Futures Thinking and Foresight on the Innovative Teaching Strategies of the Pre-Service Elementary Teachers towards Education 5.0, Northwestern Philippines

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DOI: https://dx.doi.org/10.47772/IJRISS.2025.907000201

Received: 29 June 2025; Accepted: 05 July 2025; Published: 07 August 2025

ABSTRACT

As education demands evolve, teachers are expected to be more than content deliverers; they must be adaptable, innovative, and forward-thinking. This study examines how pre-service elementary teachers at Pangasinan State University, San Carlos City Campus prepare to meet these expectations by applying futures thinking and foresight in developing teaching strategies aligned with Education 5.0. This emerging educational model integrates advanced technology with human-centered skills such as creativity, emotional intelligence, and critical thinking to foster holistic student development. Using a quantitative descriptive approach, the study surveyed 153 pre-service teachers during the first semester of the 2024–2025 academic year. It assessed their knowledge of Education 5.0, the teaching strategies they commonly employ, their use of future-oriented thinking, challenges encountered, and their perceptions of the future of teaching. Findings reveal that most pre-service teachers are familiar with key Education 5.0 concepts, particularly personalized learning and technology integration. Frequently used strategies include project-based learning, digital tools, and student-centered approaches. Many participants also naturally incorporate elements of strategic foresight and design thinking in lesson planning, even if not explicitly recognized as such. Despite these positive trends, challenges remain. Limited access to modern technology, insufficient training on innovative methods, and uncertainty about applying future-focused ideas in real classrooms were common obstacles. Nevertheless, the results suggest that pre-service teachers are motivated and capable of becoming innovative educators with adequate support. This research highlights the need to enhance teacher education programs by providing more hands-on experience with digital tools, embedding futures thinking into curricula, and offering continuous professional development. Strengthening these areas is essential to prepare future teachers to create responsive, inclusive, and future-ready classrooms that meet the demands of a rapidly changing world.

Keywords: Education 5.0, Futures Thinking, Foresight, Innovative Teaching Strategies, Pre-Service Teachers

INTRODUCTION

In today's world, where education is constantly evolving, learners' needs are also affected, making it difficult for educators to keep up with the continuous changes. As a result, the emergence of technology is the only feasible way to cope with this. With the continuous advancement of technology, it has become unavoidable for us to harness its potential for our own benefit, particularly in the field of education. The integration of technology into education plays a crucial role in enhancing the learning experience of the students, making it easier for educators to address their diverse needs. Over the time, the use of technology in education has evolved significantly. From Education 2.0 to 3.0, then 4.0, and now the latest—Education 5.0.

Education 5.0 is a modern, more personalized approach to learning that combines the use of technology with a focus on human development. It is a new way of looking at learning that aims to meet the needs of today's world, where technology, society, and the economy are changing rapidly. This kind of approach emphasizes the integration of advanced technologies and innovative learning methodologies to create a student-centered learning environment that prepares individuals for lifelong success in this increasingly complex world. But Education 5.0

isn't just about technology. It also emphasizes teaching the "human" side of learning—like creativity, critical thinking, emotional intelligence, and ethical decision-making. The idea of it is to equip students not only with technical skills but also with the personal qualities needed to thrive in a complex, interconnected world. With its integration into the teaching and learning process, the goal of it is to create a dynamic and interactive learning environments that enhances student engagement and motivation.

This systematic literature review by Hamedani et al. (2024), examines the transformative potential of Education 5.0 in preparing students for future challenges. The authors emphasize the importance of fostering a more integrated, technology-driven, and collaborative educational environment within Society 5.0. They advocate for further research into effective models for implementing Education 5.0 principles across diverse educational contexts and stress the need for continuous evaluation of these models to ensure they align with evolving societal demands. The review identifies several challenges to the adoption of Education 5.0, including resistance to change within educational institutions, limited resources for new technologies, and the necessity for faculty development to effectively incorporate innovative teaching methods. The integration of technologies such as artificial intelligence, big data, and the Internet of Things (IoT) is recognized as crucial for creating immersive learning experiences that enhance student engagement and facilitate skill development.

In the article by Babu (2024), several key components of Education 5.0 are explored in depth. These include value-based education, research-driven learning, project-based learning, experiential learning, and the importance of aligning educational practices with student aspirations. The article also highlights the need for flexibility in education, the integration of Industry 5.0, and the redesign of curricula to support these evolving demands. Furthermore, the article examines the interrelationship between teaching, learning, and evaluation processes, with a strong emphasis on outcome-based education. A particularly compelling section addresses the growing reliance of humanity on digital learning solutions in the near future. The article also discussed how a convergence of Information Technology (IT), Digital Technology (DT)—including Social Media, Mobile Networks, Analytics, and Cloud (SMAC)—and the Internet of Things (IoT) will reshape industries, both in terms of products and services. Through relevant examples, the article emphasizes how these technologies are not just enhancing, but transforming the way education and industry interact, ensuring that future generations are equipped for the digital age.

According to Saddik (2024), Education 5.0 is not merely a future vision but a transformative roadmap that prioritizes accessibility, inclusivity, and personalization. This educational era aims to equip learners of all ages with the adaptability and skills required to succeed in this constantly evolving world. Personalization in learning, supported by technology allows the expansion of knowledge, skills, and understanding. As highlighted by Shemsack and Spector (2020), technology plays a pivotal role in personalizing the learning experience, which, in turn, enhances the effectiveness of education. Ahmad et al. (2023) further suggest that this personalized learning approach, enabled by technology, can improve overall learning outcomes.

In the article From Traditional Teaching to the Digital Age, Martines (2024) presents Education 5.0 as a strategic approach that integrates advanced technologies with a focus on creating a more human-centered educational experience. This model emphasizes the comprehensive development of students, balancing the acquisition of technical skills with the cultivation of crucial interpersonal and socio-emotional competencies. According to the article, digital literacy in Education 5.0 includes skills such as coding, computational thinking, and the effective use of artificial intelligence. At the same time, it equally prioritizes emotional and social intelligence, highlighting competencies such as responsibility, collaboration, empathy, creativity, and resilience. These dual dimensions—technical expertise and socio-emotional skills—are considered vital for preparing students to navigate complex global challenges and contribute meaningfully to their communities in an increasingly interconnected, technology-driven world.

In the study of Wardhana, M.G. (2024) the results showed that students' digital intelligence, creativity, and collaborative skills improved. The implementation of Education 5.0, which embraces technology and innovative learning methodologies, facilitates a more dynamic and interactive learning environment, increasing student motivation and participation in the learning process. Judijanto (2024), Students engaged in an Education 5.0-based curriculum demonstrated enhanced performance in complex problem-solving, critical thinking, and teamwork compared to those following traditional instructional approaches. The findings also emphasize the

critical role of educators as facilitators in promoting student innovation and creativity particularly through the integration of technology and project-based learning strategies. By enriching learning experiences, Education 5.0 equips students with essential skills to navigate future challenges, highlighting the importance of transitioning to a more flexible and adaptive educational model that prepares students for success in an increasingly dynamic, globalized society.

In their qualitative literature study, Dermawan & Surmani (2024) analyzed academic literature to explore the impact of technology on curriculum development that aligns with 21st-century skills. This study emphasizes the evolving role of teachers as facilitators in digital learning environments and examines the implementation of technology in interactive learning modalities, such as e-learning and game-based learning.The findings underscore the necessity for enhancing digital skills among teachers to effectively integrate technology into their teaching practices. Furthermore, the research identifies significant challenges related to technology accessibility and the digital divide among students, which can hinder equitable learning opportunities.

According to Chairunnisa & Muawanah (2024) The adoption of Industry 5.0 technologies and practices in education raises the possibility of Education 5.0. It has paved the way for the widespread adoption of digital learning systems. These innovative platforms have the potential to provide personalized learning experiences, tailored to the unique needs and preferences of each student. This systematic review aims to get an overview of the implementation of personalized learning and assessment using educational technology in Education 5.0. The participants came from various educational backgrounds, such as elementary or high schools and universities. All studies in this systematic review have employed different approaches. The researchers also find that the implementation of personalized learning and assessment using educational technologies has experienced some challenges. This review does not cover all countries but the findings will be contributing to the literature expansion.

The integration of technology has been shown to create interactive and customized learning experiences. Digital platforms and collaborative software facilitate communication and collaboration, thereby enhancing student engagement and motivation (Lee & Wang, 2024). As Aslam et al. (2024) note, Education 5.0 not only prepares students for the future but also empowers them to shape it. A shift toward integrating technology with human-centered skills is essential for workforce readiness. Education 5.0 focuses on critical thinking, creativity, collaboration, and emotional intelligence, which are essential for success in both personal and professional spheres (Fousiya & Mohammed, 2022).

The findings of the review by Ali Rind, Asad & Sherwani (2024) revealed that limited study has been carried out in the context of digital self-efficacy in the context of education 5.0. It was found that previous studies were only focusing general digital self-efficacy through traditional ways. Moreover, findings revealed there is lack of research on digital self-efficacy pre-service teachers in the realm of education 5.0 paradigm in the literature. More specifically, the results revealed that implementation of education 5.0 into teacher preparation programmes faces numerous challenges, including a lack of technological approach, poor digital infrastructure, the digital divide, a paucity of professional training opportunities for teachers and a lack of importance in policies. This synthesis of the literature review has practical implications for pre-service teachers along with policymakers. Pre-service teachers are required to increase their digital skills for the reason that they could teach the advanced generation.

According to Boonmoh, Jumpakate & Karpklon (2024), In the digital age, technology plays a crucial role in the creation and exchange of knowledge within education. When effectively integrated into educational settings, technology can enhance teachers' expertise while supporting student learning and motivation. Over the past decade, social networking—along with its integration with online games and educational content—has been introduced into classrooms as a tool to facilitate teaching (Johnson & Germain-Froese, 2016). Many of these tools are free and user-friendly, enabling teachers to easily create engaging learning content. However, their educational value is not inherent; they become meaningful only when teachers incorporate them into the learning process. Ultimately, the decision to use technology in the classroom is often shaped by each teacher’s individual perceptions and approach.

An article by uQuiao (2024) Education 5.0 represents a transformative shift in educational paradigms,

characterized by the integration of advanced digital technologies with a strong emphasis on social and emotional development. Building on the framework established by Education 4.0, this progressive approach extends beyond the mere incorporation of emerging technologies to prioritize personalized, human-centered learning experiences. It seeks to create an educational ecosystem that not only equips students with critical digital competencies but also fosters the development of essential interpersonal and emotional skills, thereby addressing both the cognitive and socio-emotional needs of learners in an increasingly complex and technology-driven world.

