school systems have never been completely adequate to meet society's demands. Greater expectations from society regarding students who would be future citizens have prompted stakeholders—teachers, school ministries, governments, foundations, industry practitioners who would hire them, and researchers across the globe—to design unprecedented reforms throughout education systems and to introduce new skills into school curricula. Such skills often come with labels such as 21st-century skills, higher-order thinking skills, deeper learning results, and higher order thinking and communication skills (Rozeski, 2012).

Literature Review

The concept of 21st-century skills emerged in the early 2000s as education systems sought to define the competencies necessary for success in a rapidly changing world (Pedro, 2006; Huet, 2024). These skills encompass cognitive, social, and technological capacities that enable individuals to learn effectively, adapt, and innovate. Costa and Kallick (2009) categorized them into learning and innovation skills, life and career skills, and technological skills, while Wagner (2008) proposed a set of “survival skills,” including critical thinking, problem-solving, collaboration, and creativity. The ATC21S project at the University of Melbourne further organized these competencies into learning and innovation, collaboration and communication, digital literacy, and global citizenship (Leadershift, 2020).

The advent of the Fourth Industrial Revolution (IR 4.0) has led to the change in the landscape of education and work that focuses on digital literacy, computational thinking, flexibility, data management, and system thinking as being critical competencies (Hatami, 2022; Mulder, 2017). Global models such as the Skills Framework for the Information Age (SFIA), UNESCO ICT Competency Framework for Teachers, and DigComp offer a structured approach to embedding these digital and work competencies.

Many researches have been conducted to explore the integration of these skills within teacher training. For example, Mehrmohammadi (2018) noted that the integration of modern information tools increases the ability of teachers towards innovation. In a similar vein, the significance of competency curriculum within teacher training and societal needs has been noted by Hatami (2022). These researches reveal that teacher training programs have an important role within the context of providing teachers with the necessities of dealing with the challenges of society and technology. Within these competencies, the aspect of creativity emerges as a vital component since it forms the foundation of problem-solving, innovation, and adaptability within both teachers and learners.

Creativity: Definitions, Importance, and Theoretical

Increasingly, the recognition of creativity as an important competence has been noted in educational as well as artistic and industrial settings (Green et al., 2023). Despite differing views on the concept of creativity, most experts concur that it entails the capacity to generate new and practical solutions or outputs (Sternberg & Kaufman, 2011; Villa & Guerra, 2017). The classic views of creativity define it as a process and an ability in that:

Cognitive perspective: Guilford (1950) described creativity as divergent thinking, the ability to generate multiple solutions to a problem. Bloom's revised taxonomy situates “creating” at

the highest cognitive level, emphasizing synthesis and integration of knowledge (Mikani, 2013; Ligale, 2025).

Psychological perspective: Maslow highlighted the emergence of novel ideas from deep psychological processes, while Weisberg (1995) emphasized intrinsic motivation to innovate.

Educational perspective: Plucker and Dow's (2010) perspective on creativity relates to aptitude, process, and environment that come together to create an identifiable and positive outcome. Creativity is now widely regarded as a developable skill, not a fixed trait. Pedagogical strategies, supportive learning environments, and institutional backing can foster creativity in teachers, who are themselves central agents of educational change (Jalili, 2003; Namdar et al., 2014; Jan, 2017). Research shows that students' creative capacities flourish when guided by creative teachers, highlighting a direct link between teacher creativity and student outcomes.

Previous research has investigated approaches that may develop teachers' creativity (Namdar et al. 2014) as well as others that may enhance it (Jalili 2003); however, research on comparison of these within the various educational settings that exist around the world is still limited. The emphasis on creativity above other 21st-century competencies is based on the capacity it provides educators to be innovative and design solutions for the rapid changes that occur in society and technology. The role of creativity as a catalyst in the growth of other competencies like critical thinking and communication cannot be overlooked either. For better-performing students, it is important to have better-performing teachers. "Although much research has been conducted on 21st-century competencies and creativity in education, very few studies have examined the role of teachers' training programs in enhancing creativity in teachers. Since creative teachers play an important role in fostering creative students and an innovative educational environment, it is important that this research addresses the topic of teaching creativity in Singapore, Finland, Scotland, Australia, Japan, Malaysia, and Iran.

Overview of Teacher Education Policies and Structures

Teacher Education in Finland for the 21st Century

Teacher education in Finland is organized around four main components. First, academic foundations: pre-service teachers learn educational sciences and human development, and complete a major school-based research project—high school teacher candidates select a topic tied to their subject, while grade school candidates explore teaching methods. Continuous professional learning is emphasized (Maaranen et al., 2019). Second, subject-matter expertise: teacher education is conducted within schools of education and class groups, with strong focus on subject-specific knowledge for both grade and high school teachers. Third, inclusive education: Finnish teachers are prepared to identify and support students with learning difficulties, aiming to meet diverse needs and learning styles. Fourth, extended practical training: hands-on experience is integral, including a full year of supervised classroom practice and immersion in innovative school programs (Elhamian, 2018). Additionally, Finnish teacher education emphasizes communication, critical and creative thinking, media literacy, information management, and technology use to prepare teachers for contemporary classrooms (Viinikka, 2019). Finland's national curriculum identifies seven key competencies for students: learning to learn; cultural, communication, and self-expression skills; self-management; literacy; digital competence; career and entrepreneurship skills; and civic responsibility (Tirri, 2019). A central feature of Finnish teacher education is its purposeful, values-driven approach: the curriculum fosters meaningful learning across subjects and develops teachers who can reflect on the significance of their work and support students in finding personal meaning (Bundick, 2014; Tirri, 2016).

