eISSN: 2349-5715 pISSN: 2349-5707
Volume: 10, Issue 11, Nov-2023 SJIF 2019: 4.702 2020: 4.737 2021: 5.071 2022: 4.919 2023: 6.980

Enhancing Pedagogical and Psychological Mechanisms for Cultivating Creative and Critical Thinking Abilities in Informatics and Information Technology Teachers

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Abstract. In the ever-evolving landscape of education, the role of informatics and information technology (IT) teachers is pivotal in shaping the minds of future innovators and problem solvers. This article delves into the multifaceted realm of improving the pedagogical and psychological mechanisms for developing the creative and thinking abilities of informatics and IT teachers. Recognizing the importance of fostering innovation and critical thinking skills, this comprehensive exploration aims to provide insights, strategies, and frameworks for educators to enhance their instructional methodologies.

Key words: information technology (IT), educators, methodologies, institution, critical thinking, enhancing creativity.

Introduction. Informatics and information technology have become integral components of contemporary education, influencing how students learn and teachers instruct. However, the rapid pace of technological advancements necessitates a continuous refinement of pedagogical and psychological approaches employed by informatics and IT teachers. This article aims to unravel the intricacies of cultivating creative and critical thinking abilities in these educators, exploring the significance of these skills in an era dominated by digital transformation. In a rapidly advancing technological landscape, the role of informatics and information technology (IT) teachers is more crucial than ever. This article explores the intricate process of improving the pedagogical and psychological mechanisms for developing the creative and thinking abilities of informatics and IT teachers. By delving into the importance of fostering innovation and critical thinking skills, this comprehensive analysis aims to provide actionable insights, strategies, and frameworks for educators to elevate their instructional methodologies. Pedagogical skills are a teacher's ability to instruct students and manage their classroom. Teachers learn the material, understand their students, communicate with parents, collaborate with colleagues and form their own fair and consistent guidelines. In practice, that usually means two things: serving as a role model for students, and finding ways to stimulate their creative thinking processes. Although creativity can develop outside of the classroom, teachers play an indispensable role in maintaining and encouraging its continuous development. Pedagogical skills can elevate the quality of the teaching-learning process, strengthen collaborative learning, break up the boredom, and facilitate a personalized learning experience. The pedagogical skill analysis is essential for uncovering the secrets to creating a successful and impactful learning experience. Pedagogy plays an important role to help teachers understand the best ways to conduct a classroom. It gives them insights into how students learn differently in different topics so that they can conduct lessons to suit these needs. It aims to improve the quality of education for students. With pedagogical content knowledge, teachers can apply educational theories, best practices, and techniques to teach their subjects effectively. By having a deep understanding of the subject matter and how to use it, teachers can develop strategies to convey the knowledge engagingly. It has now become a valuable tool in our planning as it enables teachers to think about what they want to teach and how they want to teach it. As expert teachers and teaching professionals, we naturally ln our teaching sessions enable students to be supported to understand subject matter through various pedagogical techniques and tools such as think pair share and mind mapping, therefore, displaying effective teaching and promoting student success [1]. However, novice or pre-

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service teachers often cannot organize the teaching content as they are developing their pedological practices and building up their pedological toolkit from studying empirical studies or research. According to Shulman, Pedagogical content knowledge (PCK) is a type of knowledge that is unique to teachers and is based on how teachers relate their pedagogical knowledge (what they know about teaching) to their subject matter knowledge (what they know about what they teach). The integration or synthesis of teachers' pedagogical knowledge and their subject matter knowledge comprises pedagogical content knowledge. Cochran, DeRuiter, & King revised Shulman's original model to be more consistent with a constructivist perspective on teaching and learning. It essentially breaks down difficult questions by reflecting on critical questions before a teaching experience [2,3]. In a further paper, Loughran (2013) explains the complex relationship between pedagogy and learning by saying that in much of the literature, pedagogy is portrayed as a synonym for teaching, which is both narrow and superficial. However, it should be viewed as embedded in the relationship between education and learning. Therefore, how the teaching–learning relationship is understood, recognized and developed in the educational setting is essential. Thus, our understanding of pedagogy is substantially enhanced through a deep and rich experience of pedagogical content knowledge and the pedagogy of teacher education.