Afikah, A., Rohaeti, E., and Jumadi, J. (2022) conducted a study aimed at exploring effective learning strategies that foster innovation in education, particularly focusing on the enhancement of Higher Order Thinking Skills (HOTS) and communication abilities among students. Their systematic review examined various pedagogical approaches, emphasizing the limitations of traditional methods in developing these critical skills. The authors identified problem-based learning (PBL) and inquiry-based learning (IBL) as particularly effective in promoting critical thinking and improving communication. These innovative approaches encourage active engagement, problem-solving, and collaboration, which are essential for success in today's educational landscape. The study concludes that adopting these strategies can significantly enhance students' cognitive and communicative competencies better preparing them for the demands of modern education and the professional world.

The study A Systematic Review of the Design of Serious Games for Innovative Learning: Augmented Reality, Virtual Reality, or Mixed Reality, conducted by Lap-Kei Lee et al. (2024), examines the integration of serious games in education, focusing on advanced technologies like augmented reality (AR), virtual reality (VR), and mixed reality (MR). Serious games are interactive digital tools designed to engage learners while achieving educational objectives, improving motivation, engagement, and skill development. The review highlights that serious games effectively enhance various learning outcomes, including knowledge retention, understanding complex concepts, and developing cognitive and motor skills. The interactive nature of these games fosters active learning, creating immersive environments that encourage deeper engagement. The study emphasizes the transformative potential of AR and VR in education, advocating for their broader use to create more engaging and effective learning experiences.

Diestro (2022) emphasized the significant impact of value creation and academic productivity on students' learning readiness in the Education 5.0 era. Teachers are encouraged to enhance collaborative-based learning tasks to fully unlock students' potential and establish structured learning pathways. Wardhana (2024) found that students engaged in an Education 5.0 curriculum exhibited improved performance in complex problem-solving, critical thinking, and teamwork compared to traditional educational approaches. This suggests that educators, as facilitators, play a crucial role in fostering innovation and creativity through technology and project-based learning approaches.

Education 5.0 encourages collaborative projects and interdisciplinary problem-solving. These methods equip students with the teamwork, communication, and integration of knowledge needed for real-world challenges. Research indicates that such collaborative learning experiences significantly enhance social skills and cultural competence (Martins, 2023). Erlkollar & Oberer (2024) further highlight how Education 5.0 fosters interdisciplinary learning and the development of essential 21st-century skills. Their study on the incorporation of LEGO Serious Play (LSP) demonstrated how it enhances creativity, collaboration, and critical thinking among students.

Innovative teaching strategies don't always mean introducing the latest and greatest technology into the classroom. Instead, innovative teaching is the process of proactively introducing new teaching strategies and methods into the classroom. The purpose of introducing these new teaching strategies and methods is to improve academic outcomes and address real problems to promote equitable learning (Thompson, 2023). A study conducted in China highlighted that innovative teaching practices, which include student-centered learning and critical thinking, significantly enhance student motivation and mental well-being (Lee & Wag, 2024). The effectiveness of online and offline interactive strategies, such as video performances and the use of platforms like TikTok and Google Classroom, was rated as "excellent" in improving student engagement and academic performance (Soro, 2022).

The findings of Taleb's (2021) study revealed that 91.1% of students believe their teachers employ some innovative and interactive teaching methods in the classroom. However, 70.3% of respondents expressed the need for continuous training for teachers on these methods, highlighting a significant concern. Additionally, the study underscores the importance of shifting from a traditional focus on teaching to a learner-centered approach, aiming to make learning more enjoyable and memorable. The results contribute to the literature by emphasizing the use of innovative and interactive teaching strategies within Mauritanian higher education institutions.

The study by Paragae (2023), it was found that innovative learning strategies are student-centered, with students actively engaged in constructing their own knowledge. These strategies are designed not only to foster deeper learning but also to equip students with the essential skills needed in the digital and global era. The study highlights that innovative learning strategies offer numerous benefits, particularly in the context of language acquisition. Common strategies used in teaching English as a foreign language include cooperative learning, problem-based learning, and project-based learning. In terms of assessment, innovative learning emphasizes authentic research, ensuring that students can apply the knowledge they have gained in real-world situations.

Nearpod is an innovative educational tool that enhances the learning experience by facilitating interactive lessons, which have been shown to capture students' attention more effectively than traditional, passive teaching methods. Unlike conventional approaches, which often rely on lecture-based instruction and one-way communication. Nearpod allows for real-time interaction, enabling students to actively participate in their learning through multimedia presentations, quizzes, polls, and collaborative activities. Buttrey (2021) demonstrated that active learning strategies, such as those supported by platforms like Nearpod, can significantly improve student engagement, comprehension, and retention. By integrating a variety of digital resources, including videos, virtual field trips, and assessments, Nearpod not only fosters greater student involvement but also provides teachers with valuable data on student performance, allowing for more personalized and adaptive instruction. This shift from passive to active learning aligns with current educational theories that emphasize student-centered, technology-enhanced pedagogies, offering a dynamic approach to modern education.

According to Querashi & Jamil (2023), Teachers have a positive perception about innovative teaching strategies because they have witnessed their impact on students' learning outcomes. Innovative teaching strategies promote active participation by students in the learning process, which is crucial for their academic success. The study recommends that educational institutions should provide adequate resources and training to teachers enabling them to implement innovative teaching strategies effectively.

A study conducted in the Philippines found that collaborative, constructivist, inquiry-based, integrative, and reflective teaching strategies significantly enhanced student engagement and knowledge construction, particularly in Filipino subjects (Marasigan et al., 2019). Although it primarily focused on Thailand, this study provides some insights relevant to the Philippines by demonstrating how innovative teaching approaches can significantly enhance student performance in science subjects. The research compared traditional teaching methods with innovative techniques and found that students exposed to innovative strategies performed better in assessments (Yawman, 2019).

In a natural classroom setting, innovative teaching strategies emerge as teachers adjust their methods to better engage students and meet diverse learning needs. Educators integrate technology, collaborative learning, and project-based approaches to foster critical thinking and active participation. This adaptable approach aligns with the principles of Education 5.0, emphasizing personalized, technology-supported, student-centered learning to prepare students for future challenges.

Hence, innovative teaching strategies are essential in today’s education. Integrating Education 5.0 may be a valuable approach to expanding teachers' perspectives in lesson design and strategy development. However, given the challenges in teaching quality among pre-service elementary teachers, many struggle to understand how Education 5.0 can enhance their teaching strategies. While some are aware of its concepts, others may not realize they are already applying its principles, which limits their ability to fully leverage its benefits. Therefore, this study seeks to explore pre-service elementary teachers' understanding of how they can develop and apply the best innovative teaching strategies using the future of education, Education 5.0.

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume IX Issue VII July 2025

Statement of the Problem

This study aims to explore the futures thinking and foresight of pre-service elementary teachers enrolled at Pangasinan State University, San Carlos Campus, during the AY 2024–2025, particularly regarding their innovative teaching strategies.

Specifically, the study answered the following problems:

1. What elements of futures thinking are commonly incorporated by the pre-service teachers in their lessons in terms of:

    a. strategic foresight
    b. design thinking; and
    c. sense-making

2. What are the foresight styles of the pre-service teachers based on their cognitive approach to futures thinking?

3. What are the most frequently reported innovative teaching strategies used by the pre-service teachers?

4. What are the perceived barriers to implementing innovative teaching strategies among pre-service teachers?

5. What is the level of knowledge of the pre-service elementary teachers about Education 5.0 in terms of:

    a. personalized learning
    b. integration of technology
    c. global learning; and
    d. social and emotional development

Research Methodology

The research design for the study titled “Future's Thinking and Foresight on the Innovative Teaching Strategies of the Pre-Service Elementary Teachers towards Education 5.0" will utilize a quantitative descriptive research design. This study systematically assessed the awareness and understanding of pre-service elementary teachers enrolled at Pangasinan State University during the academic year 2024–2025. The study involved collecting numerical data through structured surveys, which included close-ended questions designed to evaluate participants' futures thinking and foresight on their innovative teaching strategies towards Education 5.0.

This research design aims not only to provide valuable insights into how futures thinking influences future educators' instructional methodologies but also to contribute to the broader discourse on educational practices in a technology-driven era. By focusing on both awareness and practical application, this study seeks to highlight the importance of integrating modern educational frameworks into teacher training programs, ultimately preparing pre-service teachers to meet the challenges of contemporary classrooms.

Population/Sample Research Participants

The respondents of this study is consist of 153 pre-service elementary education students enrolled at the Pangasinan State University, San Carlos Campus during the academic year 2024-2025. The selection process employs a stratified sampling method designed to ensure a balanced representation of participants from various year levels and a wide range of academic performance levels. This approach systematically captures the diversity within the target population, enhancing the reliability and generalizability of the findings.

Instrumentation & Data Collection

The research instruments to be used to gather data for this study is a survey questionnaire. The primary objective of this survey is to gather insights from pre-service elementary teachers at PSU-SC regarding their familiarity

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume IX Issue VII July 2025

with Education 5.0 concepts and their experiences with it when it comes on developing their innovative teaching strategies. By examining these elements, the research sought to identify how pre-service elementary teachers perceive the integration of modern educational practices and technologies into their teaching methodologies. The survey questionnaire served as a vital tool for collecting data that can inform educational stakeholders about the current state of pre-service teacher training in relation to Education 5.0. By analyzing the responses, researchers identified gaps in knowledge, highlight successful strategies, and recommend improvements to teacher education curricula. The survey questionnaire designed for this research is a carefully structured instrument aimed at gathering meaningful data from future educators.

Analysis of Data

A variety of statistical treatments was used to analyze the datasets regarding the requirements of each research question. The following statistical procedure will be used to interpret the data gathered from respondents of the study.

For Problem 1, in determining the elements of future thinking commonly incorporated by the pre-service teacher in their lesson, the researchers will utilized the use of Likert Scale.

Interval Scale for Five-point Likert Scale

Rating Scale	Point Range	Descriptive Equivalent
5	4.51-5.00	Always
4	3.51-4.50	Often
3	2.51-3.50	Sometimes
2	1.51-2.50	Rarely
1	1.00-1.50	Never

To address Problem 2, which examine the foresight styles of pre-service teachers based on their cognitive approach to futures thinking, the use of Likert Scale is employed.

Rating Scale for the Foresight Styles of Pre-Service Teachers Based on Their

Rating Scale	Point Range	Descriptive Equivalent
5	4.51-5.00	Always
4	3.51-4.50	Often
3	2.51-3.50	Sometimes
2	1.51-2.50	Rarely
1	1.00-1.50	Never

For Problem 3, which examine the innovative teaching strategies used by the pre-service teachers, a checklist is being utilized here to know what strategies are frequently used.