Teacher Education in Scotland for the 21st Century

Teacher education in Scotland consists of two main stages. The initial teacher education stage prepares new teachers by developing: subject expertise, pedagogical competence, self-evaluation skills, collaborative abilities, openness to innovation, commitment to lifelong learning, leadership capacity, and awareness of their role within local, national, and global teaching communities.

The continuing professional development stage emphasizes practical skills such as adaptability, innovation, and learner-centered teaching (Smith, 2010; Kennedy, 2018). Recent challenges, including the COVID-19 pandemic, highlighted the importance of these skills: teachers who could adapt quickly and effectively use digital tools maintained teaching quality under rapidly changing conditions (SCED, 2021).

Teacher Education in Japan for the 21st Century

In Japan, teacher education is considered central to the quality of schooling, with the belief that well-prepared teachers are essential for fostering innovative learning. The programs aim to develop a broad set of competencies, including professional commitment, understanding of human development, care for students, subject-matter expertise, pedagogical knowledge, and practical teaching skills.

Teachers also acquire skills to navigate a changing world, grouped into three categories:

1. Foundational skills – literacy, numeracy, technology use, and ethical behavior.
2. Cognitive skills – problem identification and resolution, creative and critical thinking, self-reflection, and adaptive learning.
3. Life and social skills – autonomy, decision-making, collaboration, communication, civic responsibility, and sustainable practices.

These skill sets are interdependent: foundational skills support cognitive and life skills; cognitive skills enable meaningful application of knowledge; and life skills foster moral development and holistic growth. Japanese teacher education integrates theoretical knowledge with practical training, preparing teachers to guide students not only academically but also in personal, social, and ethical development.

Teacher Education in Australia for the 21st Century

In Australia, teacher education emphasizes the development of technology-savvy educators to meet the demands of contemporary classrooms. The national curriculum outlines a combination of knowledge, skills, and dispositions aimed at preparing students for life and work, including literacy, numeracy, digital competence, creative thinking, collaboration, ethical awareness, and intercultural understanding (Amirian et al., 2015).

Responsibility for teacher education is shared between local and state authorities, while national policies set key requirements to ensure the teaching of 21st-century skills (Ledger et al., 2020). In addition, the Education Services Australia (ESA) supports teacher preparation through digital resources, technology integration, and large-scale assessment initiatives (Bavakhani, 2019; ESA, 2019).

Overall, Australian teacher education combines school-based programs, policy frameworks, and technological support to equip pre-service teachers with the competencies required for effective teaching in contemporary learning environments.

Teacher Education in Malaysia for the 21st Century

In Malaysia, teacher education is guided by the PAK21 framework, which emphasizes 21st-century skills such as critical thinking, creativity, collaboration, communication, arts, and technology integration (Yusof & Othman, 2025). The Ministry of Education has aligned the Primary School Standard Curriculum (KSSR) with these goals, emphasizing curriculum design, teaching methods, and assessment practices (Mansor & Jamaluddin, 2024).

Pre-service teachers are expected to acquire up-to-date technological competencies and pedagogical skills essential for implementing PAK21 effectively (Muhamad Zaidi & Haji Othman, 2023). Key initiatives include:

- Integrating critical thinking, collaboration, arts, and technology into teaching and learning;
- Promoting student-centered and inquiry-based learning approaches;
- Supporting continuous professional development to ensure teachers can adopt innovative teaching methods (Seng, 2020).

Overall, Malaysia's teacher education system is undergoing significant reforms to equip teachers for 21st-century classrooms, with a strong focus on practical implementation and real-world connections.

Teacher Education in Iran for the 21st Century

In Iran, teacher education is centralized under Farhangian University, established in 2011, which oversees over 60 teacher education centers and trains more than 70,000 pre-service teachers. The university is responsible for recruiting, training, and developing teacher competencies across the country.

Despite this centralized system, curriculum development has been slower to adapt to emerging educational needs. Teacher education emphasizes planning, implementation, monitoring, and evaluation of school programs, with pre-service teachers actively engaged in hands-on tasks. A two-year practicum is a key component, linking theoretical knowledge to classroom practice and providing sustained opportunities for experiential learning (Farhangian University, 2019; Zolfaghari, 2020). Practical training, reflective exercises, and collaborative teamwork are central to developing professional competencies.

However, the centralized structure limits the application of learned practices in diverse classroom contexts, and time constraints pose challenges for comprehensive skill development. Nevertheless, Farhangian University provides structured experiential learning that strengthens teachers' readiness for classroom responsibilities and supports the implementation of national educational goals.

