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Research Article

Guidelines for Developing Innovative Thinking Skills of Teachers in Samut Prakan Vocational Colleges, Thailand

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Abstract: The objectives of this research were 1) to study the innovative thinking skills of teachers in Samut Prakan Vocational Colleges, Thailand, and 2) to study guidelines for developing innovative thinking skills of teachers in Samut Prakan Vocational Colleges, Thailand. The sample consisted of 5 experts for interviews, and 201 teachers for questionnaires. The research instruments were questionnaires with an IOC (Index of Item-Objective Congruence) value between .67 and 1.00, and a reliability value of .96 and an interview form. Data were analyzed by using mean, standard deviation, and content analysis. The results of the research were as follows : 1) the innovative thinking skills of teachers were at a high level, in overall and particular aspects, ranking from the highest to the lowest mean : Crafting, Imaging, Personalizing, Collaborative, Serious play, and Paying attention, and 3) Development Guidelines of 1) Crafting: Workshops and Training, Collaborative Projects, Case Studies, Industry Collaboration, and Innovation Labs; 2) Imaging: Incorporate Visual Storytelling ,Utilize Digital and Immersive Tools, Real-World Applications and Simulations, Visual Mapping for Critical Thinking, and Collaborative Visual Brainstorming; 3) Personalizing: Teacher Training and Reflection, Student-Centered Learning, Industry Collaboration and Practical Application, Collaborative Platforms for Peer Learning, and Tailored Learning Plans; 4) Collaborative inquiry: Structured Collaborative Environments, Collaborative Research Projects, Technology Integration, Leadership in Collaboration, and Institutional Networks; 5) Serious play: Innovation Labs/Makerspaces, Prototyping and Iteration, Workshops and Collaborative Projects, Challenge-Based Learning, and Innovation Challenges; and 6) Paying attention: Implement Hands-On Workshops, Integrate Technology, Adopt Project-Based Learning, Foster Collaborative Learning, and Encourage Cross-Disciplinary Learning.

Keywords: innovative thinking skills; vocational teachers; educational administration

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1. Introduction

In the current era of rapid changes in economics, society, and technology, the 13th National Economic and Social Development Plan (2023–2027) emphasizes the importance of enhancing and improving the quality of public administration to align with the needs of modern society. Additionally, this development plan highlights the crucial role of the education system at all levels, particularly in vocational education, which must focus on producing highly competent manpower to meet the country's economic development needs and effectively adapt to the rapid societal changes (Office of the National Economic and Social Development Council, 2018). Vocational education serves as a key mechanism in preparing a workforce with high skills and competence. Lieutenant Thanuth Wongjinda, Secretary-General of the Office of Vocational Education Commission, stressed the role of vocational education in producing highly capable personnel, which aligns with the concept of "Thailand: Stable and Prosperous through Vocational Expertise" (Office of the Vocational Education Commission, 2023). Progress at this stage is imperative for improving the standard of living for individuals within our society and bolstering the international competitiveness of our nation, especially within the industrial and manufacturing fields, which serve as the foundation for economic advancement (Eradatifam et al., 2020). In the context of Samut Prakan province, an important industrial hub, vocational education plays a vital role in supporting the development of manpower to meet the demands of the business sector.

Therefore, the development of innovative thinking skills is essential, particularly at Samut Prakan Vocational College, which aims to foster both students and teachers in creating new innovations that respond to the needs of the labor market in the digital age.

Fostering innovative thinking holds great importance in driving organizational growth and success. In today's rapidly evolving world, it is crucial for companies to stay ahead of the curve by constantly promoting creativity and encouraging their workforce to think outside the box (Meinel et al.,2020). This is where the significance of developing and educating staff to embrace innovative thinking comes into play. Investing in training programs, workshops, and coaching sessions, organizations can equip their employees with the necessary skills and mindset to generate groundbreaking ideas, problem-solve efficiently, and drive continuous improvement. When employees are empowered to think innovatively, they become valuable assets who can contribute to the company's overall goals and objectives. With a culture that values innovation and nurtures creative thinking, organizations can stay competitive, adapt to change effectively, and unleash their full potential for growth and success (Steinerowska-Streb & Głód,2020). They must share the organization's vision of becoming an innovation-driven entity, like the organization's leaders. This leads to continuous improvements in work processes (Process Innovation), which eventually develop into product or service innovations (Product/Service Innovation) and culminate in the creation of new business models (Business Model Innovation) (Juliana et al.2021). "Innovative Thinking" comprises two key concepts: "thinking" or "thinking skills" and "innovation." Thus, the meaning of "thinking skills" refers to the ability to think, arising from the brain's cognitive processes in response to various situations, potentially cultivated through upbringing, experience, or education (Serdyukov, 2017). Meanwhile, "innovation" refers to the use of creativity to develop or invent new products or processes. Therefore, "Innovative Thinking" refers to generating new ideas that help solve problems or develop new products, services, or processes that add value and benefit customers or clients. Chamchoy (2012) state that innovative thinking skills are the fundamental thinking skills needed to foster innovation within organizations. Cultivating this type of thinking in teachers and staff in educational institutions is crucial because educational administration requires collaboration between teachers and education personnel to drive outcomes through knowledge management processes, ultimately transforming the institution into an innovative organization (Imuetinyan & Ngozi, 2023). The results of such innovation-driven management are reflected in the quality of students, which can be seen as innovative products that stem from effective innovative management (Bednar & Spiekermann-Hoff, 2021).