For Problems 4 and Problem 5, to examine the perceive barriers and level of knowledge of the pre-service elementary teachers, a five-point Likert scale was used.

Rating Scale for the Perceived Barriers and Level of Knowledge of the Pre-service Elementary Teachers.

Rating Scale	Point Range	Descriptive Equivalent
5	4.51-5.00	Strongly Agree
4	3.51-4.50	Agree

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume IX Issue VII July 2025

3	2.51-3.50	Moderately Agree
2	1.51-2.50	Disagree
1	1.00-1.50	Strongly Disagree

RESULTS AND DISCUSSION

The study yielded several significant findings, which provide valuable insights into the topic at hand. These major findings shed light on the elements of futures thinking commonly incorporated by the pre-service teachers in their lessons, their foresight styles, innovative teaching strategies, perceived barriers to implementing innovative teaching strategies, and level of knowledge about Education 5.0.

Elements Of Futures Thinking Commonly Incorporated By The Preservice Teachers In Their Lessons

The elements of futures thinking commonly incorporated by the preservice teachers in their lessons in terms of strategic foresights, design thinking, and sense-making is presented in Table 1-4.

Table 1. Elements of Futures Thinking Commonly Incorporated By The Preservice Teachers In Their Lessons

n = 153

A. Strategic Foresight In Lessons	**N**	**R**	**S**	**O**	**A**
1. I incorporate real-world scenarios to help students anticipate possible future challenges.	0	0	15	54	**84**
	0.0%	0.0%	9.8%	35.3%	**54.9%**
2. I guide students in making long-term decisions by considering future consequences.	0	0	23	**65**	**65**
	0.0%	0.0%	15.0%	**42.5%**	**42.5%**
3. I encourage students to analyze trends and predict future developments related to the subject.	0	1	23	**68**	61
	0.0%	0.7%	15.0%	**44.4%**	39.9%
4. I use foresight tools like SWOT analysis, trend analysis, or scenario planning in my lessons.	1	3	34	**60**	55
	0.7%	2.0%	22.2%	**39.2%**	35.9%
5. I teach students how to evaluate multiple possible futures instead of assuming a single outcome.	1	1	29	58	**64**
	0.7%	0.7%	19.0%	37.9%	**41.8%**
Mean	**4.25**		**Often**		

Note: Boldface means highest frequency.

Legend: 1.00-1.50: Never (N), 1.51-2.50: Rarely (R), 2.51-3.50: Sometimes (S), 3.51-4.50: Often (O), 4.51-5.00: Always (A)

The extent to which preservice teachers integrate the elements of futures thinking into their lessons is presented in Table 1, with mean value of 4.25. This implies that, in general, the preservice teachers often integrate strategic foresight in their lessons.

Specifically, the data shows that the respondents have a strong preference for incorporating real-world scenarios to help students anticipate future challenges, with more than 50% of the respondents always utilizing this approach. This suggests a commitment to contextual learning, where lessons are designed to reflect real-life situations that students may encounter.

Likewise, guiding students in making long-term decisions by considering future consequences is a widely practiced strategy, with nearly equal number of respondents indicating they do so often (42.5%) or always

(42.5%). This highlights the emphasis on developing students' ability to think ahead and consider the impact of their choices. At the same time, many preservice teachers often (44.4%) to always (39.9%) encourage students to analyze trends and predict future developments related to their subject matter. These reinforces the importance of pattern recognition and critical thinking.

The use of foresight tools such as SWOT analysis, trend analysis, and scenario planning is somewhat less common compared to other strategies, though still relatively integrated into lesson planning. While a number of respondents employ these tools often (39.2%), fewer do so always (35.9%), which indicates room for greater utilization of structured forecasting techniques. Meanwhile, evaluating multiple possible futures rather than assuming a single outcome is another well-incorporated (41.8%) aspect of futures thinking.

According to the study Engaging Kindergarten Pre-Service Teachers in the Design and Implementation of STEM Lesson (2024) by Evagorou et al, hands-on experience allowed PSTs to engage directly with concepts, leading to a deeper comprehension of integrated teaching methods. PSTs who incorporated real-world problems observed increased student engagement and a more cohesive integration of disciplines.

In this study conducted by Ladson-Billings, Gay, & Howard (2024), they emphasize the importance of hands-on learning and real-world scenario approaches in preparing preservice teachers for culturally diverse classrooms. These experiential methods are central to bridging the gap between theory and practice in culturally relevant pedagogy. In particular, the study investigates how hands-on activities—such as immersive field experiences, cultural community engagements, and collaborative lesson planning—allow preservice teachers to develop a deeper understanding of their students' backgrounds and cultural contexts.

Based on the study conducted by Reibeirenha & Correia (2025), the impact of a flipped classroom approach incorporating hands-on activities and real-world problem-solving on preservice teachers' science teaching self-efficacy. The study shows that engaging preservice teachers in practical, scenario-based learning improves their confidence and ability to prepare students for real-life scientific challenges.

The extent to which preservice teachers integrate the elements of futures thinking into their lessons is presented in Table 2, with mean value of 4.25. This implies that, in general, the preservice teachers often integrate design thinking when it comes in their lessons.

Specifically, the data shows that the respondents have a strong preference for designing lessons that challenges students to rethink and improve existing systems, with about 47.1% of the respondents. This suggest that pre-service teachers like to utilize challenges in creating their lesson plans to measure their students thinking capabilities.

Table 2. Elements of Futures Thinking Commonly Incorporated By The Preservice Teachers In Their Lessons

n = 153

B. Design Thinking In Lessons	**N**	**R**	**S**	**O**	**A**
1. I design lessons that challenge students to rethink and improve existing systems.	0	1	21	**72**	59
	0.0%	0.7%	13.7%	**47.1%**	38.6%
2. I encourage students to identify and define problems before proposing solutions.	0	2	20	60	**71**
	0.0%	1.3%	13.1%	39.2%	**46.4%**
3. I use activities that require students to generate creative and innovative solutions.	0	2	19	**67**	65
	0.0%	1.3%	12.4%	**43.8%**	42.5%
4. I emphasize hands-on learning where students can prototype and test their ideas.	0	1	24	**69**	59
	0.0%	0.7%	15.7%	**45.1%**	8.6%
5. I encourage students to empathize with different perspectives	0	0	22	**66**	65

when solving problems.	0.0%	0.0%	14.4%	**43.1%**	42.5%
Mean	**4.25**		**Often**		
Note: Boldface means highest frequency.					
Legend: 1.00-1.50: Never (N), 1.51-2.50: Rarely (R), 2.51-3.50: Sometimes (S), 3.51-4.50: Often (O), 4.51-5.00: Always (A)					

The use of encouragement to students to identify problems before proposing solutions received a high level of Always responses, with approximately 46.4% of respondents selecting this indicator. This highlights that pre-service teachers consistently incorporate problem-solving approaches when designing their lesson plans.

At the same time, many pre-service teachers emphasize hands-on learning (45.1%) when designing their lessons. Additionally, approximately 43.85% of respondents often incorporate activities that require students to generate creative and innovative solutions. This suggests that pre-service teachers prioritize critical thinking and creativity which are the key components of futures thinking and design thinking pedagogies.

The use of encouragement to empathize with different perspectives when solving problems is somewhat less common utilized in designing a lesson plan. While a number of respondents employ these often (43.1%), fewer do so always (42.5%), which indicates room for other key elements in designing a lesson plan.

In the study conducted by Henderson (2023), challenging students to rethink is a critical pedagogical approach for meeting the diverse needs of students in elementary classrooms. This study investigates the use of a transparent lesson plan template designed to scaffold elementary preservice teachers' understanding and application of differentiated instruction.

In the study of the Anti-Defamation League (ADL) curriculum guides (2023), the researchers and curriculum developers provide a comprehensive framework for preservice teachers to design lesson plans that help students connect different pieces of information to form a bigger picture, particularly in the context of anti-bias education. The curriculum guides, which span elementary through high school levels, are structured to promote safe, respectful, and inclusive classroom environments by encouraging students to critically analyze identity, bias, and social justice issues.

In the study of Kim, Kim, and Lee (2024), the researchers investigated how preservice teachers design lesson plans through a learning-by-design approach, particularly focusing on the context of English language education in Korea. The study engaged 22 preservice teachers in a project where they were tasked with creating lesson plans for middle school English classes, emphasizing the integration of virtual and spatial learning environments.

In terms of Sense- Making, the elements of the futures thinking incorporated by the pre-service teacher are presented in Table 3, with the mean value of 4.25. This implies that, in general, the preservice teachers often integrate sense-making when it comes in their lessons.

Table 3. Elements of Futures Thinking Commonly Incorporated By The Preservice Teachers In Their Lessons

n = 153

C. Sense-Making In Lessons	**N**	**R**	**S**	**O**	**A**
1. I help students connect different pieces of information to form a bigger picture.	0	0	18	65	**70**
	0.0%	0.0%	11.8%	42.5%	**45.8%**
2. I guide students in identifying biases and assumptions in future-related discussions.	0	2	29	56	**66**
	0.0%	1.3%	19.0%	36.6%	**43.1%**
3. I encourage reflective thinking by asking students to explain	0	1	26	61	**65**

their reasoning and insights.	0.0%	0.7%	17.0%	39.9%	**42.5%**
4. I provide opportunities for students to interpret complex issues from multiple perspectives.	0	1	28	**63**	61
	0.0%	0.7%	18.3%	**41.2%**	39.9%
5. I encourage students to critically analyze current events and their potential impact on the future.	0	1	24	**66**	62
	0.0%	0.7%	15.7%	**43.1%**	40.5%
Mean	**4.25**		**Often**		
Note: Boldface means highest frequency.					
Legend: 1.00-1.50: Never (N), 1.51-2.50: Rarely (R), 2.51-3.50: Sometimes (S), 3.51-4.50: Often (O), 4.51-5.00: Always (A)					

Specifically, the data shows that approximately 45.8% of respondents consistently help students connect different pieces of information to form a bigger picture. This suggests that many pre-service teachers emphasize integrative thinking in their lesson planning, encouraging students to see relationships between ideas and develop a deeper and more holistic understanding of the content.

Additionally, guiding students to identify biases and assumptions in future-related discussions was widely practiced, with 43.1% of respondents indicating they "always" do this. A similar proportion, though under the "often" category, reported regularly encouraging students to critically analyze current events and consider their potential impact in the near future. This reflects a strong emphasis on cultivating critical thinking and futures thinking skills among pre-service teachers.