Method

This study adopted a descriptive–analytical comparative review design to explore how creativity is taught and developed in teacher education programs across selected countries. The primary purpose was to identify conceptual and pedagogical frameworks used internationally to foster creative thinking among pre-service teachers, and to compare similarities and differences across educational systems.

Research Design

The research employed a comparative education methodology grounded in the model proposed by Bray, Adamson, and Mason (2014), which supports a structured and systematic analysis across diverse educational contexts. This design combines descriptive elements, documenting the structure and content of teacher education programs, with analytical features, interpreting pedagogical and institutional mechanisms that foster creativity. The use of this framework was deliberate, as it enables national experiences to be synthesized within a coherent comparative lens while maintaining analytical rigor and validity. Such a design also allows for the generation of evidence-based insights and informed generalizations on how creative educational practices can be adapted and implemented across various socio-educational systems.

Country Selection

Countries were selected through purposeful sampling to represent diversity in cultural, economic, and educational settings. Each selected country has a globally recognized teacher education system that emphasizes innovation, pedagogical quality, and the integration of

creativity and 21st-century skills. The inclusion of both high-performing systems and reform-oriented contexts ensures a balanced and meaningful comparative analysis. Australia and Singapore were chosen for their advanced teacher education systems that promote reflective and innovative pedagogical practices (Bavakhani, 2019). Finland was included because of its internationally recognized model that integrates research-based learning and creativity-centered pedagogy (Sahlberg, 2021). Japan represents a technology-driven and industry-oriented system that balances creativity with structure and discipline (Isuzaki, 2018). Scotland illustrates a Western system that has undergone comprehensive curriculum reform promoting creative teaching, reflective practice, and professional autonomy (Hulme & Menter, 2011). Malaysia serves as an emerging example of a Global South nation rethinking its teacher education frameworks to align with international trends emphasizing creativity and competency-based learning. Iran is classified as a developing educational context where creativity and innovation in teacher education is currently developing as a point of policy review, and thus offers a contrasting setting to the ways in which it has become more institutionalized in other countries. This grouping of countries provides a lens through which we can analyze diversity in approaches to education and yet maintain a level of cross-national comparability through economic, cultural and policy dimensions.

Data Sources and Selection Criteria

Data were collected from a broad range of academic and institutional sources to ensure comprehensive coverage of teacher education practices and policies. The primary tool used for literature collection was Research Rabbit, an AI-supported research platform that facilitates systematic exploration of academic publications through citation mapping and thematic clustering. This tool was used to identify, expand, and link studies related to creativity and teacher education.

The corpus included peer-reviewed journal articles, national policy documents, curriculum frameworks, and official teacher education reports published between 2010 and 2024. Inclusion criteria required that each document (a) explicitly addressed teacher education or teacher training, (b) focused on creativity, innovation, or 21st-century competencies, and (c) was available in full text. To enhance reliability, the corpus developed through Research Rabbit was cross-checked with publications indexed in ERIC, Scopus, SpringerLink, and Google Scholar.

Data Analysis

The analysis followed a two-stage process. In the first stage, a thematic content analysis was conducted to identify patterns related to how creativity is conceptualized, taught, and evaluated in teacher education programs. Through inductive coding, key categories emerged that represented curriculum design, pedagogical practices, policy orientations, and institutional support mechanisms.

In the second stage, findings were synthesized within a comparative analytical framework based on Bray and Thomas's (1995) cube model for comparative education. This framework considers three dimensions of comparison: (1) levels of analysis (international, national, institutional), (2) aspects of education systems (curriculum, pedagogy, policy), and (3) analytical purposes (description, interpretation, evaluation). This systematic structure allowed the study to identify both global trends—such as the growing emphasis on creativity and digital literacy—and localized differences influenced by context-specific factors like policy direction, institutional culture, and socio-economic conditions.

Overall, this combined analytical approach provided a rigorous foundation for drawing cross-national insights and proposing recommendations for enhancing creativity within teacher education programs worldwide.

Findings

The themes developed in this study come from an analysis of teacher education programs, policies, and curriculum frameworks in seven (7) countries. Specifically, they look at how creativity is defined and taught in pre-service teacher education, and how it will be developed in pre-service teachers through teacher education institutions, or programs. Creativity is a multidimensional construct in the theoretical framework of the study and is viewed to include creative thinking, innovative pedagogical practices, problem solving, and the ability to create adaptive learning environments – all key competencies for both teaching and learning in the 21st century. In total, 245 sentences and 87 excerpts from the documents from each country in the case studies were systematically coded. The process consisted of multiple cycles of coding, comparing and refining the initial codes into higher order categories, which resulted in the development of six theme (analytically driven) categories. Explicit and/or implicit references to elements of creativity-related pedagogical practices, the relationship between theory and practice, reflective and experience-based learning, technology supported and adaptive learning environments for teachers, teacher autonomy, and policy and institutional support structures were reflected in the codes identified. Therefore, although the unit of analysis is the pedagogical, institutional, and policy structures that teach and build creativity in pre-service teachers (as opposed to the teacher education systems in each of the countries), it is still possible to compare how on a general level they identify, teach and build creativity amongst the pre-service teachers in the different countries.