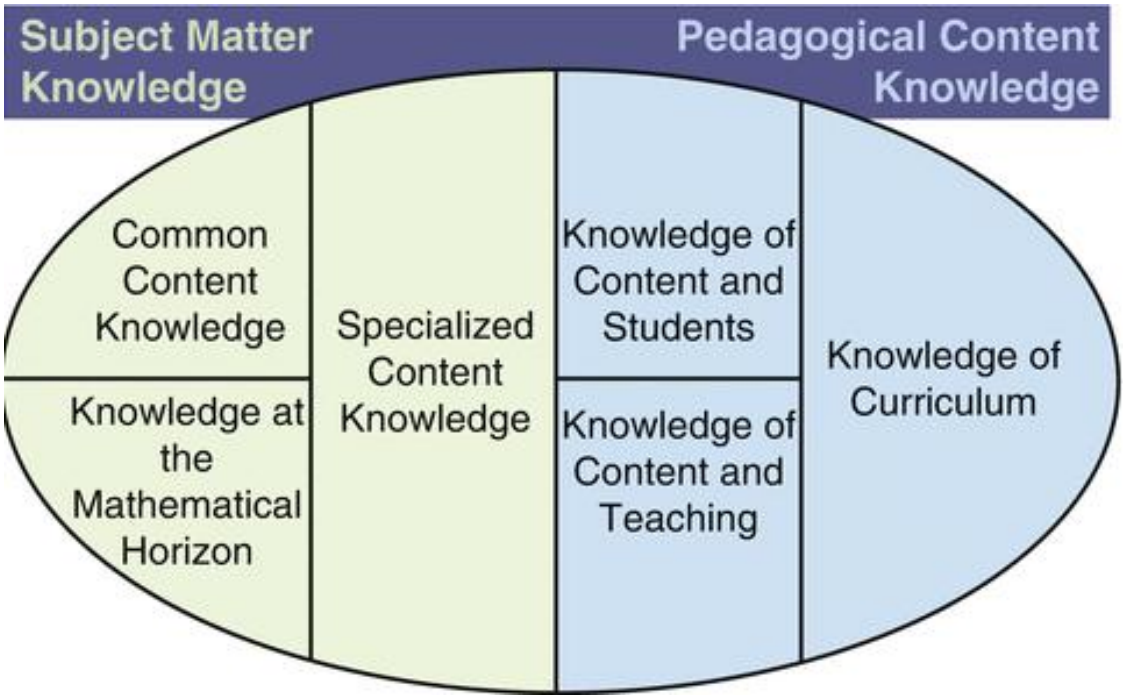

Figure 1. Conceptualizing pedagogical content knowledge

Pedagogical Content Knowledge (PCK) stands at the intersection of subject matter expertise and effective pedagogical strategies, forming a conceptual framework crucial for teacher professional growth. According to a report in the Journal of Technology and Teacher Education, 70% of successful teaching practices rely on a robust foundation of PCK. They described a model of pedagogical content knowledge (PCK) that results from an integration of four major components [4,5]. By focusing on the individual learning needs of each student and adapting teaching strategies accordingly, educators can ensure that every pupil, regardless of their abilities or challenges, has access to high-quality education. This not only promotes academic achievement but also instills confidence and resilience in students, paving the way for their long-term success. Knowledge of Students: Understanding the unique needs, interests, and learning styles of students is the first step in

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implementing PCK. Primary school teachers, for instance, may employ classroom observations to gather insights into student learning behaviors, which can then inform instructional approaches [6].

I. Understanding the Educational Landscape:

The Evolving Role of Informatics and IT Teachers:
Analyzing the shifting dynamics of education in the digital age.
The expanded role of informatics and IT teachers beyond technical expertise.
The Importance of Creative and Critical Thinking:
Defining creativity and critical thinking in the context of informatics and IT education.
The correlation between these skills and success in the technology-driven workforce.
II. Pedagogical Strategies for Enhancing Creativity:
Project-Based Learning (PBL):
Implementing PBL to foster creativity and problem-solving skills.
Real-world applications and case studies.
Collaborative Learning Environments:
The role of collaboration in stimulating creative thinking.
Leveraging technology for virtual collaboration.
Integration of Design Thinking:
Infusing design thinking principles into informatics and IT curricula.
Empathy-driven problem-solving and user-centric design.
III. Psychological Mechanisms for Developing Critical Thinking:
Cognitive Development Theories:
Applying Piaget's and Vygotsky's theories to informatics and IT education.
The impact of cognitive development on critical thinking.
Metacognition and Reflective Practices:
Promoting metacognitive awareness among informatics and IT teachers.
Incorporating reflective practices for continuous improvement.
Cultivating a Growth Mindset:
Nurturing a mindset that embraces challenges and sees failures as opportunities.
Strategies for fostering resilience and perseverance.
IV. Technology Integration in Pedagogy:
Innovative Teaching Tools:
Exploring emerging technologies for enhanced engagement.
The role of virtual reality, artificial intelligence, and gamification.
Online Platforms for Professional Development:
Utilizing online resources and communities for continuous learning.
Building a supportive network for informatics and IT teachers.
V. Evaluating and Assessing Creative and Critical Thinking:
Alternative Assessment Methods:
Moving beyond traditional exams to assess higher-order thinking skills.
Developing authentic assessments aligned with real-world scenarios.
Feedback and Iterative Assessment:
The importance of timely and constructive feedback.
Implementing iterative assessment strategies to track progress.