Encouraging reflective thinking by asking students to explain their reasoning and insights was consistently practiced, with 42.5% of respondents indicating they "always" use this approach. In contrast, providing opportunities for students to interpret complex issues from multiple perspectives received a lower frequency of "always" responses (39.9%), with a slightly higher percentage (41.2%) indicating they do this "often." This suggests that while reflective thinking is a common focus, there is slightly less consistency in promoting perspective-taking around complex issues.

In the study of Gentry, McLeskey, and Billingsley (2023), the researchers examined how preservice teachers design lesson plans that connect different pieces of information to form a bigger picture, particularly through the use of a transparent lesson plan template focused on differentiated instruction. The study involved elementary preservice teachers enrolled in a teacher preparation program, where they were introduced to a structured lesson plan template designed to support the integration of multiple instructional elements.

Kim et al. (2024) observed that this approach helped preservice teachers develop a more holistic view of teaching and learning. By intentionally designing lessons that connected different content areas and skills, the preservice teachers enabled their students to see the relationships between pieces of information and to build a more comprehensive understanding of the subject matter. The study highlighted that such lesson designs fostered higher-order thinking and promoted deeper engagement, as students were challenged to make connections and construct meaning actively.

Table 4: Summary Table of the Elements of Futures Thinking Commonly Incorporated By The Preservice Teachers In Their Lessons

n = 153

Elements	**Mean**	**Descriptive Equivalent**
A. Strategic Foresight In Lessons	4.25	Often
B. Design Thinking In Lessons	4.25	Often
C. Sense-Making In Lessons	4.25	Often

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume IX Issue VII July 2025

Grand Mean	4.25	Often
Legend: 1.00-1.50: Never (N), 1.51-2.50: Rarely (R), 2.51-3.50: Sometimes (S), 3.51-4.50: Often (O), 4.51-5.00: Always (A)		

The elements of Futures Thinking commonly incorporated by pre-service teachers in their lessons specifically in terms of Strategic Foresight, Design Thinking, and Sense-Making has an overall mean of 4.25. This indicates that these elements are generally incorporated often in their lesson planning and instructional practices.

Foresight Styles Of Pre-Service Teachers Based On Their Cognitive Approach To Futures Thinking

The foresight styles of pre-service teachers based on their cognitive approach to futures thinking in terms of Analytic, Intuitive, Adaptive, Creative, Strategic, Methodological, and Scenario are presented in Table 5-7

Table 5. Foresight Styles of Pre-service Teachers based on their Cognitive Approach to Futures Thinking

n = 153

Analytic	**N**	**R**	**S**	**O**	**A**
1. I use historical data and past experience to anticipate future outcomes.	0	5	34	**65**	49
2. I critically evaluate the potential impact of a new teaching method or technology before using it.	1	5	30	**63**	54
Mean	**4.05**			**Often**	
Intuitive	**N**	**R**	**S**	**O**	**A**
1. I rely on instincts and personal beliefs to make future-related decisions.	1	5	28	**74**	45
2. I can quickly recognize emerging trends in student behavior and adjust my teaching strategies accordingly.	1	2	30	**67**	53
Mean	**4.07**			**Often**	
Note: Boldface means highest frequency.					
Legend: 1.00-1.50: Never (N), 1.51-2.50: Rarely (R), 2.51-3.50: Sometimes (S), 3.51-4.50: Often (O), 4.51-5.00: Always (A)					

The foresight styles of pre-service teachers, based on their cognitive approaches to futures thinking, are presented in Table 5. These styles are categorized into seven dimensions: Analytic, Intuitive, Adaptive, Creative, Strategic, Methodological, and Scenario.

In the Analytic aspect, 65 pre-service teachers demonstrate a tendency to use historical data and past experiences to anticipate future outcomes. Also, 63 of them critically evaluate the potential impact of new teaching methods or technologies before incorporating them into their instructional practices. This style recorded a mean score of 4.05, indicating that it is often used as a preferred foresight approach.

For the Intuitive foresight style, most pre-service teachers reported that they often rely on instincts and personal beliefs when making future-related decisions. They are also able to quickly recognize emerging trends in student behavior and adjust their teaching strategies accordingly. This style recorded a mean score of 4.07, indicating that it is also often used as a preferred approach to foresight.

The article titled Intuitive Thinking is Future Thinking (2024) explores the role of intuitive thinking in strategic foresight and future-oriented decision-making, emphasizing how the intuitive mind generates ideas and possibilities that the analytical mind later develops. It argues that in times of profound uncertainty and change, intuitive thinking is crucial for envisioning and imagining futures that do not yet exist, complementing analytical thinking which relies on past data.

Based on the quasi-experimental study of Guo, Jantharajit & Thongpanit (2024), the effectiveness of an instructional approach integrating collaborative and reflective learning to enhance students' analytical and critical thinking skills. Analytical thinking was defined as the ability to integrate complex information into well-explained statements, involving hypothesis formulation, supporting ideas, and confutation.

In the Adaptive aspect, pre-service teachers typically prepare for uncertainty by developing flexible teaching strategies, with 73 respondents supporting this approach. Additionally, 66 respondents believe that flexibility in teaching is essential for student success in a rapidly changing world. This style recorded a mean score of 4.01, indicating that it is often used as a preferred foresight approach.

For the Creative aspect, most pre-service teachers expressed a willingness to take risks and try new teaching strategies that may lead to innovative solutions, with 72 responses affirming this. Meanwhile, 67 respondents reported focusing on developing innovative ideas to shape future educational practices. This style recorded a mean score of 3.98, also suggesting it is often used as a preferred foresight approach.

Table 6. Foresight Styles of Pre-service Teachers based on their Cognitive Approach to Futures Thinking

n = 153

Adaptive	**N**	**R**	**S**	**O**	**A**
1. I believe that flexibility in teaching is essential for student success in a rapidly changing world.	2	2	33	**66**	50
2. I prepare for uncertainty by developing flexible teaching strategies.	1	7	29	**73**	43
Mean	**4.01**			**Often**	
Creative	**N**	**R**	**S**	**O**	**A**
1. I am willing to take risks and try new teaching strategies that may lead to innovative solutions.	2	2	36	**72**	41
2. I focus on developing innovative ideas to shape future educational practices.	0	4	37	**67**	45
Mean	**3.98**			**Often**	

Note: Boldface means highest frequency.

Legend: 1.00-1.50: Never (N), 1.51-2.50: Rarely (R), 2.51-3.50: Sometimes (S), 3.51-4.50: Often (O), 4.51-5.00: Always (A)

In the study of strategic foresight, this research investigates how cultivating future-centric mindsets empowers individuals and organizations to anticipate and adapt to potential futures effectively. It underscores critical mindset shifts-from reactive to proactive approaches and from linear to dynamic thinking-that closely align with adaptive thinking as a key foresight style. Furthermore, the study emphasizes the vital roles of continuous learning, adaptability, and systemic mindfulness in successfully navigating volatile, uncertain, complex, and ambiguous (VUCA) environments.

Another meta-analysis rigorously evaluated the impact of creativity training programs on university students, providing strong evidence that targeted, well-designed interventions significantly improve creative capacities within higher education contexts.

Table 7. Foresight Styles of Pre-service Teachers based on their Cognitive Approach to Futures Thinking

n = 153

Strategic	**N**	**R**	**S**	**O**	**A**
1. I regularly monitor technological and societal trends to predict future needs.	1	0	27	**65**	60

2. I incorporate future educational trends into my teaching strategies.	1	3	25	**74**	50
Mean	**4.15**			**Often**	
Methodological	**N**	**R**	**S**	**O**	**A**
1. I prefer to use a structured approach (e.g. research reviews, expert consultations) to evaluate the effectiveness of new teaching methods.	0	5	26	53	**69**
2. I prefer systematic approaches like SWOT analysis to assess future risks.	1	4	28	**65**	55
Mean	**4.16**			**Often**	
Scenario	**N**	**R**	**S**	**O**	**A**
1. I would integrate differentiated instruction to cater to varying learning styles and abilities.	0	5	30	**63**	55
2. I create alternative future scenarios to prepare for different possibilities.	1	2	27	**70**	53
Mean	**4.11**			**Often**	
Note: Boldface means highest frequency.					
Legend: 1.00-1.50: Never (N), 1.51-2.50: Rarely (R), 2.51-3.50: Sometimes (S), 3.51-4.50: Often (O), 4.51-5.00: Always (A)					

In the Strategic foresight style, 74 pre-service teachers reported that they incorporate future educational trends into their teaching strategies. Additionally, 65 respondents indicated that they regularly monitor technological and societal trends to anticipate future needs. This style recorded a mean score of 4.15, indicating that it is often used as a preferred foresight approach.

In the Methodological aspect, 69 pre-service teachers stated that they prefer using a structured approach to evaluate the effectiveness of new teaching methods. Likewise, 65 respondents reported favoring systematic methods, such as SWOT analysis, to assess potential future risks. This foresight style had the highest mean score of 4.16, signifying that it is often and consistently used by pre-service teachers.

Finally, in the Scenario-based foresight style, most pre-service teachers (70 respondents) create alternative future scenarios to prepare for different possibilities. Additionally, 63 respondents reported integrating differentiated instruction to address diverse learning styles and abilities. This style recorded a mean score of 4.11, again reflecting that it is often used as a preferred approach to futures thinking.

The study Approaches to Empowering Preservice Teachers to Enact Culturally Relevant Pedagogy highlights the importance of hands-on learning and real-world scenarios, drawing on scholars like Ladson-Billings, Gay, and Howard (2024). Experiential methods-such as immersive fieldwork, community engagement, and collaborative lesson planning-help preservice teachers deepen their understanding of students' cultural backgrounds. These authentic experiences foster critical self-reflection and the development of culturally responsive teaching strategies. Findings show that preservice teachers involved in these practices gained greater confidence, adaptability, and competence in applying culturally relevant pedagogy in diverse classrooms.

Cabanes, Roger, and Doganova's (2023) Polytechnique Insights study provides critical insights into methodological thinking as a foresight style, framing foresight as a structured set of practices designed to inform present action through systematic future-oriented analysis. This research delves into the diversity of foresight methodologies, categorizing them into predictive, exploratory, and prescriptive approaches, and highlights the scenario method as an essential tool for strategic planning amidst uncertainty. The study's findings suggest that methodological rigor in foresight enables organizations to effectively navigate complex future landscapes by integrating diverse analytical techniques and systematically considering a range of potential outcomes.