Theme 1 – Creative Thinking and Problem-Solving

This analytically derived theme captures how teacher education systems conceptualize creative thinking and problem-solving as learnable professional competencies rather than innate individual traits. Across the analyzed cases, creativity is operationalized through pedagogical mechanisms that emphasize problem framing, inquiry, and adaptive reasoning, positioning pre-service teachers as active designers of learning rather than passive recipients of prescribed methods (Bundick & Tirri, 2014; Costa & Kallick, 2009; Sternberg & Kaufman, 2011).

At an analytical level, three recurring mechanisms underpin this theme across contexts. First, the use of problem-based and inquiry-oriented tasks situates creativity within authentic classroom challenges (Maaranen et al., 2019; Elhamian, 2018). Second, the integration of reflective and collaborative processes supports divergent thinking (Viinikka et al., 2019; Tirri, 2016). Third, curriculum expectations are aligned with adaptive problem-solving as a core teaching competence (Bell, 2016; Bundick & Tirri, 2014). While these mechanisms recur across cases, their institutional intensity and pedagogical articulation vary according to national and organizational contexts (Bavakhani et al., 2019; Ali Mohammadi et al., 2019).

Empirically, these mechanisms are instantiated in different ways. In Singapore, the TE21 framework embeds reflective thinking and structured problem-solving within pedagogical skills courses, enabling pre-service teachers to design lessons that encourage divergent thinking (Bavakhani et al., 2019). Finland emphasizes inquiry-based learning and research projects that require student-teachers to identify pedagogical problems and propose innovative, evidence-informed solutions (Maaranen et al., 2019; Elhamian, 2018). In Scotland, problem-based scenarios within initial teacher education promote collaborative solution-building, linking individual creativity with collective professional practice (Smith, 2010; O'Brien, 2021). In Japan, creative problem-solving is intertwined with moral and cognitive development, encouraging student-teachers to balance curricular coherence with creative engagement (Kimura & Tatsuno, 2017; Tirri, 2016). Australia and Malaysia employ project- and technology-based learning tasks to strengthen adaptive reasoning (Bani Amrian et al., 2015; Seng et al., 2020), while Iran's Farhangian University introduces reflective and teamwork-oriented activities that foster creative problem-solving within the constraints of a centralized curriculum framework (Zolfaghari, 2020; Farhangian University, 2019).

Taken together, this theme demonstrates that creative thinking and problem-solving function as foundational pedagogical capacities in contemporary teacher education. Despite contextual variation, pre-service teachers across systems are systematically prepared to approach classroom challenges through adaptive, reflective, and creativity-oriented problem-solving practices aligned with 21st-century educational goals.

Theme 2 – Linking Theory to Practice in Teacher Education

In teacher education, linking theory to practice is recognized as a key approach for nurturing creativity, allowing pre-service teachers to transform conceptual understanding into actionable teaching strategies (Fletcher & Macuga, 2004; Zolfaghari, 2020). Across the analyzed cases, creativity is developed through structured opportunities in which student-teachers enact, adapt, and apply pedagogical principles rather than treating creativity as an abstract theoretical construct (Elhamian, 2018; Ayvazpour et al., 2024).

Analytically, two interrelated patterns emerge. First, theory–practice integration is intentionally designed to support reflective experimentation, enabling pre-service teachers to convert conceptual knowledge into creative instructional action (Bell, 2016; Mishra & Mehta, 2017). Second, practicum-based and inquiry-oriented structures provide iterative learning spaces in which creativity develops through cycles of planning, implementation, feedback, and revision (Ledger et al., 2020; O’Brien, 2021). Together, these patterns position creative teaching as a situated professional practice rather than a transferable set of techniques.

Empirically, these mechanisms are embedded in diverse institutional arrangements. In Singapore, the TE21 framework systematically aligns coursework with practicum experiences, encouraging student-teachers to design and refine innovative lessons responsive to classroom diversity (Bavakhani et al., 2019; TE21, 2019). Finland emphasizes extended school placements, inquiry projects, and research-based practice, allowing experimentation grounded in evidence (Maaranen et al., 2019; Elhamian, 2018). Scotland implements practice-based modules and ongoing professional development to reinforce reflective and problem-solving competencies (Smith, 2010; O’Brien, 2021). Japan integrates lesson study and observation cycles to allow iterative testing and refinement of creative approaches (Kimura & Tatsuno, 2017). Australia and Malaysia use project- and school-based assignments to connect curricular theory with pedagogical innovation (Bani Amrian et al., 2015; Seng et al., 2020), while Iran’s Farhangian University combines supervised practicum with reflective and collaborative activities to link theoretical knowledge to classroom practice within a centralized framework (Farhangian University, 2019; Zolfaghari, 2020).

Taken together, integrating theory and practice emerges as a central mechanism through which creativity is learned, enacted, and sustained in teacher education. By embedding experimentation within authentic teaching contexts, pre-service teachers are empowered to translate pedagogical knowledge into adaptive, context-responsive professional practice aligned with 21st-century educational goals (Fletcher & Macuga, 2004; Ayvazpour et al., 2024).