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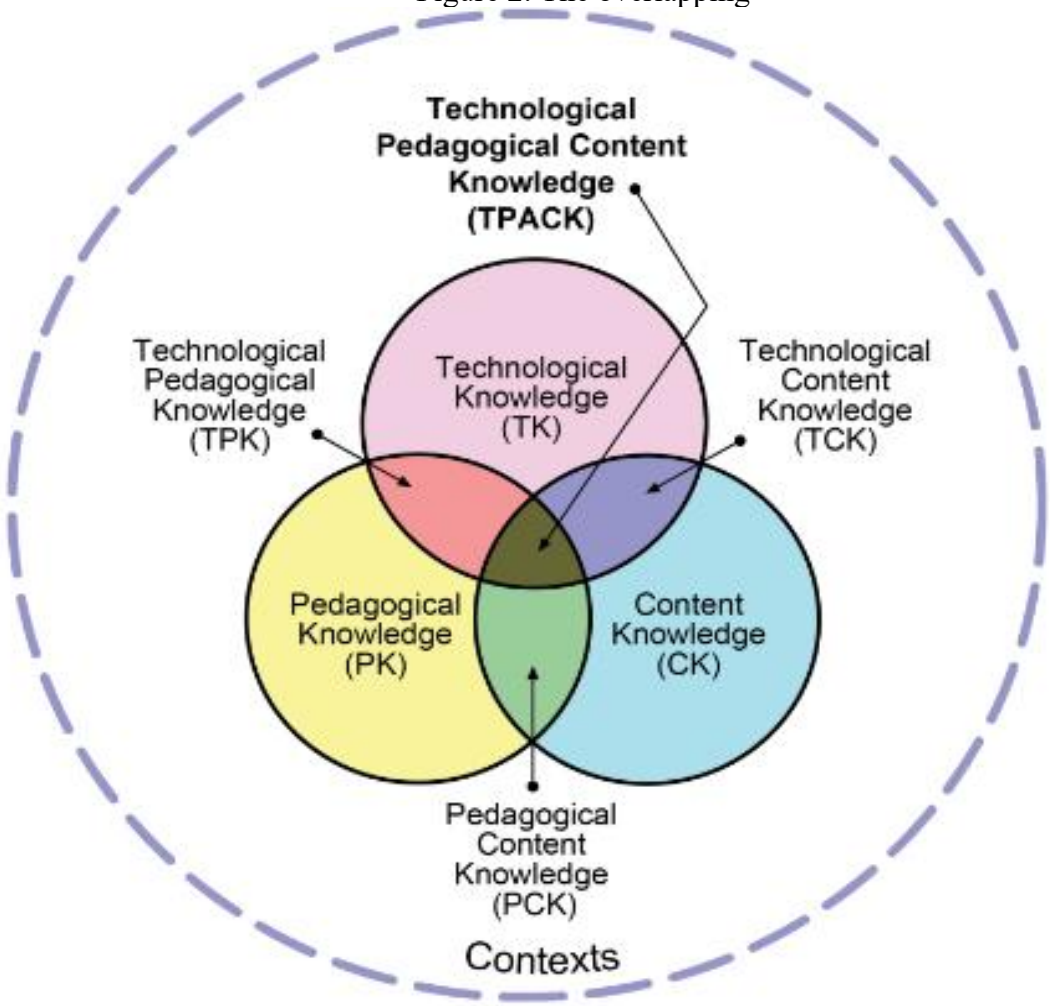
Figure 2. The overlapping



cir cles defined types of knowledge

The creators of both models realized that the traditional technology PD offered in isolation from the classroom was not working. As developers of the TIM, we took a slightly different tack, however [7]. After flirting a bit with a three-dimensional model that included content subject areas, we decided that the greatest need was at the intersection of pedagogy and technology "Technological Pedagogical Knowledge" in the language of the TPACK. We therefore focused the TIM model on creating a deeper understanding of how to apply the most effective pedagogical principles to the use of technology [8]. Critical thinking is the ability to clearly and logically consider information that is presented to us. Creative thinking is about generating new, novel, or useful ideas. The great innovators combine critical thinking and creative thinking. Old world perspectives with new world ideas. Critical thinking is the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action.