Table 8. Foresight Styles of Pre-service Teachers based on their Cognitive Approach to Futures Thinking		
n = 153		
Foresight Styles	**Mean**	**Descriptive Equivalent**
1. Analytic	4.05	Often
2. Intuitive	4.07	Often
3. Adaptive	4.01	Often
4. Creative	3.98	Often
5. Strategic	4.15	Often
6. Methodological	4.16	Often
7. Scenario	4.11	Often
Legend: 1.00-1.50: Never (N), 1.51-2.50: Rarely (R), 2.51-3.50: Sometimes (S), 3.51-4.50: Often (O), 4.51-5.00: Always (A)		

The Foresight Styles of pre-service teachers, based on their cognitive approaches to future teaching, are categorized into seven distinct styles. These styles help identify how pre-service teachers think and plan for the future in educational settings. Based on the data, the three most commonly used foresight styles are: Methodological (4.16), Strategic (4.15), and Scenario-Based (4.11). These results suggest that pre-service teachers tend to prefer structured, forward-thinking, and adaptive approaches when preparing for future classroom challenges.

Meanwhile, the Creative (3.98), Adaptive (4.01), and Analytic (4.05) foresight styles are the least used among pre-service teachers. Although these styles still fall within the "often used" range, they are comparatively less preferred than the Methodological, Strategic, and Scenario-Based styles. This suggests that while pre-service teachers do engage in innovative and flexible thinking, they tend to rely more heavily on structured and trend-driven approaches when planning for the future of education.

Innovative Teaching Strategies Used by The Preservice Teachers

The innovative teaching strategies employed by pre-service teachers are presented in Table 9. These strategies were identified through a checklist-based data collection method, allowing respondents to indicate which approaches they commonly use in their teaching practices.

Specifically, most pre-service teachers use Cooperative Learning as their primary teaching strategy, with 88.9% of respondents indicating its use, making it the most commonly adopted approach among the strategies presented. Visualization and Inquiry-Based Learning also showed high usage, with a combined total of 72.9% of responses.

Additionally, the three least used strategies by pre-service teachers are Flipped Classroom (49.7%), Mind Mapping (45.1%), and Phenomenon-Based Learning (37.3%). This suggests that even if its innovative, these approaches may be less familiar or less frequently applied in their current teaching practices.

Table 9. Innovative Teaching Strategies Used by the Preservice Teachers			
n = 153			
Teaching Strategies	**Frequency**	**Percent**	**Rank**
Augmented and Virtual Reality (AR/VR)	79	51.6%	12
Blended Learning	95	62.1%	9

Cooperative Learning	136	88.9%	1
Differentiation	104	68.0%	7
Flipped Classroom	76	49.7%	13
Experiential Learning	110	71.9%	4
Explicit Teaching	83	54.2%	11
Gamification	105	68.6%	6
Inquiry-Based Learning	111	72.5%	2.5
Mind Mapping	69	45.1%	14
Peer Teaching	109	71.2%	5
Phenomenon Based Learning	57	37.3%	15
Problem-based Learning	103	67.3%	8
Project-Based Learning (PBL)	92	60.1%	10
Visualization	111	72.5%	2.5

On to recent research and expert analysis (2024), phenomenon-based learning (PhenoBL) is an educational approach that emphasizes direct engagement with real-world phenomena, centering learning around students' actual experiences and observations.

Based on the Approaches and Techniques of Phenomenon-Based Learning (2025), this approach connects academic content to real-world issues, making learning more meaningful and engaging for students. The study highlights that PheBL systematically integrates multiple disciplines, which improves both teaching practices and student learning outcomes. It is especially effective in developing students' critical thinking skills and preparing them to solve complex, real-world problems.

Perceived Barriers In Implementing Innovative Teaching Strategies

The perceived barrier in implementing innovative teaching strategies in terms of Lack of Knowledge and Skills, Perceived Lack of Support, Resource Constraints, Concerns about Student-related Factors, and Lack of Time for Reflection and Planning are presented in Table 10-14.

Table 10. Perceived Barriers in Implementing Innovative Teaching Strategies

n = 153

A. Lack Of Knowledge And Skills	**SD**	**D**	**MA**	**A**	**SA**
1. I feel I lack sufficient knowledge about innovative teaching strategies	9	35	**61**	36	12
	5.9%	22.9%	**39.9%**	23.5%	7.8%
2. I am unsure how to manage a classroom when using innovative teaching strategies.	15	38	**55**	35	10
	9.8%	24.8%	**35.9%**	22.9%	6.5%
3. I am not confident in my ability to design lesson plan that incorporates innovative teaching strategies.	18	41	**55**	26	13
	11.8%	26.8%	**35.9%**	17.0%	8.5%
Mean	**2.93**	**Encountered**			

Note: Boldface means highest frequency.

Legend: 1.00-1.50: Not Encountered (NE), 1.51-2.50: Sometimes Encountered (SE), 2.51-3.50: Encountered (E), 3.51-4.50: Highly Encountered (HE), 4.51-5.00: Very Highly Encountered (VHE)

The perceived barriers in implementing innovative teaching strategies among pre-service teachers in terms of Lack of Knowledge and Skills are presented in Table 10, which shows an overall mean value of 2.93. This indicates that, in general, many pre-service teachers face challenges in applying innovative teaching approaches in the classroom.

Specifically, in terms of lack of knowledge and skills, 39.9% of respondents reported feeling that they do not have sufficient knowledge about innovative teaching strategies. This suggests that a significant portion of pre-service teachers are not yet fully familiar with what these strategies entail.

Additionally, approximately 35.9% of respondents expressed uncertainty about how to manage a classroom when using innovative teaching strategies. A similar percentage also reported lacking confidence in their ability to design lesson plans that incorporate these methods. These findings highlight a need for further training and support to build both competence and confidence in implementing innovative instructional practices.

The British Antarctic Survey (BAS) has outlined an Innovation and Impact strategy (2023-2025) emphasizes a strong innovation culture, adoption of novel technologies, and partnerships to address challenges like net-zero carbon emissions. This strategy focuses on leveraging assets and prioritizing impactful innovation despite resource constraints.

Table 11. Perceived Barriers in Implementing Innovative Teaching Strategies

n = 153

B. Perceived Lack Of Support	**SD**	**D**	**MA**	**A**	**SA**
1. I fear negative evaluations from supervisors if I try innovative teaching strategies.	11	44	41	**47**	10
	7.2%	28.8%	26.8%	**30.7%**	6.5%
2. I feel there is a lack of professional development opportunities focused on innovative teaching.	13	40	**55**	32	13
	8.5%	26.1%	**35.9%**	20.9%	8.5%
3. There is not enough collaboration among pre-service teachers to share ideas about innovative teaching.	17	42	**46**	39	9
	11.1%	27.5%	**30.1%**	25.5%	5.9%
Mean	**2.94**	**Encountered**			

Note: Boldface means highest frequency.

Legend: 1.00-1.50: Not Encountered (NE), 1.51-2.50: Sometimes Encountered (SE), 2.51-3.50: Encountered (E), 3.51-4.50: Highly Encountered (HE), 4.51-5.00: Very Highly Encountered (VHE)

In terms of perceived lack of support, with the mean score of 2.94, most pre-service teachers moderately agree that they encounter lack of professional development opportunities focused on innovative teaching strategies. This suggests that limited access to targeted training and workshops may hinder their ability to effectively implement these approaches in their teaching practice.

Some pre-service teachers expressed fear of negative evaluations from supervisors, with 30.7% indicating this concern. This suggests a lack of confidence in implementing innovative teaching strategies, possibly due to fear of making mistakes or deviating from traditional methods. Additionally, 30.1% of respondents reported a lack of collaboration among peers and higher ups in sharing ideas about these strategies. This points to limited opportunities for professional dialogue and peer support, which are essential for building confidence and competence in adopting innovative practices.

A qualitative study in Türkiye (2024) found that teachers face significant challenges including inadequate pre-service and in-service education, lack of funding, poor planning, inconsistent educational policies, and negative attitudes from school managers. These factors contribute to insufficient professional development opportunities and hinder teachers' growth. However, opportunities such as international exposure, mentorship, and digital skill development were noted as beneficial when available.

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume IX Issue VII July 2025

A systematic review highlights that lack of customized, ongoing, and well-supported PD in digital instructional integration leads to low teacher confidence and limited use of technology in classrooms. Conversely, lack of such support perpetuates digital skill gaps and resistance to technology adoption.

In terms of resource constraints, with the mean score of 3.34, most pre-service teachers moderately agree that they encounter limitations when implementing innovative teaching strategies in the teaching process. This indicates that a lack of access to necessary materials, tools, or infrastructure may hinder their ability to effectively apply these strategies in classroom settings.

Table 12. Perceived Barriers in Implementing Innovative Teaching Strategies

n = 153

C. **Resource Constraints**	**SD**	**D**	**MA**	**A**	**SA**
1. I believe there is a lack of funding to support innovative teaching projects.	7	24	**62**	43	17
	4.6%	15.7%	**40.5%**	28.1%	11.1%
2. I worry about the time required to prepare and implement innovative lessons.	4	20	**67**	41	21
	2.6%	13.1%	**43.8%**	26.8%	13.7%
3. I am concerned about the availability of necessary technology for implementing innovative teaching.	6	14	**63**	52	18
	3.9%	9.2%	**41.2%**	34.0%	11.8%
Mean	**3.34**	**Encountered**			

Note: Boldface means highest frequency.

Legend: 1.00-1.50: Not Encountered (NE), 1.51-2.50: Sometimes Encountered (SE), 2.51-3.50: Encountered (E), 3.51-4.50: Highly Encountered (HE), 4.51-5.00: Very Highly Encountered (VHE)

A significant portion of pre-service teachers (43.8%) express concern that the time required to prepare and implement innovative teaching strategies may not be sufficient. This highlights time constraints as a key barrier, suggesting that the demands of lesson planning, combined with limited preparation time, can discourage the use of more creative and student-centered approaches.

About 41.2% of pre-service teachers expressed concern about the availability of necessary technology for implementing innovative teaching strategies. Additionally, approximately 40.5% of respondents believe there is a lack of funding to support such projects. These findings emphasize that access to adequate technological resources and financial support are significant barriers to the effective integration of innovative practices in the classroom.

Reduced funding worsens problems like overcrowded classrooms, teacher shortages, and lack of reforms, all of which impede the implementation of innovative teaching strategies. Insufficient investment in infrastructure and digital tools limits teachers' ability to adopt new pedagogies and technology-enhanced learning, perpetuating poor student performance and the learning crisis.

Funding shortfalls also affect the hiring and retention of qualified teachers, especially in high-poverty or hard-to-staff schools, which are often the focus of innovative education projects. For example, federal funding cuts in the U.S. under proposals like Project 2025 threaten to eliminate hundreds of thousands of teaching positions, disproportionately impacting vulnerable students and undermining innovation efforts that rely on stable, skilled educators

In the study Educational Challenges in the Philippines: Resource Limitations and Disparities (2023), it is outlined that persistent resource issues in the Philippine education system, including a deficit of 91,000 classrooms for 2023-2024, insufficient funding for facilities and teacher salaries, and urban-rural disparities in educational quality. Rural schools face scarcity of qualified teachers and inadequate facilities, which perpetuate unequal access to quality education and specialized programs.