Theme 3 – Technology and Digital Pedagogy for Creativity

This theme examines how technology and digital pedagogy function as enabling learning spaces for creativity in teacher education (Mishra & Mehta, 2017; Garay & Quintana, 2019). Across the analyzed cases, digital tools are not treated merely as technical add-ons but are pedagogically positioned to support creative thinking, collaborative problem-solving, and the design of adaptive learning environments (Seng, 2020; Kimura & Tatsuno, 2017).

At an analytical level, two interrelated patterns characterize this theme. First, technology is mobilized to create interactive and participatory learning spaces that allow pre-service teachers to experiment with instructional design, explore multiple solution pathways, and engage in collaborative knowledge construction (Monyai, 2019; Marsiti et al., 2023).

Second, digital pedagogy supports iterative feedback and reflection, enabling student-teachers to refine creative teaching approaches through cycles of design, implementation, and evaluation (Huet, 2024; Ledger et al., 2020). These patterns highlight the role of technology in shaping not only what teachers learn, but how creativity is enacted within teacher education (Bell, 2016).

Empirically, these patterns are reflected in diverse institutional practices. In Singapore, the TE21 framework integrates digital platforms for lesson planning, collaborative projects, and simulation-based teaching exercises, encouraging experimentation with creative instructional strategies (TE21, 2019; Bavakhani et al., 2019). Finland emphasizes media literacy, educational technology, and digitally mediated inquiry tasks that enable student-teachers to explore multiple pathways for knowledge creation (Maaranen et al., 2019; Elhamian, 2018). Scotland incorporates technology-rich classrooms and virtual learning environments into initial teacher education, promoting experimentation, reflection, and adaptive pedagogy (O'Brien, 2021; Hulme & Menter, 2011). In Japan, digital resources are embedded within lesson study cycles, allowing student-teachers to test innovative teaching approaches and receive real-time feedback (Kimura & Tatsuno, 2017). Australia and Malaysia employ project-based and blended learning designs that combine creativity with technology (Bani Amrian et al., 2015; Seng et al., 2020), while Iran's Farhangian University gradually introduces digital pedagogical tools within supervised practicum contexts to foster both technical competence and inventive teaching practices (Farhangian University, 2019; Ayvazpour et al., 2024).

Taken together, this theme demonstrates that technology-enhanced pedagogy operates as a critical learning space for the development of creative teaching capacity. By embedding digital tools within reflective, collaborative, and practice-oriented structures, teacher education programs equip pre-service teachers with the skills and confidence to design, implement, and adapt innovative learning experiences aligned with the demands of 21st-century classrooms (Mishra & Mehta, 2017; Bell, 2016).

Theme 4-Teacher Autonomy and Reflective Practice

Teacher autonomy and structured reflective practice are central mechanisms that foster creativity in pre-service teacher education (Bundick & Tirri, 2014; Sternberg & Kaufman, 2011). Across the cases studied, creativity is associated with the capacity of student-teachers to exercise professional judgment, critically evaluate their teaching, and adapt instructional strategies according to classroom contexts (Ali Mohammadi et al., 2019; Viinikka et al., 2019).

Analytically, a dynamic relationship exists between autonomy and reflection. Autonomy provides space for experimentation and pedagogical innovation, while structured reflective processes—including guided self-evaluation, peer feedback, and mentorship—ensure that such experimentation is purposeful and accountable (Costa & Kallick, 2009; Tirri, 2016). These structures do not imply unrestricted freedom; rather, they frame creativity as a deliberate, context-sensitive professional practice.

Empirical evidence illustrates the operationalization of these mechanisms in different countries. In Singapore, the TE21 framework allows student-teachers to independently plan lessons while participating in reflective exercises and peer feedback activities that support creative problem-solving (TE21, 2019; Bavakhani et al., 2019). Finland integrates reflection journals, inquiry-based projects, and mentorship to enable iterative refinement of teaching approaches (Maaranen et al., 2019; Elhamian, 2018). In Scotland, portfolio-based assessment and continuous professional development foster experimentation and professional growth (O'Brien, 2021; Hulme & Menter, 2011). Japan incorporates reflective cycles within lesson study, allowing student-teachers to adapt creatively based on observed outcomes (Kimura & Tatsuno, 2017). Australia and Malaysia embed reflective practice into practicum and collaborative projects, promoting self-directed innovation (Ledger et al.,

2020; Seng et al., 2020). In Iran, Farhangian University combines reflective group work with supervised autonomy to balance centralized curricula and opportunities for creativity (Farhangian University, 2019; Ayyazpour et al., 2024).

In summary, nurturing creativity in teacher education is most effective when professional autonomy is intentionally coupled with structured reflection. These mechanisms collectively equip pre-service teachers to respond flexibly, responsibly, and innovatively to diverse classroom challenges, embedding creativity as a sustainable component of professional practice (Bundick & Tirri, 2014; Sternberg & Kaufman, 2011).