According to the policy of the Office of the Vocational Education Commission (OVEC), management approaches aimed at enhancing efficiency and raising the quality of vocational education systems are essential in developing the quality of personnel within organizations (Office of the Vocational Education Commission, 2023). These approaches emphasize innovative thinking skills, a process that administrators must prioritize in developing teachers, to foster a working environment conducive to creativity and innovation, particularly in the current context of technological and societal changes. Similarly, Professional Standards in Education (2022) highlight the importance of innovative thinking skills, stating that innovative thinking is a critical necessity for personnel development in organizations. Creativity and innovation are other essential factors that help organizations grow. Continuous development of creative and innovative thinking will provide new approaches to work, solve problems effectively, and view challenges as opportunities for improvement(Abdelhamid, 2022).It also prepares individuals to face changes and emerging technologies in an uncertain world while generating new ideas that are beneficial and valuable to the organization (Brenner & Uebernickel, 2016).This marks the beginning of innovation development within organizations, giving them a sustainable business advantage.

As the evaluation and quality assurance report on educational standards in the group of four public vocational colleges in Samut Prakan Province, namely: 1) Phra Samut Chedi Vocational College; 2) Samut Prakan Polytechnic College; 3) Kanjanapisek Technical College Samut Prakan; and 4) Samut Prakan Technical College, a significant issue has been identified. The innovation, invention, creative works, and research activities of teachers, students, and learners are generally at an overall level of 60%, which is considered average. Furthermore, the executive summary provided recommendations for overall institutional development, suggesting that educational institutions should support and encourage the creation of innovations, inventions, and creative works by teachers, education personnel, and students by applying vocational skills and knowledge. These innovations and inventions should be beneficial to the institution, community, local area, and society. As the quality assurance report

on educational standards of Phra Samut Chedi Vocational College (2021), Kanjanapisek Technical College (2023), Samut Prakan Technical College (2022), and Samut Prakan Polytechnic College (2022) identified that these can be achieved through: 1) Enhancing students' competitiveness in vocational skills; 2) Providing guidance and support to increase graduation rates; 3) Developing or improving competency-based curricula or adding supplementary subjects in line with professional qualifications in relevant fields; and 4) Fostering teachers' and students' work in innovation, invention, creative works, and research, enabling them to compete and apply these contributions effectively at various levels. Horth & Buchner (2014) discussed the innovative thinking skills required to foster innovation in organizations. They emphasized the need to instill these skills in teachers and educational personnel. Since educational administration depends on collaboration between teachers and education staff, managing outcomes through knowledge management processes can transform an institution into an innovative organization. The innovative thinking skills of administrators consist of six key abilities: 1) Paying attention: The ability to notice overlooked details and new patterns by slowing down and observing deeply. It involves thoroughly examining and analyzing a given situation from fresh and novel angles, thereby taking into consideration a wide array of diverse perspectives, all aimed at attaining a significantly enhanced and thorough comprehension (Gadušová et al.2021); 2) Personalizing: Tapping into personal experiences and passions to introduce fresh perspectives at work. It also involves deeply understanding customers to innovate by connecting insights from personal life and customer experiences (Trasmundi et al., 2021); 3) Imaging: Using imagery, metaphors, and stories to process complex information. Imagination is instrumental in fostering innovative prospects and envisioning potential end results (Smith et al., 2022); 4) Serious play: Breaking routine and using playful exploration to foster innovation. Engaging in enjoyable and exploratory activities may yield significant outcomes through the bending of rules and the testing of limits (Kim et al.2021); 5) Collaborative inquiry: Innovation comes from shared ideas through thoughtful dialogue. Engaging various stakeholders in nonjudgmental conversations can lead to new insights and opportunities (McCarthy & McNamara, 2021); and 6) Crafting: The skill of synthesizing opposing ideas to find new solutions. Crafting involves integrating different viewpoints and shaping possibilities from seemingly unrelated information (Ferri et al., 2020).

It is evident that studying strategies to promote innovative thinking skills among teachers at vocational colleges in Samut Prakan Province, Thailand is of great importance (Rapanta, 2021). The rapid and exponential progressions in technology and significant shifts in the economic landscape are increasingly demanding the vocational education system to nurture and foster educators who not only possess exceptional expertise in their respective fields but also exhibit exemplary forward-thinking abilities. These vital skills play an indispensable role in the generation of revolutionary ideas and innovative concepts that can seamlessly adapt to the ever-evolving and dynamic environment, ultimately fulfilling the ever-growing demands and requirements of the highly competitive labor market (McGrath & Yamada, 2023). This research will play a significant role in assisting vocational colleges in Samut Prakan to develop effective strategies aimed at enhancing the overall teaching quality and educational management. Moreover, it will also focus on nurturing a pool of creative and highly adaptable personnel capable of facing and overcoming future challenges (Muzam, 2023). By not conducting this research, there is a risk that educators and educational professionals might not be equipped with the necessary skills and knowledge to promptly adapt to the evolving educational landscape. Consequently, this could potentially lead to an obsolete education system and a significant decrease in competitiveness at both the national and international level. Therefore, the significance of this research cannot be overstated as it holds the power to shape education and ensure its continued relevance and superiority in today's ever-changing world (Fairman et al.2020). This aligns with Chamchoy (2012) emphasized the importance of creating a culture that fosters creativity and innovation, stating that such a culture helps transform an institution into an innovative organization with strong competitive potential. It is essential to foster originality and creativity in educators and leaders in order to enhance the quality of education and create advantageous results for the organization (Yeap et al., 2021).