Table 13. Perceived Barriers in Implementing Innovative Teaching Strategies

n = 153

D. Concerns About Student-Related Factors	**SD**	**D**	**MA**	**A**	**SA**
1. I worry that my students may not be attentive to innovative teaching strategies.	3	20	**63**	48	19
	2.0%	13.1%	**41.2%**	31.4%	12.4%
2. I am concerned that innovative teaching strategies may not be effective for all learners.	5	26	**61**	41	20
	3.3%	17.0%	**39.9%**	26.8%	13.1%
3. I am concerned that innovative teaching strategies may not adequately prepare students for standardized test.	4	27	**54**	50	18
	2.6%	17.6%	**35.3%**	32.7%	11.8%
Mean	**3.34**	**Encountered**			

Note: Boldface means highest frequency.

Legend: 1.00-1.50: Not Encountered (NE), 1.51-2.50: Sometimes Encountered (SE), 2.51-3.50: Encountered (E), 3.51-4.50: Highly Encountered (HE), 4.51-5.00: Very Highly Encountered (VHE)

In terms of concerns about student-related factors, with the mean score of 3.34, most pre-service teachers moderately agree that they encounter challenges related to their students. This suggests that issues such as varying student attentiveness, effectiveness, or readiness to participate in innovative activities may affect the implementation of innovative teaching strategies.

Some pre-service teachers expressed concern about students being unattentive during the implementation of innovative teaching strategies, with approximately 41.2% of respondents indicating this. This suggests that student inattentiveness can negatively impact both the confidence of the teacher and the effectiveness of the strategies being used.

Additionally, some pre-service teachers expressed concerns that innovative teaching strategies may not be effective for all learners, with 39.9% indicating this belief. This reflects apprehension about meeting the diverse needs of students through non-traditional methods. Furthermore, 35.3% of respondents reported concern that innovative strategies may not adequately prepare students for standardized tests, suggesting that the pressure to meet testing benchmarks may limit their willingness to fully adopt these approaches.

Research on mature or non-traditional learners highlights that innovative methods may not fully address their unique needs. These learners often require teaching approaches that consider prior knowledge, cognitive differences, and real-world application. Innovative strategies that do not accommodate these factors may be less effective for adult learners.

A study on online learning engagement found that teaching strategies must be carefully tailored to maintain student motivation and participation, implying that innovative strategies are not inherently effective without contextual adjustments.

Table 14. Perceived Barriers in Implementing Innovative Teaching Strategies

n = 153

E. Lack Of Time For Reflection And Planning	**SD**	**D**	**MA**	**A**	**SA**
1. I lack sufficient time to plan and prepare innovative lessons	6	27	**62**	44	14
	3.9%	17.6%	**40.5%**	28.8%	9.2%
2. I don't have enough time to reflect on my teaching practices.	10	28	**65**	40	10

	6.5%	18.3%	**42.5%**	26.1%	6.5%
3. The demands of the curriculum leave me with little time to explore innovative teaching methods.	7	31	**66**	35	14
	4.6%	20.3%	**43.1%**	22.9%	9.2%
Mean	**3.14**	**Encountered**			
Note: Boldface means highest frequency.					
Legend: 1.00-1.50: Not Encountered (NE), 1.51-2.50: Sometimes Encountered (SE), 2.51-3.50: Encountered (E), 3.51-4.50: Highly Encountered (HE), 4.51-5.00: Very Highly Encountered (VHE)					

In terms of lack of time for reflection and planning, with the mean score of 3.14, most pre-service teachers moderately agree that they encounter challenges related to the time available for preparing and reflecting on the strategies they incorporate into their lessons. This suggests that time constraints are a significant factor hindering their ability to fully engage with and refine their teaching methods and practices.

Specifically, the highest response (43.1%) came from pre-service teachers who stated that the demands of the curriculum leave them with little time to explore innovative teaching methods. Additionally, most pre-service teachers indicated that they don't have enough time to reflect on their teaching practices, with 42.5% of responses.

Furthermore, 40.5% reported that they lack sufficient time to plan and prepare innovative lessons. These findings highlight significant time constraints that hinder the incorporation of innovative strategies into their teaching practices.

Teachers frequently report being pressed for time to create engaging, innovative lesson plans due to heavy workloads, administrative duties, and curriculum demands. This limits their ability to thoughtfully design lessons that incorporate new teaching strategies or technologies.

Contextual Challenges in Under-Resourced Settings: In schools with limited resources or infrastructure, time constraints are compounded by lack of access to technology and additional responsibilities, further restricting teachers' capacity to prepare innovative lessons. Non-digital alternatives and community support can help address these gaps.

Table 15. Perceived Barriers in Implementing Innovative Teaching Strategies

n = 153

Foresight Styles	**Mean**	**Descriptive Equivalent**
A. Lack Of Knowledge And Skills	2.93	Encountered
B. Perceived Lack Of Support	2.94	Encountered
C. Resource Constraints	3.34	Encountered
D. Concerns About Student-Related Factors	3.34	Encountered
E. Lack Of Time For Reflection And Planning	3.14	Encountered
Grand Mean	3.14	Encountered

Legend: 1.00-1.50: Not Encountered (NE), 1.51-2.50: Sometimes Encountered (SE), 2.51-3.50: Encountered (E), 3.51-4.50: Highly Encountered (HE), 4.51-5.00: Very Highly Encountered (VHE)

The Perceived Barriers in Implementing Innovative Teaching Strategies, specifically in terms of Lack of Knowledge and Skills, Perceived Constraints, Resource Constraints, Concerns about Student-related Factors,

and Lack of Time for Reflection and Planning, have an overall mean of 3.14. This indicates that these barriers are generally encountered by pre-service teachers when attempting to implement innovative teaching strategy in their classrooms.

Level Of Knowledge Of The Pre-Service Elementary Teachers About Education 5.0

The level of knowledge of pre-service teachers about Education 5.0 in terms of Personalized Learning, Integration of Technology, Global Learning and Social and Emotional Development is presented in Table 16-19.

Table 16. Level of Knowledge of the Pre-service Elementary Teachers about Education 5.0

n = 153

A. Personalized Learning	**SD**	**D**	**MA**	**A**	**SA**
1. I understand how Education 5.0 emphasizes tailoring instruction to meet individual student needs.	0	3	31	**69**	50
	0.0%	2.0%	20.3%	**45.1%**	32.7%
2. I am aware of methods for assessing individual learning preferences and styles in the context of Education 5.0.	0	4	31	**76**	42
	0.0%	2.6%	20.3%	**49.7%**	27.5%
3. I can design learning activities that allow students to progress at their own pace within the Education 5.0 framework	0	4	38	**70**	41
	0.0%	2.6%	24.8%	**45.8%**	26.8%
Mean	**4.02**	**High**			

Note: Boldface means highest frequency.

Legend: 1.00-1.50: Very Low (VL), 1.51-2.50: Low (L), 2.51-3.50: Moderate (M), 3.51-4.50: High (H), 4.51-5.00: Very High (VH)

The **level of knowledge of pre-service elementary teachers about Education 5.0**, specifically in terms of **Personalized Learning**, is presented in **Table 16**. The data reveals an **overall mean score of 4.02**, indicating that, in general, many pre-service teachers are **aware of Education 5.0** and how it is applied in the context of personalized learning.

Specifically, the highest response (**49.7%**) indicates awareness of **methods for assessing individual learning preferences and styles** within the Education 5.0 framework. Additionally, **45.8%** of respondents reported that they can **design learning activities that allow students to progress at their own pace**, while **45.1%** expressed an understanding of how Education 5.0 **emphasizes tailoring instruction to meet individual student needs**. These findings highlight a solid foundational knowledge among pre-service teachers regarding the principles of personalized learning under Education 5.0.

A study by SimpleK12 (2025) emphasizes that although the traditional educational framework categorizes learners into four primary styles-visual, auditory, kinesthetic, and reading/writing-contemporary research identifies up to 70 distinct learning style variations, underscoring the critical need for educators to customize instructional strategies to accommodate individual learner preferences and thereby enhance educational outcomes.

A empirical study (2024) investigating learning style-based differentiated instructional activities in a social studies course demonstrated that tailoring teaching strategies to individual learning preferences significantly enhances students' academic achievement and learning retention, fostering active participation, facilitating classroom management, and promoting a student-centered learning environment that accommodates diverse learner needs in contrast to traditional teacher-centered methods.

Table 17. Level of Knowledge of the Pre-service Elementary Teachers about Education 5.0

n = 153

B. Integration Of Technology	**SD**	**D**	**MA**	**A**	**SA**
1. I can use technology to create more interactive and immersive learning environments.	0	2	23	**71**	57
	0.0%	1.3%	15.0%	**46.4%**	37.3%
2. I am familiar with the emerging technologies (e.g., AI, VR, AR) used to enhance learning in Education 5.0	0	1	39	**73**	40
	0.0%	0.7%	25.5%	**47.7%**	26.1%
3. I know how to effectively integrate digital tools for research and communication within Education 5.0.	0	3	34	**66**	50
	0.0%	2.0%	22.2%	**43.1%**	32.7%
Mean	**4.08**	**High**			

Note: Boldface means highest frequency.

Legend: 1.00-1.50: Very Low (VL), 1.51-2.50: Low (L), 2.51-3.50: Moderate (M), 3.51-4.50: High (H), 4.51-5.00: Very High (VH)

In terms of Integration of Technology, the data shows an overall mean score of 4.08, indicating that pre-service teachers are generally well-aware of how to use technology, which is a key component of Education 5.0, in their teaching practices.

Specifically, the highest response (47.7%) reflects that pre-service teachers are familiar with emerging technologies that enhance learning within the Education 5.0 framework. Additionally, 46.5% reported being able to use technology to create interactive and immersive learning environments, while 43.1% indicated they know how to effectively integrate digital tools for research and communication. These findings suggest that pre-service teachers are not only aware of technological tools but are also beginning to adopt them to enrich the teaching and learning process.

A 2024 analysis of emerging educational technologies reveals that AI-powered personalized learning improves student learning outcomes by approximately 30%, reduces dropout rates by up to 20%, and increases graduation rates by 15% through adaptive, individualized instruction and automation of administrative tasks for teachers. Together, AI and VR technologies are transforming educational environments by fostering personalized, immersive, and efficient learning experiences that support diverse student needs and improve academic success.