Theme 5- Policy Support and Institutional Structures for Creativity

Across the analyzed cases, policy frameworks and institutional structures emerge as key determinants of how creativity is fostered in teacher education. Rather than focusing solely on individual teacher competencies, this theme highlights the systemic and organizational mechanisms that enable or constrain the enactment of innovative pedagogical practices (Bavakhani et al., 2019; Sahlberg, 2021; OECD, 2014).

Analytically, two interrelated patterns are evident. First, policy coherence and institutional alignment provide scaffolding for pre-service teachers to experiment, innovate, and engage in reflective practice (Ledger et al., 2020; Gore, 2015). Second, the flexibility or rigidity of institutional structures influences the extent to which creative pedagogical practices can be explored and sustained, highlighting the interplay between governance, autonomy, and opportunity for innovation (Smith, 2010; Hulme & Menter, 2011).

Empirical illustrations demonstrate these mechanisms across national contexts. In Singapore, the TE21 framework is embedded in national policy, ensuring structured support for creative pedagogies and ongoing professional development (TE21 Framework, 2019). Finland's decentralized, research-oriented teacher education system grants institutions significant autonomy to design programs that foster creativity, while national guidance reinforces 21st-century competencies (Maaranen et al., 2019; Elhamian, 2018). Scotland combines curriculum reforms with institutional initiatives that promote teacher experimentation, autonomy, and reflective practice (O'Brien, 2021; Smith, 2010). Japan aligns teacher education with national standards while embedding lesson study practices that encourage creative problem-solving (Kimura & Tatsuno, 2017). Australia and Malaysia leverage policy-driven initiatives such as ESA and the PAK21 framework to systematically integrate technology, collaboration, and 21st-century skills (Bani Amrian et al., 2015; Seng et al., 2020). In Iran, Farhangian University operates under a centralized policy system, offering broad reforms but limiting institutional flexibility, resulting in gradual adoption of creative pedagogical practices (Farhangian University, 2019; Zolfaghari, 2020).

Overall, this theme demonstrates that the systemic and institutional context shapes the conditions under which pre-service teachers can develop and sustain creative teaching practices, emphasizing that enabling environments are as critical as individual competencies in fostering innovation (Bavakhani et al., 2019; Sahlberg, 2021; OECD, 2014).

Theme 6- Experiential Learning and Real-World Teaching Opportunities

Experiential and hands-on teaching opportunities serve as the primary contexts in which creativity is enacted and developed in teacher education. Authentic classroom environments allow pre-service teachers to experiment, reflect, and adapt pedagogical strategies, transforming theoretical knowledge into innovative and context-sensitive practice (Ledger et al., 2020; Gore, 2015; TE21 Framework, 2019).

Analytically, two interrelated mechanisms characterize this theme. First, immersive practicum experiences offer iterative opportunities for designing, implementing, and refining creative instructional strategies (Farhangian University, 2019; Elhamian, 2018). Second, structured mentorship and reflective cycles guide experimentation and consolidate learning, ensuring

that individual experiences contribute cumulatively to sustained professional competencies (Zolfaghari, 2020; Smith, 2010).

Empirical examples illustrate these mechanisms across contexts. In Singapore, TE21 integrates school-based practicum and action research projects that enable student-teachers to develop problem-solving skills and creative instructional strategies (TE21 Framework, 2019). Finland mandates extensive teaching practice supported by mentorship and reflective inquiry, giving pre-service teachers repeated opportunities to test novel approaches in authentic classrooms (Maaranen et al., 2019; Elhamian, 2018). Scotland combines practicum experiences with ongoing professional development to encourage experimentation in curriculum innovation and collaborative teaching methods (O'Brien, 2021; Smith, 2010). Japan's lesson study approach provides cyclical, hands-on experiences where student-teachers collaboratively plan, implement, and refine lessons focused on creative problem-solving (Kimura & Tatsuno, 2017). Australia and Malaysia embed experiential projects and internships, often incorporating technology-enhanced learning and interdisciplinary approaches (Bani Amrian et al., 2015; Seng et al., 2020). In Iran, Farhangian University offers supervised school placements and collaborative workshops, gradually allowing pre-service teachers to engage in creative lesson planning and adaptive teaching within a centralized framework (Farhangian University, 2019; Zolfaghari, 2020).

Overall, this theme demonstrates that structured experiential learning, combined with guided reflection and mentorship, provides the conditions necessary for pre-service teachers to cultivate adaptive creativity, bridging theory and practice and preparing them for the demands of 21st-century classrooms (Ledger et al., 2020; Gore, 2015; TE21 Framework, 2019).