The researcher thus recognizes that guidelines for developing innovative thinking skills of teachers in Samut Prakan Vocational Colleges, Thailand is particularly significant in the context of economic, social, and technological changes. Research in this area will not only elevate the quality of educational management but also provide a key approach to creating innovations that can meet the demands of both current and future labor markets

2. Materials and Methods

This section presents the research methodology employed in gathering and analyzing data to identify innovative thinking skills of teachers in Samut Prakan Vocational Colleges, Thailand. The methodology involves a descriptive research method with both quantitative and qualitative phases. The key components of this methodology are outlined as follows:

2.1. Population and Sample

The study involved two phases: In Phase 1, the population comprised 415 teachers in the group of four public vocational colleges in Samut Prakan Province, namely: 1) Phra Samut Chedi Industrial and Community Education College; 2) Samut Prakan Polytechnic College; 3) Kanjanapisek Technical College Samut Prakan; and 4) Samut Prakan Technical College, and the sample consisted of 201 teachers selected through stratified random sampling based on colleges, using Krejcie & Morgan (1970)'s table. In Phase 2, five experts, who met specific criteria such as a master's degree and at least three years of experience, were chosen for qualitative analysis. These experts included school directors of the group of four public vocational colleges in Samut Prakan Province, Thailand and educational directors in public vocational colleges, Thailand.

2.2. Research Instruments

Two instruments were employed in this study. The first instrument was a survey questionnaire, adapted from Horth & Buchner (2014), utilizing a 5-point Likert scale. The questionnaire was structured into a total of 40 closed-ended questions, specifically designed to address the first objective of the study. The questions were organized into blocks focusing on 6 variables of innovative thinking skills. Data were collected using Google Forms, targeting 201 vocational teachers from Phra Samut Chedi Vocational College, Kanjanapisek Technical College, Samut Prakan Technical College, and Samut Prakan Polytechnic College. The survey took place during the academic year, ensuring a comprehensive representation of the teachers' perspectives across these institutions, and the second instrument was a structured interview questionnaire, developed based on the average results from the first objective of the survey. This interview questionnaire was designed to gather deeper insights from five experts in vocational education management. These experts were selected based on their expertise and knowledge in the field of vocational education. Their input was crucial in validating and expanding upon the findings from the initial survey, providing a well-rounded understanding of innovative thinking in vocational education.

2.3. Quality of Research Instruments

The quality of the research instruments was ensured through a series of steps. First, theories and prior research on teachers in the group of four public vocational colleges in Samut Prakan Province, were studied to inform the development of the instruments. The questionnaires were then reviewed by three experts to assess content validity, achieving an IOC (Index of Item-Objective Congruence) value between .67 and 1.00. The reliability of the survey was tested using Cronbach's alpha coefficient, with a result of .96, indicating a high level of confidence. The instruments were refined and validated based on this testing.

2.4. Data Collection

Data collection was conducted in two phases. For the quantitative data, the researcher distributed the survey questionnaire to the selected sample via Google Forms. The qualitative data were gathered through interviews with the five selected experts. These interviews were conducted both on-site and through Zoom Application, depending on the availability of the participants. The researcher coordinated with the group of four public vocational colleges in Samut Prakan Province, namely: 1) Phra Samut Chedi Industrial and Community Education College; 2) Samut Prakan Polytechnic College; 3) Kanjanapisek Technical College Samut Prakan; and 4) Samut Prakan Technical College to ensure support in the data collection process.

2.5. Statistics Used in Research

The collected data were analyzed using statistical tools. For quantitative data: means, and standard deviations were used to assess the competency levels of the teachers. For qualitative data, content analysis was employed to interpret the expert interviews, providing guidelines for developing innovative thinking skills of teachers in Samut Prakan Vocational College.

3. Results

Section I: Analyze the data to study the innovative thinking skills of teachers in Samut Prakan Vocational Colleges, Thailand, both overall and by specific aspects, by calculating the mean and standard deviation.

Table 1 displays the statistical findings of the level of the innovative thinking skills of teachers in Samut Prakan Vocational Colleges, Thailand that it was at a high level in overall, and particular aspects. The highest mean was Crafting followed by Imaging, Personalizing, Collaborative inquiry, Serious play, and Paying attention

Table 1. The results of the mean, standard deviation, level, and ranking on the six innovative thinking skills of teachers in Samut Prakan Vocational Colleges, Thailand

Innovative Thinking Skills	Mean	Std. Deviation	Description Equivalent
Paying attention	3.56	.39	High
Personalizing	4.05	.58	High
Imaging	4.12	.51	High
Serious play	4.00	.56	High
Collaborative inquiry	4.01	.60	High
Crafting	4.18	.52	High
Total	3.99	.45	High

Section II : Content Analysis on guidelines for developing innovative thinking skills of teachers in Samut Prakan Vocational Colleges, Thailand.

Based on the research findings on the aspect of "Crafting", which received the highest mean of 4.18 at a high level in the study of guidelines for developing innovative thinking skills of teachers in Samut Prakan Vocational Colleges, Thailand, five key informants provided insightful comments and development guidelines:

The first key informant emphasizes that in order for teachers to be able to construct crafting innovative thinking, they need to be able to combine concepts that are in opposition to one another and produce solutions that take into account diverse points of view. In order to cultivate this ability, the first key informant propose encouraging teachers to participate in workshops that provide them with difficult issues to answer and encourage abductive reasoning to link concepts that are not connected to one another. Providing frequent training that is centered on problem-solving in real-world vocational situations was the proposal that was made. This would enable educators to develop new solutions that are in line with the requirements of the respective sector.

The second key informant highlights that vocational education must focus on synthesizing practical skills with creative thinking. The second key informant recommends setting up collaborative projects that require teachers to work with students on industry-based problems, where conflicting ideas often arise. These projects will help teachers learn to guide students through crafting solutions by integrating theory and practice, promoting both technical skills and innovative thinking.

The third key informant emphasizes the importance of balancing tradition with innovation in vocational training. The third key informant suggested creating case studies from industry and business dilemmas that present paradoxes or contradictions. Teachers would guide students in resolving these issues through crafting, combining different perspectives and techniques. The third key informant also recommended that teachers undergo continuous professional development that focuses on how to incorporate creativity into technical disciplines.