The study Bridging the Digital Divide: AI, VR, and AR for Equitable K-12 Education (2025) comprehensively examines the integration of artificial intelligence, virtual reality, and augmented reality in K-12 settings, highlighting their potential to enhance personalized learning, teacher training, and curriculum innovation.

In terms of Global Learning, the data shows an overall mean score of 4.08, indicating that pre-service teachers generally agree that they are well-aware of the global learning component of Education 5.0.

Table 18. Level of Knowledge of the Pre-service Elementary Teachers about Education 5.0

n = 153

C. Global Learning	**SD**	**D**	**MA**	**A**	**SA**
1. I can design activities that foster teamwork, empathy, and respect for diverse perspective.	0	2	25	**75**	51
	0.0%	1.3%	16.3%	**49.0%**	33.3%
2. I am familiar with incorporating global content into my teaching using Education 5.0 strategies.	0	1	36	**72**	44
	0.0%	0.7%	23.5%	**47.1%**	28.8%

3. I understand how Education 5.0 promotes collaboration and communication in today's interconnected world.	0	1	32	**76**	44
	0.0%	0.7%	20.9%	**49.7%**	28.8%
Mean	**4.08**	**High**			
Note: Boldface means highest frequency.					
Legend: 1.00-1.50: Very Low (VL), 1.51-2.50: Low (L), 2.51-3.50: Moderate (M), 3.51-4.50: High (H), 4.51-5.00: Very High (VH)					

The highest response (49.7%) reflects that they understand how Education 5.0 promotes collaboration and communication in today's interconnected world. Furthermore, 49% reported being able to design activities that foster teamwork, empathy, and respect for diverse perspectives, while 47.1% indicated familiarity with incorporating global content into their teaching using Education 5.0 strategies. These findings suggest a strong awareness among pre-service teachers of the importance of preparing students for global citizenship through inclusive and collaborative learning experiences.

Birgit Oberer and Alptekin Erkollar (2024) examine Education 5.0's emphasis on student-centered, personalized learning that fosters collaboration and interdisciplinary teamwork. Their study highlights the critical development of communication skills, empathy, and respect for diverse perspectives through group projects and interactive discussions. Additionally, the research underscores the integration of advanced technologies such as artificial intelligence and gamification to facilitate engaging, collaborative learning environments and to customize instruction according to individual learner needs, thereby enhancing both engagement and educational outcomes.

Collaborative learning supported by AI and gamification, the study Global Filipino Teachers' Readiness on Education 5.0: Reinforcing the Status Quo (Gamad et al., 2024) further highlights the critical role of technology proficiency in enhancing collaborative practices among educators. The research finds a significant positive correlation between higher technology skill proficiency and more effective collaboration and communication in Education 5.0 environments. This suggests that technology competence not only supports personalized and interdisciplinary learning, as described by Oberer and Erkollar, but also strengthens educators' ability to engage in collaborative pedagogies essential for the dynamic, connected classrooms envisioned in Education 5.0. Together, these studies underscore the intertwined importance of technological skills and collaborative approaches in preparing teachers for innovative, future-ready education systems.

Education 5.0 is framed as a groundbreaking paradigm that prioritizes learner-centric environments by integrating advanced technologies and innovative pedagogical approaches. According to Ahmad and Umirzakova (2023), this model hinges on key requirements and enabling technologies such as artificial intelligence, blockchain, and virtual and augmented reality. Their study provides an in-depth analysis of how these technologies can transform the educational landscape by significantly enhancing personalization, boosting student engagement, and broadening access to quality education. This research underscores Education 5.0's potential to redefine learning experiences and address the evolving needs of future learners in a digitally connected world.

Table 19. Level of Knowledge of the Pre-service Elementary Teachers about Education 5.0

n = 153

D. Social And Emotional Development	**SD**	**D**	**MA**	**A**	**SA**
1. I can promote student's self-awareness, self-regulation, and empathy, which are essential skills is Education 5.0.	0	3	28	**69**	53
	0.0%	2.0%	18.3%	**45.1%**	34.6%
2. I am aware of strategies for addressing students' individual social and emotional needs in a classroom setting.	0	1	33	**73**	46
	0.0%	0.7%	21.6%	**47.7%**	30.1%
	0	2	28	**72**	51

3. I am familiar with creating a safe and supportive learning environment that encourages students to express their emotions.	0.0%	1.3%	18.3%	**47.1%**	33.3%
Mean	**4.11**	**High**			
Note: Boldface means highest frequency.					
Legend: 1.00-1.50: Very Low (VL), 1.51-2.50: Low (L), 2.51-3.50: Moderate (M), 3.51-4.50: High (H), 4.51-5.00: Very High (VH)					

In terms of Social and Emotional Development, the data shows an overall mean score of 4.11, indicating that pre-service teachers are generally well-aware of the importance of nurturing students' social and emotional growth, which is a key aspect of Education 5.0.

According to the data, 47.7% of pre-service teachers are aware of strategies for addressing students' individual social and emotional needs in the classroom. Additionally, 47.1% reported being familiar with creating a safe and supportive learning environment that allows students to express their emotions. Moreover, 45.1% indicated that they can promote students' self-awareness, self-regulation, and empathy—all of which are essential skills emphasized in Education 5.0.

These findings suggest that pre-service teachers are not only aware of cognitive and academic goals but are also developing a strong understanding of how emotional intelligence impacts student learning and behavior.

The 2023 research overview by the Collaborative for Academic, Social, and Emotional Learning (CASEL) synthesizes empirical evidence demonstrating that SEL programs yield statistically significant medium to large effect sizes on students' social-emotional competencies, behavioral outcomes, and academic achievement across diverse demographic groups. The analysis underscores the necessity of sustained, targeted teacher training and the adoption of whole-school implementation models to optimize program efficacy. These findings highlight the critical interplay between program design, educator capacity, and systemic integration in driving measurable improvements in student outcomes.

Integrating Social-Emotional Learning and Standards-Based Grading (2024) provides a comprehensive analysis of how the deliberate integration of SEL competencies alongside standards-based grading frameworks can significantly improve student motivation and behavioral outcomes. Through a critical examination of implementation challenges-including institutional barriers and variability in educator readiness-the study identifies key factors influencing the successful embedding of SEL within academic assessments. Employing both qualitative and quantitative data, the research offers practical, evidence-based strategies that facilitate alignment between social-emotional development and academic rigor. These findings underscore the potential of integrated approaches to foster holistic student development, balancing cognitive achievement with emotional and social growth.

In the study of Taha, Karim, and Vinayagan (2025), investigated the impact of Social-Emotional Learning (SEL) programs on emotional intelligence and academic achievement among primary students in Malaysia. The study found significant improvements in students' emotional regulation, empathy, classroom behavior, and engagement. It also highlighted challenges such as limited resources and the need for teacher training to optimize SEL implementation

Table 20. Level of Knowledge of the Pre-service Elementary Teachers about Education 5.0

n = 153

Indicators	**Mean**	**Descriptive Equivalent**
A. Personalized Learning	4.02	High
B. Integration Of Technology	4.08	High
C. Global Learning	4.08	High

D. Social And Emotional Development	4.11	High
Grand Mean	**4.07**	High
Legend: 1.00-1.50: Very Low (VL), 1.51-2.50: Low (L), 2.51-3.50: Moderate (M), 3.51-4.50: High (H), 4.51-5.00: Very High (VH)		

The Level of Knowledge of the Pre-service Elementary Teachers about Education 5.0 , specifically in terms of Personalized Learning, Integration of Technology, Global Learning and Social and Emotional Development, have an overall mean of 4.07. This indicates high level of knowledge and awareness of Education 5.0. It also suggest a strong fundamental understanding of modern, student-centered approaches that is aligned with future of education, the Education 5.0

CONCLUSIONS

Pre-service teachers effectively integrate key elements of futures thinking in their instructional planning, as reflected by consistently high mean scores across Strategic Foresight, Design Thinking, and Sense Making. This suggests they frequently employ forward-looking strategies that promote anticipation, innovation, critical reflection, and deeper student understanding. Overall, pre-service teachers demonstrate strong capability in preparing learners to navigate future challenges through thoughtful and innovative teaching approaches.

The respondents frequently employed foresight styles with varying preferences. The Methodological foresight style was most prominent, indicating a strong reliance on structured and systematic approaches. Closely following was the Strategic style, highlighting the importance of planning and long-term vision. The Scenario-based style reflects a value for envisioning multiple future possibilities. Both Intuitive and Analytic styles suggest that pre-service teachers balance gut-feeling with logical reasoning in their foresight. The Adaptive style emphasizes flexibility in responding to changing circumstances, while the Creative style, though slightly less dominant, still indicates a frequent emphasis on innovation and originality.

Cooperative Learning stands out as the most widely adopted approach, highlighting the value placed on collaboration and peer interaction. Visualization and Inquiry-Based Learning are also commonly integrated, reflecting a strong commitment to active and student-centered learning. However, strategies such as the Flipped Classroom, Mind Mapping, and Phenomenon-Based Learning are less frequently utilized, indicating potential areas for enhanced training and support to increase familiarity and confidence in implementing these methods.

A prominent challenge when it comes on implementing innovative teaching strategies is the lack of knowledge and skills, which leaves many feeling unprepared to apply such approaches effectively in the classroom. This is closely linked to a perceived lack of institutional support and limited access to professional development opportunities focused on innovation. Resource constraints, such as inadequate teaching materials and technology, further hinder their ability to fully implement these strategies. Additionally, student-related challenges and limited time for reflection and lesson planning add to the difficulty.

The pre-service teachers possess a generally strong level of knowledge regarding the key components of Education 5.0. They demonstrate clear awareness of Personalized Learning, recognizing the importance of adapting instruction to individual needs. Their understanding of Technology Integration and Global Learning further reflects readiness to engage students in digitally connected and globally aware classrooms. Notably, Social and Emotional Development emerged as the most well-understood component, indicating a strong appreciation for fostering students' holistic growth. These findings suggest that pre-service teachers are well-prepared to apply the principles of Education 5.0 in their future teaching practices.

Suggestion

The Pangasinan State University must invest in upgrading educational materials, classroom facilities, and digital technologies. Upgraded and innovative facilities and equipment in classrooms significantly increase the potential for effectively integrating and practicing innovative teaching strategies.

The College of Teacher Education of Pangasinan State University must design and implement regular and comprehensive professional development programs focused on innovative teaching methodologies for pre-service teachers. These programs should include hands-on workshops, peer mentoring, and expert-led seminars that equip educators with the necessary skills, knowledge, and confidence to apply innovative approaches in their respective disciplines.

The pre-service teachers must explore a wider range of innovative teaching strategies to incorporate into lesson planning and instructional design. Creating unique and innovative instructional materials promotes active engagement and participation among students, particularly at the elementary level.