Table 1. Comparative Overview of Cross-National Themes in Teacher Education Systems

Theme / Country	Singapore	Finland	Scotland	Japan	Australia	Malaysia	Iran
Creative Thinking & Problem-Solving	TE21 policy and curriculum explicitly foster reflective and adaptive problem-solving integrated into pedagogical courses.	Inquiry-based learning and research projects develop students' ability to generate innovative solutions.	Problem-based scenarios cultivate both individual creativity and collaborative problem-solving.	Lesson study combines moral and cognitive development to encourage creative instructional approaches.	Project- and technology-based tasks strengthen adaptive problem-solving and innovation.	PAK21-aligned activities enable collaborative and creative solutions.	Reflective and teamwork exercises gradually nurture problem-solving within centralized curriculum constraints.
Linking Theory to Practice	TE21 systematically integrates theoretical modules with practicum, enabling innovation in diverse classroom contexts.	Long-term school placements and research-based practice allow iterative testing of pedagogical theories.	Continuous professional development ensures reflective theory-to-practice translation.	Lesson study and observation cycles support iterative experimentation linking theory and practice.	Hands-on project work bridges curriculum knowledge with practical creativity.	School-based assignments promote theory-practice integration for creative teaching.	Supervised teaching practice with reflection gradually links theoretical knowledge to classroom application.
Technology & Digital Pedagogy	Digital platforms for lesson planning and simulations facilitate experimentation with creative instructional strategies.	Media literacy and digitally mediated inquiry tasks foster multiple pathways for	Technology-rich classrooms and virtual environments support reflective and adaptive pedagogy.	Digital resources embedded in lesson study cycles enable real-time feedback on innovative teaching.	Project-based and blended learning integrate creativity with technological competence.	Technology-enhanced collaborative projects develop inventive instructional approaches.	Gradual introduction of digital tools supports creativity within structured

		knowledge creation.					practicum sessions.
Teacher Autonomy & Reflective Practice	Structured reflection and independent lesson planning promote self-directed creative problem-solving.	Reflection journals, inquiry projects, and mentorship allow iterative improvement of teaching strategies.	Professional autonomy and portfolios encourage experimentation and innovation in practice.	Lesson study cycles guide reflection and adaptation for creative teaching approaches.	Reflective practicum and collaborative projects foster self-directed innovation.	Reflective group work embedded in practicum supports gradual creative exploration.	Supervised autonomy combined with guided reflection gradually develops adaptive teaching competencies.
Policy Support & Institutional Structures	TE21 embedded in national policy provides structured support for creative pedagogies and professional growth.	Decentralized institutions enjoy autonomy to design programs nurturing creativity, aligned with national guidance.	Curriculum reforms combined with institutional initiatives support experimentation and reflective practice.	National standards integrated with lesson study enable creative problem-solving in practice.	Policy-driven initiatives systematically integrate technology, collaboration, and 21st-century skills.	PAK21 framework promotes structural support for creative and innovative teaching.	Centralized policy limits flexibility but gradual reforms allow progressive adoption of creative pedagogy.
Experiential Learning & Real-World Opportunities	School-based practicum and action research projects provide iterative opportunities for creative experimentation.	Extensive teaching practice with mentorship and reflective inquiry consolidates creative problem-solving skills.	Practicum combined with professional development encourages curriculum innovation and collaborative teaching.	Lesson study cycles provide hands-on iterative opportunities for creative lesson design.	Experiential projects and internships integrate technology, interdisciplinary approaches, and innovation.	Project-based and school assignments develop adaptive creative capacities.	Supervised placements and workshops gradually allow creative lesson planning and adaptive teaching within centralized curriculum.

Table 1 presents a comparative overview of six cross-national themes, highlighting how creativity and 21st-century skills are incorporated within teacher education systems across the seven countries. Each cell summarizes evidence-based practices associated with the respective analytical theme, providing a concise mapping of similarities and differences across national contexts. The table serves as an empirical reference, illustrating the alignment between teacher education policies, curricula, and pedagogical approaches.

Discussion

The findings of this comparative analysis reveal that fostering creativity in pre-service teacher education is not primarily a matter of incorporating isolated instructional strategies, but rather of constructing coherent and interdependent systems that align curriculum, pedagogy, institutional structure, and policy orientation. Across the seven national contexts examined, creativity emerges not as an add-on competency, but as an outcome of systemic design.

One of the central insights of this study is the pivotal role of structured theory–practice integration. While existing scholarship has long emphasized the importance of bridging theoretical coursework and school-based practice, the present analysis demonstrates that creativity develops most effectively when this integration is intentionally designed as iterative and reflective. In contexts such as Finland, Singapore, and Japan, structured practicum models, inquiry-based assignments, and lesson study cycles create conditions in which pre-service teachers can experiment, receive feedback, and refine instructional approaches. This supports the view that creativity in teaching is fundamentally situated and practice-dependent rather than purely cognitive or dispositional.

Another significant pattern concerns institutional coherence and policy alignment. Systems that demonstrate curricular flexibility, professional autonomy, and consistent policy support appear more capable of sustaining creative development over time. In contrast, highly centralized or rigidly regulated environments tend to constrain experimentation and risk-taking, even when creativity is rhetorically emphasized. This finding reinforces broader educational research suggesting that innovation in teacher education depends not only on pedagogical design but also on enabling governance structures.

Technology integration also functions as a mediating factor rather than a standalone solution. The cases analyzed indicate that digital tools contribute to creative development when embedded within pedagogically meaningful frameworks. Where technology is positioned as a platform for collaboration, inquiry, and design, it strengthens adaptive expertise. However, where it is treated merely as a delivery mechanism, its contribution to creativity remains limited. Thus, digital competence should be conceptualized as intertwined with pedagogical imagination and reflective capacity.