The fourth key informant stresses the need to adopt crafting skills through cross-disciplinary projects. The fourth key informant suggested that vocational teachers collaborate with industry professionals from various fields to design learning modules that expose students to multiple viewpoints. By facilitating discussions that embrace conflicting ideas, teachers can model the crafting process for students, teaching them to synthesize solutions that reflect both technical expertise and innovative thought.

The fifth key informant highlights the value of fostering a culture of experimentation and continuous improvement in vocational settings. The fifth key informant proposed that vocational colleges create innovation labs where teachers and students work on prototyping ideas. These labs would provide a space for trial and error, where teachers can mentor students through the process of crafting, connecting disparate ideas into cohesive solutions. This approach ensures teachers and students alike learn how to navigate uncertainty and contradictions in practical settings.

Based on the research findings on the aspect of "Imaging", which received the highest mean of 4.12 at a high level in the study of guidelines for developing innovative thinking skills of teachers in Samut Prakan Vocational College, five key informants provided insightful comments and development guidelines:

The first key informant emphasizes that incorporating imaging techniques into daily teaching practices can help students better grasp complex vocational concepts. The first key informant suggests using visual storytelling as part of project-based learning, where students create visual presentations of their work processes, helping them link theory to practice. A structured use of metaphors for abstract concepts can also make learning more intuitive for vocational students.

The second key informant proposes a more technology-driven approach by incorporating digital imagery tools into the classroom. For instance, students could use software to design their projects visually before the actual creation process. This not only helps in planning but also engages students more creatively. Virtual reality (VR) could also be explored, offering an immersive learning experience that aligns with vocational education's hands-on nature.

The third key informant stresses the use of imaging through real-world applications, such as field trips or simulations that encourage students to visualize how their skills would be applied in industries. The third key informant suggests integrating workplace simulations into vocational training where students visualize entire production processes, from raw materials to final products, allowing for a deeper understanding of their future roles in the workforce.

The fourth key informant focuses on enhancing critical thinking through visual mapping tools. The fourth key informant suggests that teachers encourage students to create mind maps or process diagrams that represent their thought processes in solving technical problems. By visualizing their approach to a task, students can explore multiple solutions and develop a more flexible, innovative mindset.

The fifth key informant recommends integrating imaging with team-based projects, where students collaborate to design and present solutions visually. By encouraging collaborative visual brainstorming, students develop their innovative thinking skills in a group setting, benefiting from diverse perspectives. This approach also mirrors the real-world dynamics of vocational industries where teamwork and visual communication are key.

Based on the research findings on the aspect of "Personalizing", which received the highest mean of 4.05 at a high level in the study of guidelines for developing innovative thinking skills of teachers in Samut Prakan Vocational College, five key informants provided insightful comments and development guidelines:

The first key informant suggests that personalizing can be developed through teacher training programs that focus on integrating personal experiences into teaching methods. For vocational students, who often come from diverse backgrounds, teachers should leverage their personal knowledge to connect with students on a deeper level. Teachers should also be encouraged to participate in student-centered activities, such as practical projects or community engagement, to better understand their students' real-world challenges. Additionally, workshops should be organized for teachers to reflect on their own experiences and apply them to vocational education in innovative ways, such as through practical demonstrations or industry simulations.

The second key informant emphasizes that teachers should be encouraged to draw upon their personal hobbies and non-academic interests, such as craftsmanship or technical hobbies, to engage vocational students more effectively. The second key informant suggests creating a peer-sharing platform where teachers can exchange ideas and experiences, allowing them to see how personal interests can enhance their teaching. For example, a teacher who is passionate about mechanics can apply their knowledge to teaching automotive courses, bringing a real-life perspective to the classroom. Building networks with industry partners is also crucial, as teachers can better understand the skills students need by interacting with professionals in relevant fields.

The third key informant highlights the importance of tailoring teaching approaches to each student's unique learning style and background. She proposes a mentorship program where teachers interact closely with students, allowing for a more personalized teaching approach. Teachers should be trained to identify students' strengths and weaknesses early on and adapt their teaching strategies accordingly. Furthermore, field trips to industries** or collaborative projects with companies can be incorporated into the curriculum, allowing teachers and students to apply personal insights to real-world problems, fostering innovation.

The fourth key informant believes that the integration of personal experiences into vocational teaching is essential for fostering creativity. The fourth key recommends implementing interactive workshops that encourage teachers to reflect on their life experiences and think of innovative ways to incorporate them into vocational education. Teachers should also engage in collaborative research with students, encouraging a hands-on approach to problem-solving. This would not only allow teachers to draw from their own experiences but also to learn from the fresh perspectives of their students, creating a cycle of innovation within the classroom.

The fifth key informant stresses the need for understanding the student demographic at a deeper level, especially in vocational education. The fifth key informant suggests that teachers should spend time in the environments where their students live and work—such as factories, workshops, or even family businesses—to gain a better understanding of their students' daily challenges. This immersion will allow teachers to tailor their curriculum to better match the real-world demands students face. Additionally, he recommends implementing customized learning plans for students, which are designed to reflect the unique skills and challenges of each learner.

Based on the research findings on the aspect of "Collaborative inquiry", which received the highest mean of 4.01 at a high level:

The first key informant emphasizes that collaborative inquiry must be fostered through creating structured environments where teachers and students can engage in open dialogues. Regular cross-departmental meetings and workshops should be held to allow teachers to exchange ideas and best practices. A formal platform for knowledge-sharing must be set up, where teachers can present challenges and brainstorm solutions. This initiative will build a culture of continuous inquiry and reflection, allowing innovation to flourish in real-time classroom environments.

The second key informant focuses on encouraging teachers to participate in collaborative research projects. Teachers should be given opportunities to work on joint projects with peers from different disciplines, which will expose them to diverse perspectives and ideas. Providing time and resources for team-based problem-solving sessions will encourage critical thinking. A mentor system should be established where senior teachers guide younger staff through collaborative research activities, further strengthening the institution's innovative culture.