ACKNOWLEDGMENTS

The researcher acknowledged the support of the selected Students of Pangasinan State for without them, this research would not be possible.

REFERENCES

1. Ahmad, S., Umirzakova, S., Mujtaba, G., Amin, M. S., & Whangbo, T. (2023). Education 5.0: Requirements, enabling technologies, and future directions. arXiv. https://arxiv.org/pdf/2307.15846
2. Afikah, A., Astuti, S. R., Suyanta, S., Jumadi, J., & Rohaeti, E. (2022). Mobile learning in science education to improve higher-order thinking skills (HOTS) and Communication Skills: A systematic review. International Journal of Advanced Computer Science and Applications, 13(7). https://doi.org/10.14569/ijacsa.2022.0130782
3. Alabi, O. (n.d.). Overcoming lesson plan challenges: Solutions for educators. LinkedIn. https://www.linkedin.com/pulse/overcoming-lesson-plan-challenges-solutions-educators-omolade-alabi
4. Aslam, A., Ahmad, S., Siller, H.-S., & Nasreen, A. (2024). Impact of the Understanding by Design Model on the Science Academic Achievement of Fifth Grade Students in Pakistan. Asia-Pacific Science Education, 10, 113–153. https://doi.org/10.1163/23641177-bja10006
5. Arugay, J. L. (2024). Enhancing analytical and critical thinking skills through reflective and collaborative learning: A quasi-experimental study. ResearchGate.https://www.researchgate.net/publication/385809498_Enhancing_Analytical_and_Critical_Thinking_Skills_through_Reflective_and_Collaborative_Learning_A_Quasi-Experimental_Study
6. Bergin, C., Tsai, C.-L., Prewett, S., Jones, E., Bergin, D. A., & Murphy, B. (2024). Effectiveness of a social-emotional learning program for both teachers and students. AERA Open, 10, 1–18. https://doi.org/10.1177/23328584241281284
7. Boonmoh, A., & Jump Kate, T. (2024). Using scaffolded instructions to improve students' skills. rEFLections, 26(1), 1–16. https://doi.org/10.61508/refl.v26i1.199840
8. British Antarctic Survey. (2023). BAS strategy for innovation and impact 2023–2025. https://www.bas.ac.uk/data/our-data/publication/bas-strategy-for-innovation-and-impact-2023-2025/
9. Caiga, N. C. (2024). Technologıcal, Pedagogıcal, and Content Knowledge: Onlıne Teachıng Performance Predıctors in Hıgher Educatıon Instıtutıons in the Northwestern Philippines towards Educatıon 5.0. Asian Journal of Multidisciplinary Studies, 7(1), 264-269.
10. Caiga, N. (2025). When Lines Don't Meet: Angles And Tangles In The Non-Fulfillment Of The Trifocal Functions Of Tertiary Faculty, Northwestern Philippines. Journal of Education and Innovation, 27(1), 16-26.
11. Chen, L., & Wang, H. (2024). Perceived teacher emotional engagement and its relationship with teaching expectations and student learning outcomes. Frontiers in Psychology, 15, Article 1475048. https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2024.1475048/full
12. Chairunnisa, & Muawanah. (n.d.). Higher Education Department, Govt.of Kerala. Education 5.0. https://www.highereducation.kerala.gov.in/index.php/102-hedn/government-order/g-o-index-for-2024

13. Deloitte. (2024). Tech trends 2025. Deloitte Insights. https://www2.deloitte.com/content/dam/insights/articles/us187540_tech-trends-2025/DI_Tech-trends-2025.pdf
14. Dermawan, H., & Sumarni, S. (n.d.). Basic education in the era of society 5.0: Opportunities and challenges. International Journal of Education Element aria andPsychologia.https://journal.ypidathu.or.id/index.php/ijeep/article/view/1110
15. Education Sciences. An Open Access Journal from MDPI. (n.d.). https://www.mdpi.com/journal/education
16. EDUCAUSE. (2025). 2025 students and technology report: Shaping the future of higher education through technology, flexibility, and well-being. https://www.educause.edu/content/2025/students-and-technology-report
17. E.Laamarti, M. Faisal and A. E. Saddik, "Exploring the Potential and Technical Challenges of Metaverse for University Education," 2024 IEEE 3rd International Conference on Intelligent Reality (ICIR), Coimbra, Portugal, 2024, pp. 1-2, doi: 10.1109/ICIR64558.2024.10976880.
18. Intuitive Thinking. (n.d.). Intuitive thinking is future thinking. Intuitive Thinking. https://www.intuitivethinking.com/intuitive-thinking-is-future-thinking/
19. Johnson & Germain-Froese,(2023). Teachers' Preparation Experiences from Coursework to the Classroom: Findings from the 2022 Learn Together Survey. https://doi.org/10.7249/rra827-13
20. Lee, L.-K., Wei, X., Chui, K. T., Cheung, S. K., Wang, F. L., Fung, Y.-C., Lu, A., Hui, Y. K., Hao, T., U, L. H., & Wu, N.-I. (2024). A systematic review of the design of serious games for Innovative Learning: Augmented Reality, virtual reality, or mixed reality? Electronics, 13(5), 890. https://doi.org/10.3390/electronics13050890
21. London School of Science and Technology. (n.d.). Innovative teaching methods in higher education: Empowering mature non-traditional learners. https://www.lsst.ac/blogs/innovative-teaching-methods-in-higher-education-empowering-mature-non-traditional-learners/
22. Luo, Y., Chen, Y., & Li, X. (2025). A systematic review on the impact of teacher professional development on digital instructional integration and teaching effectiveness. Frontiers in Education, 10, Article 1541031. https://www.frontiersin.org/journals/education/articles/10.3389/feduc.2025.1541031/full
23. Matsh. (2025). Emerging technologies in education: Statistics on AI and VR adoption. https://www.matsh.co/en/statistics-on-ai-vr-adoption-in-education/
24. Mostafa, M. A. M. (2025). Bridging the digital divide: AI, VR, and AR for equitable K–12 education. SSRN. https://doi.org/10.2139/ssrn.5124551
25. Nida Sharif Qureshi, Asif Jamil (2023). Impact of Innovative Teaching Strategies on students' active participation in learning. The Journal of Educators Online, 16. https://doi.org/10.9743/jeo.2019.16.2.9
26. Oben, A. I., & Hui, X. (n.d.). The Future of Higher Education: A call for radical pedagogical innovation in post-pandemic times. Journal of Teaching and Learning. https://jtl.uwindsor.ca/index.php/jtl/article/view/9710
27. Oberer, B., & Erkollar, A. (2024). Education 5.0: Using the design thinking process. Journal of Systemics, Cybernetics and Informatics, 22(1), 1–17.
28. https://www.iiisci.org/journal/PDV/sci/pdfs/ZA795SN23.pdf
29. Paragae, (2023). Innovative teaching strategies in teaching English as a foreign language.(n.d.-b). https://www.researchgate.net/publication/367499317_Innovative_Teaching_Strategies_in_Teaching_English_as_a_Foreign_Language
30. Person, V, B., & Babu. (2024, March 29). Education 5.0: 13: An overview: B V babu: Taylor & Francis Ebooks,. Taylor & Francis. https://www.taylorfrancis.com/chapters/edit/10.1201/9781003376699-13/education-5-0-babu
31. Philippine Institute for Development Studies. (2024, January 18). Reduced DepEd budget could hurt initiatives to address learning crisis. PIDS News. https://www.pids.gov.ph/details/news/in-the-news/reduced-deped-budget-could-hurt-initiatives-to-address-learning-crisis
32. Rind, A. A., Asad, M. M., & Sherwani, F. (2024). Pre-service teachers' digital self-efficacy towards Education 5.0: A narrative literature review. Digital Transformation in Higher Education, Part B, 29–56. https://doi.org/10.1108/978-1-83608-424-220241003

33. RSIS International. (2024). Impact of social-emotional learning (SEL) programmes on emotional intelligence and academic achievements of students. International Journal of Research and Innovation in Social Science, 8(12), 2522–2528. https://ideas.repec.org/a/bcp/journl/v8y2024i12p2522-2528.html
34. Shahidi Hamedani, S., Aslam, S., Mundher Oraibi, B. A., Wah, Y. B., & Shahidi Hamedani, S. (2024, September 24). Transitioning towards Tomorrow's workforce: Education 5.0 in the landscape of Society 5.0: A systematic literature review. MDPI. https://www.mdpi.com/2227-7102/14/10/1041
35. Shemsack, Saddik , Burton. (n.d.). Advancements in AI-driven education: Transforming Learning and training with Intelligent Technologies. Scholarly Commons. https://commons.erau.edu/publication/2267/
36. SimpleK12. (2025). Learning styles guide for every teacher in 2025. https://www.simplek12.com/learning-theories-strategies/learning-styles-guide/
37. Sofascore. (n.d.). Wang L. - Zhang B. Live score, video stream and H2H results. Sofascore live results. https://www.sofascore.com/table-tennis/match/wang-lee-zhang-benji/vYRdsTzee
38. Sönmez, E. (2024). Teachers' professional development: Opportunities and challenges in Türkiye. International Journal of Professional Development, Learners and Learning, 6(1), Article 15834. https://www.ijpdll.com/article/teachers-professional-development-opportunities-and-challenges-in-turkiye-15834
39. Tas, H. (2024). The effects of learning style-based differentiated instructional activities on 4th-grade students' academic achievement and motivation. SAGE Open, 14(1), 1–14. https://doi.org/10.1177/21582440241249290
40. Thangavel, S., K, S., & K, S. (2025). Revolutionizing education through augmented reality (AR) and virtual reality (VR): Innovations, challenges and future prospects. Asian Journal of Interdisciplinary Research, 8(1), 1–28. https://doi.org/10.54392/ajir2511
41. Trinity University of Asia. (n.d.). Philippine education today: Statistics, challenges, opportunities. https://www.tua.edu.ph/blogs/philippine-education-statistics-challenges-and-opportunities/
42. Tubastuvi, N., Azaria, M. J. F., Purwidianti, W., & Aryoko, Y. P. (n.d.). Gen Z Investment Decision: Role of Financial Literacy, financial Behaviour, financial experience and risk tolerance. Airlangga Journal of Innovation Management. https://e-journal.unair.ac.id/AJIM/article/view/61315
43. University Social Responsibility Network. (2023). USR Summit 2022 proceedings. https://www.usrnetwork.org/app/uploads/2023/09/USR_Summit-2022_Proceedings_Final.pdf
44. Vorobyov, D. (2024, August 13). Technology-driven education: A new era of learning.Forbes.https://www.forbes.com/councils/forbestechcouncil/2024/02/01/technology-driven-education-a-new-era-of-learning/