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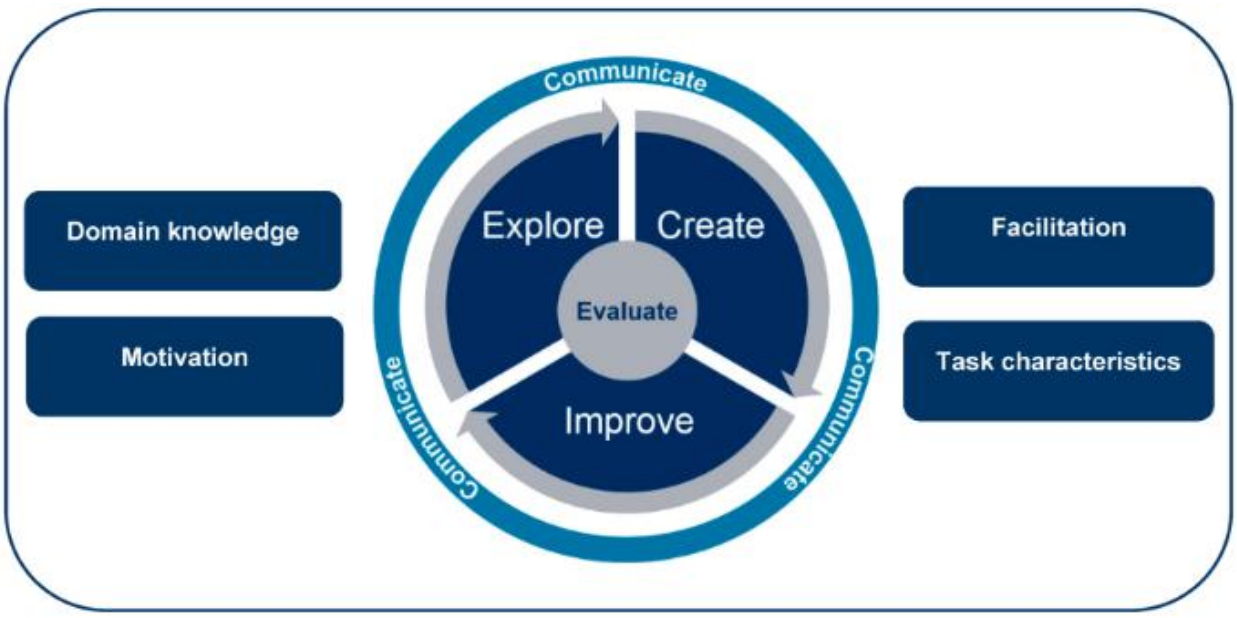

Figure 3. Creative thinking model for learning and assessment.

As these examples illustrate, there is overlap in key ideas between prominent models of creativity, but there are differences in focus and emphasis for different features and applications. Other distinctions in the literature on creativity are the types of behaviors and applications of interest. Creativity may range from a low level, as in, for instance, solving a typical-insight problem, to a very high level involved in the shift of paradigms or genres involved in science and art. In application, this allows for more emphasis to be placed on the evaluative, metacognitive, and communicative processes involved with the creative thinking processes, their cultivation, and the benefits that they may provide in improving specific creative thinking outcomes [9]. This broader conceptualization allows for the inclusion of aspects of creative thinking that are more difficult to access in large scale summative assessment environments but may be relevant and attainable for the development of learning solutions as well as summative and formative classroom assessments and tools. The proposed Creative Thinking Learning and Assessment Model defines creative thinking as the capacity to expand beyond conventional boundaries to create unconventional and valuable solutions. Building from the PISA definition given above, this model adds more explicit focus on the importance of first understanding conventionality, its boundaries, and its construction, as a foundation for developing ideas or solutions that can be unconventional and still valuable. Conventionality can be described as the ways in which something is commonly done, or the common solutions for a problem or challenge. We use the term “challenge” to refer to situations that call for creative approaches (e.g., designing a logo) but do not necessarily present problems to be solved. The understanding of conventionality allows for a better understanding of the boundaries and range of unconventionality and supports the processes of generating unconventional solutions. The understanding of conventionality also allows for the evaluation of unconventionality as it relates to the criteria that are required for the unconventional solutions to retain value for the intended purpose [10]. For instance, the lengths of creative artefacts such as songs or movies were originally limited by the materials that were available to record and play them. Identifying that creative artefacts, such as songs and movies, have common lengths, allows for the exploration of why those lengths were common, and whether those factors continue to be limiting criteria.

Conclusion. As the educational landscape continues to evolve, informatics and IT teachers play a pivotal role in preparing students for the challenges of the future. By embracing innovative

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pedagogical and psychological mechanisms, educators can enhance their ability to cultivate creative and critical thinking skills. This article serves as a roadmap for informatics and IT teachers, offering practical strategies and insights to empower them in shaping the next generation of technologically adept, critically thinking individuals.

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