The third key informant highlights the importance of integrating technology into the collaborative inquiry process. The third key informant suggests that teachers use online collaborative tools such as shared digital workspaces to facilitate continuous interaction and idea-sharing. Collaborative teaching methods, like team teaching, should also be promoted. Teachers from different fields can co-develop lesson plans, creating a more interdisciplinary approach to problem-solving and innovation.

The fourth key informant underscores the need for leadership in collaborative inquiry. Teachers should be trained to lead collaborative discussions, fostering an environment of trust and openness. The college should host regular innovation labs, where teachers work together to address specific challenges in vocational education. Additionally, collaborative problem-solving should be part of the formal teacher evaluation process, rewarding those who actively engage in team-based innovative thinking.

The fifth key informant suggests creating a collaborative network between institutions. By fostering relationships with other vocational colleges, teachers can collaborate beyond their own institution, broadening their perspectives. Regular conferences and collaborative workshops should be organized, encouraging teachers to network, share best practices, and co-create solutions to shared challenges. This will increase the range of experiences and expertise available for collaborative inquiry.

Based on the research findings on the aspect of "Serious play", which received the highest mean of 4.00 at a high level:

The first key informant suggests fostering creativity and innovation in vocational education. To integrate serious play into teaching, teachers must be encouraged to create an environment where students can freely explore, improvise, and experiment with ideas, without fear of failure. In the context of vocational education, this can be achieved by incorporating hands-on, project-based learning into the curriculum that encourages students to work on real-world problems. It should establish innovation labs or makerspaces where students can engage in practical, exploratory activities. Teachers should be trained to facilitate playful experimentation by setting challenges that require creative problem-solving, with an emphasis on practical ap-plication in the vocational field.

The second key informant highlights flexibility in teaching methods and enables students to apply their vocational skills in unorthodox ways. Encouraging improvisation and rapid prototyping within lessons can help students understand the iterative nature of innovation, where testing limits leads to practical insights. Teachers should integrate prototyping exercises in which students can rapidly develop and test models or products. This would involve using simple materials and tools to simulate real-world scenarios, where students can learn by doing, refining their skills through trial and error.

The third key informant focuses on aligning with the need for hands-on experience and active learning. Teachers should create opportunities for students to experiment with vocational tools and equipment in a risk-free, playful environment where exploration is encouraged. It should imply workshops and collaborative projects where students are free to explore and test different techniques, with instructors acting as facilitators rather than strict guides. Ensure that students have access to various materials and tools that allow them to engage in "play" while still focusing on industry-relevant skills.

The fourth key informant emphasizes that Innovation in vocational education requires that students break out of routine learning and engage in creative thinking. Serious play can be integrated by encouraging students to challenge traditional methods and develop solutions through free exploration, teamwork, and experimentation. Group projects should engage where students work together to solve complex, open-ended problems using innovative approaches. Teachers should encourage students to think outside the box by offering flexibility in the way they approach these projects, allowing for creativity in technical problem-solving.

The fifth key informant suggests that learning cannot be understated, especially in a vocational context. Serious play stimulates innovative thinking by reducing the fear of making mistakes and encouraging continuous learning. Vocational students thrive when they are allowed to engage in trial-and-error learning through playful activities that mimic real-world tasks. It should be developed a system where students are given "innovation challenges" – timed, practical tasks that require them to improvise solutions using limited resources. Teachers should facilitate by offering guidance only when necessary, allowing students to independently discover new ways to approach and solve vocational tasks.

Based on the research findings on the aspect of "Paying attention", which received the highest mean of 3.56 at a high level:

The first key informant emphasizes the importance of nurturing students' attention to detail in real-world industrial environments. Developing this skill can be achieved by incorporating hands-on projects that require students to observe complex mechanical systems and identify faults or inefficiencies. It should imply workshops that simulate real industrial scenarios, encouraging students to slow down, observe, and troubleshoot mechanical or technical issues. Integrate peer-review sessions where students assess each other's projects to foster multiple viewpoints.

The second key informant focuses on cultivating attention by integrating technology in the classroom, such as virtual simulations. These can be used to expose students to various technical situations that require close attention to detail, allowing them to recognize overlooked aspects in a controlled environment. It should introduce virtual reality (VR) simulations in vocational training, where students engage in simulated troubleshooting tasks that emphasize the im-portance of paying attention to small but critical details.

The third key informant stresses that teachers should guide students to enhance their observational skills in technical work through project-based learning. By working on long-term projects, students can revisit their tasks, enabling them to notice patterns or anomalies they might have missed earlier. It should adopt project-based learning where students engage in ongoing technical assignments, requiring them to revisit their work and reflect on earlier decisions. Regular feedback loops from teachers and peers should be established to deepen their observational capabilities.

The fourth key informant highlights the need for collaborative learning environments where students are encouraged to share observations. This enhances their attention skills as they compare perspectives with their peers. It should create collaborative group projects where each student focuses on different aspects of a technical problem. Regular group discussions should be held, allowing students to share their observations and learn from each other's viewpoints, refining their ability to pay attention to various technical details.

The fifth key informant emphasizes cross-disciplinary learning, where vocational students are exposed to different fields of study to broaden their perspective and improve their attention skills. Learning from diverse contexts encourages students to look for patterns

and details that may not be immediately apparent in their own field. It should organize cross-disciplinary workshops where students from various technical fields work together on common projects. This broadens their ability to pay attention to details beyond their specialized area, fostering creativity and deeper observational skills.