Importantly, the comparative dimension of this study highlights that there is no single universal model for cultivating creativity in teacher education. Instead, different systems operationalize creativity through culturally and structurally specific pathways. Finland emphasizes research-based autonomy; Singapore prioritizes strategic coherence and professional identity formation; Japan institutionalizes collective reflection through lesson study; Scotland embeds reflective practice within professional standards; Australia and Malaysia employ project-based integration; and Iran's centralized model attempts to balance national coherence with practicum-based application. Despite these differences, the common denominator lies in the deliberate structuring of learning environments that allow pre-service teachers to test, adapt, and contextualize pedagogical ideas.

This study contributes to the literature by reframing creativity in teacher education as a systemic and relational construct. Rather than treating creativity as an individual trait or a discrete skill, the findings suggest that it is cultivated through ongoing interaction between curriculum, institutional conditions, reflective practice, and professional autonomy. Consequently, reforms aimed at enhancing creativity must move beyond curricular revision alone and address structural and policy-level alignment.

At the same time, this study is limited by its reliance on document analysis and secondary data sources. Future research could incorporate longitudinal empirical investigation of pre-service teachers' developmental trajectories or comparative case studies focusing on implementation processes within institutions. Such approaches would deepen understanding of how systemic design translates into classroom-level creative practice.

Conclusion

This study provides a comparative analysis of the ways in which creativity and 21st century skills are fostered within the context of teacher education programs in 7 countries. The findings of this analysis suggest that developing these competencies is not due to isolated curricular components, but rather they develop as a result of the interdependence and alignment of multiple components within pre-service teacher preparation systems including curriculum design, teaching pedagogy, institutional structure, and policy framework.

Creativity, problem-solving, collaboration and other 21st century skills need to be integrated into pre-service teachers' curricula and this should be the foundation for their education. The greatest gains for pre-service teachers will result from making systematic connections between theoretical and practical application, such that they have opportunities to explore instructional strategies, modify lessons based on the diverse contexts of school and students, and develop a professional skill set that incorporates pedagogical innovation. Experiential learning, which takes the form of school-based practicum experiences, project based assignments and repeated lesson implementation, provides the greatest opportunities for

developing adaptive capacity and reflection. These experiences also provide that pre-service teachers will have an opportunity to trial, refine and embed creative approaches into their cognitive and practical teaching experiences in an authentic setting.

The use of teacher autonomy combined with systematic reflective processes will also support the enhancement of creativity. When pre-service teachers have opportunities for engaging in self-assessment, peer interaction, and incremental improvement, they develop the capacity to respond flexibly to challenges, create flexible learning environments, and sustain innovation long-term. In contrast, rigidly controlled or centralised contexts limit these processes; therefore, institutional and policy support becomes critical. Aligned and consistent policies and flexible organisational structures provide the scaffolding necessary for experimentation, risk-taking, and long-term professional development.

The integration of technology is also a critical element. Digital tools and learning platform use as vehicles for delivering content; however, they can also be used as tools for providing engaging, collaborative and innovative methods of instruction that allow for the design, implementation and evaluation of creative instructional methods by pre-service teachers. At the same time, developing digital literacy as a component of the professional competencies associated with teaching will build pre-service teachers' capacity for adaptive teaching and will prepare them for the evolving needs of 21st-century classrooms.

Recommendations for Designing Teacher Education Programs to Support the Development of Creativity

Based on the insights gathered from this inquiry there are strong reasons to provide a series of recommendations to guide the design of pre-service teacher education programs that promote the development of creativity:

1. **Holistic Curriculum Alignment** – Creativity, critical thinking skills and problem solving should be integrated across all program components (theoretical and practical) so that teacher candidates can successfully transform their learning into innovative classroom practices.
2. **Structured Experiential Learning** – Diverse and increasingly complex opportunities for engaging in hands-on teaching, collaboration with other teacher candidates on projects and the iterative design of lessons should be provided in order for teacher candidates to consolidate their development of creative skills.
3. **Supportive Institutional and Policy Contexts** – Frameworks that promote the autonomy, reflective practices and professional experimentation of teachers should be established. To achieve sustainable creativity, education policies within a given region must demonstrate coherence and the institution must exhibit flexibility.
4. **Technology-Enhanced Pedagogy** – Efforts should be made to expose pre-service teachers to a broad array of digital tools and platforms (e.g., online collaborative spaces, social media, applications, etc.) in order to enhance their growth as creative, collaborative and adaptive problem solvers while also preparing them for teaching in 21st century learning environments.
5. **Ongoing Professional Growth** – Lifelong learning, ongoing reflective practice and adaptive expertise should be cultivated so that pre-service teachers continue to demonstrate creativity throughout their careers.

Collectively, these recommendations create a systematic, globally informed framework for preparing pre-service teachers to develop creativity in their classrooms. By recognizing the interdependence of curricula, practice, institutional supports, policy coherence and technological support; teacher education programs can move from unconnected interventions to developing long-term, contextually situated approaches to developing innovation and 21st century competencies.

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