4. Discussion

The innovative thinking skills of teachers in Samut Prakan Vocational Colleges, Thailand that it was at a high level in overall, and particular aspects. The highest mean was Crafting followed by Imaging, Personalizing, Collaborative inquiry, Serious play, and Paying attention. This might be because these particular skills, especially "Crafting," allow teachers to synthesize complex information and create solutions that blend creativity with practicality, which is essential in vocational education. "Imaging" and "Personalizing" help teachers connect abstract concepts to real-world applications, ensuring that students not only understand theoretical knowledge but can also apply it effectively. The strong focus on collaboration and play allows for innovation to emerge in a more dynamic, flexible environment, meeting the demands of the evolving workforce with creativity and confidence. These skills are essential in fostering an educational culture that emphasizes adaptability, problem-solving, and teamwork, which are critical for the success of both teachers and students in an ever-changing industry landscape. According to Haryani et al (2021) found that the importance of fostering a culture of innovation in educational institutions cannot be overstated when it comes to preparing students for a rapidly changing world. In today's society, innovative thinking is considered essential as it encompasses the foundational thinking skills that drive innovation within an organization. Therefore, it becomes crucial to cultivate these skills not only among students but also among teachers and staff within educational institutions. By doing so, we create an environment that nurtures and encourages creativity, problem-solving, and out-of-the-box ideas, ultimately equipping students with the tools they need to thrive in an ever-evolving society (Kwangmuang et al.2021). In the field of educational administration, effective collaboration between teachers and educational personnel plays a pivotal role in driving positive outcomes through efficient knowledge management processes. Through this collaboration, the institution can foster an environment of innovation and transformation, leading to enhanced organizational effectiveness and success (Boonmoh & Chanchay, 2024). The end outcome of this intricate and systematic procedure is undeniably the overall caliber and excellence of the enrolled learners, who can rightly be labeled as the distinctive yield that arises from the seamless integration of pioneering and efficacious administrative techniques (Bertrand & Namukasa, 2020).

Development Guidelines of "Crafting" consist of Workshops and Training, Collaborative Projects, Case Studies, Industry Collaboration, and Innovation Labs. These guidelines ensure that vocational teachers in Samut Prakan are equipped with the necessary skills to craft innovative solutions that respond to the complexities of the modern workforce, fostering a learning environment that embraces creativity and practical application. This might be because vocational education in Samut Prakan requires a dynamic approach to meet the ever-evolving demands of the workforce. The integration of workshops, collaborative projects, case studies, and innovation labs ensures that teachers not only develop innovative thinking but also apply their knowledge in real-world scenarios (Burghardt et al.2021). These strategies foster a hands-on learning environment where creativity thrives, and students are prepared to solve complex problems. The emphasis on industry collaboration further bridges the gap between education and the labor market, making the learning process relevant and aligned with current industry standards (Jackson & Bridgstock, 2021). Therefore, these guidelines are essential for equipping both teachers and students with the skills needed to succeed in a rapidly changing world. According to Malhotra et al (2023) stated that reasoning involves being open to a wide range of external perspectives, which can provide valuable insights into both opportunities and challenges that lie ahead. In order to navigate these complexities successfully, organizations must establish robust mechanisms to actively perceive and effectively communicate with these external viewpoints. This can be achieved by placing a strong emphasis on understanding the needs and expectations of customers, as well as keeping a close eye on advancements in technology. Incorporating these external perspectives into their decision-making processes, organizations can better adapt, strategize, and innovate to stay ahead in today's dynamic and competitive business landscape (Malhotra et al., 2023), as Khasawneh (2024) have revealed that possessing the capacity to perceive and comprehend the demands and requirements of customers and the market serves as a crucial

determinant of an innovative organization's triumphant achievements. Therefore, the process of developing effective and efficient methods to accurately recognize and identify the diverse and ever-changing needs and requirements of customers, comprehending and comprehensively understanding the multifaceted and dynamic nature of market demands, as well as establishing and maintaining highly effective and trans-parent channels of communication with customers, is widely regarded and recognized as a fundamentally crucial problem-solving approach and a pivotal driving force behind fostering and cultivating innovation within organizations and business enterprises alike.

Development Guidelines of "Imaging" consist of Incorporate Visual Storytelling, Utilize Digital and Immersive Tools, Real-World Applications and Simulations, Visual Mapping for Critical Thinking, and Collaborative Visual Brainstorming. These development guidelines are designed to not only promote innovative thinking among teachers but also ensure that vocational students are well-equipped to visualize and implement creative solutions in their future careers. This might be because imaging, as a tool, allows learners to process complex information more effectively through visualization, enabling them to grasp abstract concepts and apply them in practical, real-world scenarios (Skulmowski et al.,2021). In the context of vocational education, where hands-on learning is key, visual tools such as storytelling and simulations offer a bridge between theory and practice. Furthermore, collaborative activities that involve visual mapping and brainstorming help to foster creativity and critical thinking, essential skills for the modern workforce. By integrating these methods, vocational students will not only develop technical. Lee et al. (2023) stated that utilizing media to facilitate tangible learning experiences entails classifying instructional media to explicate the correlation between audiovisual aids and the various stages of learning experiences and media consumption. This principle is encapsulated in the "Cone of Experience," which comprises the following stages:

1) Direct Experience – the most tangible stage, where learners acquire knowledge from real objects and actual locations;

2) Contrived Experience – where learners engage with experiences that closely resemble reality;

3) Dramatized Experience – role-playing or dramatization;

4) Demonstration – presenting or performing actions alongside explanations;

5) Field Trips – providing learners with experiences beyond the confines of the classroom;

6) Exhibits – showcasing objects and visual displays;

7) Television – utilized for both open or closed-circuit broadcasting, featuring live or pre-recorded educational sessions;

8) Film – recorded events or narratives on film;

9) Recordings, Radio, and Still Images – audio or visual materials that learners observe or listen to without textual input;

10) Visual Symbols– such as charts, maps, and graphs; and

11) Verbal Symbols – the most abstract level.

Encompassing written words and spoken language, as the research of Cecep et al (2024) conducted it was determined that innovation within the education system is imperative for the advancement and development of both individuals and society as a whole. The study emphasized the significance of both innovation and evolution in this context, highlighting the essential nature of educational innovation due to its crucial role in shaping a sustainable future. The report likened "innovative skills" to biological mutations, illustrating how they enable the evolution of species and ultimately enhance the competitiveness and resilience of educational management. Lotfi et al. (2023) stated that the use of media to create concrete learning experiences refers to instructional media that facilitate student learning, helping to develop knowledge, understanding, skills, attitudes, and competencies in alignment with desired objectives. Media acts as a conduit that aids in conveying and transmitting knowledge from the teacher to the student, enabling the student to achieve the set goals effectively.

Development Guidelines of "Personalizing" consist of Teacher Training and Reflection, Student-Centered Learning, Industry Collaboration and Practical Application, Collaborative Platforms for Peer Learning, and Tailored Learning Plans. By implementing these strategies, vocational education in Samut Prakan can foster an environment where both teachers and students use their unique experiences to drive innovation, ensuring that the education provided is dynamic, relevant, and forward-thinking. This might be because personalizing education helps bridge the gap between theoretical knowledge and practical application, especially in vocational settings where individual experiences play a critical role (Oller et

al.2021).When teachers are trained to reflect on their own experiences and connect them to teaching, it allows for a more authentic and relatable learning environment (Escandell & Chu, 2023).Additionally, student-centered approaches and industry collaboration provide real-world context, making education more relevant and impactful. By tailoring learning to individual students' needs and backgrounds, both teachers and students can thrive in a system that fosters creativity and innovation. According to Gamage et al. (2021) stated that the understanding of individual differences refers to the different learning styles of individuals. Learning style is the way people perceive, understand, organize, and remember information or knowledge. These learning styles are often influenced by genetics, past experiences, and the individual's surrounding society and culture. Each person has their own learning style, and understanding it helps enhance the efficiency of learning. In the field of education, educators who emphasize learning styles do not ask questions like, "Is this student intelligent?" but instead, "How does this student become so intelligent?".

Development Guidelines of "Collaborative inquiry" consist of Structured Collaborative Environments, Collaborative Research Projects, Technology Integration, Leadership in Collaboration, and Institutional Networks. These guidelines aim to create a culture of collaboration, innovation, and shared inquiry, ensuring teachers can continuously develop their innovative thinking skills in alignment with the evolving needs of vocational education (Bendak et al., 2020). This might be because collaborative inquiry allows teachers to engage in diverse perspectives and share knowledge in structured, supportive environments (Brown et al., 2021). When teachers work together through research projects or institutional networks, they are exposed to new ideas and ways of thinking, which fosters creativity and innovation. The amalgamation of technology and effective leadership guarantees that cooperation is not only effective but also yields high productivity. Additionally, by establishing connections within and among organizations, vocational education can continue to adapt to changes in the industry, providing teachers and students with the necessary skills for the future (Munir et al.2022). According to Irfan (2021) described as a procedure that takes place when all parties are engaged in creating the framework, responsibilities, regulations, and cooperative activities. It can be concluded that participants in formal relationships share common goals or objectives. Each party involved in the collaboration acknowledges shared leadership and engages in long-term collaboration, actively participating in every process from initial planning to ongoing operations and eventual evaluation. They willingly accept risks and outcomes together while efficiently sharing resources to achieve the desired outcomes. collaboration in this context emerges from the seamless cooperation of all parties involved, effectively carrying out various activities and initiatives. The key elements that contribute to successful collaboration include effective communication, reciprocal information exchange, collaborative problem-solving, and inclusive shared decision-making processes that ensure everyone's perspective is taken into account. This mutually beneficial collaboration fosters a strong sense of teamwork, synergy, and collective success, contributing to the attainment of common goals and the growth of the parties involved (Paula et al., 2020).

Development Guidelines of "Serious play" consist of Innovation Labs/Makerspaces, Prototyping and Iteration, Workshops and Collaborative Projects, Challenge-Based Learning, and Innovation Challenges. These guidelines provide a clear and actionable roadmap for integrating "Serious Play" into vocational education, ensuring that students are prepared to meet the demands of the evolving workforce with creativity and confidence. This might be because "Serious Play" encourages active learning through hands-on experiences, where students can experiment, make mistakes, and learn in a safe, creative environment. Through the integration of innovation labs and a curriculum based on challenging learning activities, students are provided with the chance to participate in real-life problem-solving exercises, all the while honing their ability to bounce back from setbacks and adjust to new situations (Rosário & Raimundo, 2024). This method is highly important and holds significant value in vocational training, as it focuses on enhancing practical abilities and stimulating creative problem-solving skills, which have become crucial in order to meet the ever-changing demands of rapidly evolving sectors (Chen et al., 2021). To achieve this, the implementation of collective assignments and the development of models are key. These practices not only foster collaboration among students but also cultivate analytical thinking, allowing them to refine and enhance their understanding through repetitive procedures and continuous improvement processes. By integrating these methods into vocational training, students are able to refine their skills and develop a strong conceptual foundation that will equip them for success in their future careers (Guaman-Quintanilla et al., 2022). Kwangmuang et al. (2021) stated that activities are centered around innovation are those that promote and encourage

innovation within the professional setting. All employees contribute to establishing a work environment that fosters creativity and innovation, which involves three essential elements: mutual inspiration, feedback, and constructive critique. Promotong innovation and collaboration need to promote employee participation, openly share pertinent information, and provide the resources necessary for fostering innovation. Innovation is dependent on teams that excel in open communication and have the ability to adapt their structure as needed (Grass et al., 2020).

Development Guidelines of "Paying attention" consist of Implement Hands-On Workshops, Integrate Technology, Adopt Project-Based Learning, Foster Collaborative Learning, and Encourage Cross-Disciplinary Learning. This might be because Paying attention to every intricate detail is of the utmost and unparalleled significance in the realm of vocational education, where an unwavering dedication to precision and unwavering focus reign supreme. These indispensable qualities serve as the quintessential pillars upon which the acquisition of true proficiency in a myriad of highly specialized technical skills is built. Without this meticulous scrutiny and concentration, the attainment of mastery in the vocational sphere would undoubtedly remain an unattainable aspiration (Rasheed & Rashid, 2024). Therefore, it is essential for individuals beginning this educational endeavor to acknowledge the essential role that meticulous attention to detail has in their pursuit of excellence. Practical workshops offer hands-on experience, enabling students to carefully observe and analyze the finer points of their assignments (Harfitt & Chow, 2020). Through the incorporation of advanced technology, such as cutting-edge virtual simulations and state-of-the-art educational tools, students nowadays have unparalleled opportunities to fully engage in identifying and understanding crucial elements within controlled settings. By utilizing project-based learning methods, students are not only able to deeply immerse themselves in their respective subjects but also to sustain their involvement and continuously enhance their work over time. Moreover, the power of collaborative learning plays a pivotal role in promoting knowledge exchange and fostering an open, inclusive environment where students can freely observe, discuss, and learn from one another's diverse perspectives, creative ideas, and innovative approaches. Villarroel et al. (2020) asserted that meticulous attention to detail entails effectively communicating and establishing clear comprehension of the organization's vision, goals, and novel strategies. Additionally, it necessitates the dissemination and promotion of active participation in the organization's vision, goals, and innovation strategies. Training and development are essential for fostering innovation; thus, these processes must be closely integrated with personnel development within the organization (Rampa & Agogué, 2021).

5. Conclusions

The findings from this study underscore that teachers at vocational colleges in Samut Prakan exhibit a high level of innovative thinking skills, with "Crafting" emerging as the most developed skill, followed by "Imaging," "Personalizing," "Collaborative Inquiry," "Serious Play," and "Paying Attention." These skills are pivotal in fostering creativity and innovation among students, equipping them to meet the rapidly evolving demands of the labor market, especially in industrial hubs like Samut Prakan. The study emphasizes the critical role of these innovative skills in supporting Thailand's economic growth by cultivating a workforce that is adaptable, innovative, and well-prepared to tackle the challenges of modern industries.

However, the study does have limitations. It focused solely on vocational colleges in one province, which may limit the generalizability of the findings to other regions or educational settings. Additionally, while the research provides comprehensive guidelines for enhancing each innovative thinking skill, the long-term impact and effectiveness of these strategies on both teachers and students have yet to be thoroughly evaluated.

Future research should seek to broaden the scope of this study by including vocational institutions in other provinces and regions, providing a more diverse perspective on how innovative thinking is fostered in different educational contexts. Additionally, it is essential to assess the long-term implementation of the proposed guidelines to determine their sustained impact over time. Investigating how the integration of innovative thinking influences student outcomes across various industries and sectors could also provide valuable insights into the broader implications of these skills.

In conclusion, this research contributes significantly to the growing body of knowledge on vocational education by offering practical guidelines for enhancing teachers' innovative thinking skills. These skills are crucial not only for preparing vocational educators to lead effectively in the classroom but also for driving innovation and economic development as

Thailand moves toward an increasingly industrialized future. By fostering a culture of creativity and adaptability, these innovative thinking skills will ensure that both teachers and students are well-equipped to meet the challenges and opportunities of a rapidly changing world.

6. Recommendations

It is recommended that vocational colleges integrate hands-on workshops and training specifically focused on problem-solving and creative thinking, directly linked to re-al-world industry scenarios. These workshops should be conducted in collaboration with industry partners, enabling teachers to guide students in developing innovative solutions for real industrial challenges. Outcome-based learning methods should be employed, where students work on projects that simulate real industry demands, ensuring they are equipped to meet workforce needs immediately upon graduation.

Also, it is required that vocational colleges should enhance the use of imaging skills, it is advised to incorporate more digital and immersive tools, such as VR, into teaching. Visual storytelling and real-world simulations should also be emphasized to allow students to see how their theoretical knowledge translates into practical application. Collaborative visual brainstorming sessions can also encourage teamwork and creative problem-solving.

Next recommendation concerns personalizing, and it is recommended that teachers should receive ongoing training to integrate personal experiences into their teaching, making learning more relevant to students' real-world contexts. Fostering student-centered learning through mentorship programs and collaboration with industry partners is crucial. Tailored learning plans should be developed to meet the unique needs of each student, encouraging more meaningful engagement in the classroom.

Vocational colleges should establish structured environments for collaboration is key such as regular meetings, cross-disciplinary research projects, and the use of digital tools for teamwork be incorporated into teaching practices. Teachers should also receive leadership training to facilitate collaborative discussions and innovative labs, helping to build a culture of continuous learning and improvement.

Vocational colleges should prioritize creating innovation labs and makerspaces where students can experiment and learn through hands-on activities. It is recommended to incorporate challenge-based learning and prototyping into lessons, encouraging students to test ideas in a flexible, creative environment. Innovation challenges that require students to think quickly and use limited resources will foster critical thinking and creativity.

It is suggested that vocational colleges should support hands-on workshops should continue to be a focus, simulating real-world tasks to improve students' attention to detail. Integrating technology, such as VR simulations, and adopting project-based learning will help students notice and address overlooked details. Encouraging collaborative learning and cross-disciplinary experiences will broaden students' perspectives and sharpen their observational skills.

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