

APPLICATION OF THE '4C CONCEPT' IN 21ST CENTURY LEARNING AMONG TRAINING TEACHERS

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Abstract	
<p>Keyword:</p> <p>4C concepts, 21st-century learning, trainee teachers, teacher education</p> 	<p>This study investigates the self-reported practice of the 4C concepts - collaboration, critical thinking, creativity, and communication - among trainee teachers enrolled in the Bachelor of Teaching Degree Programme (PISMP & PPISMP) at Institut Pendidikan Guru Kampus Perempuan Melayu, Melaka, within the context of 21st-century learning. A survey design was employed, involving 121 trainee teachers from various fields of specialisation. Data were collected using a five-point Likert scale questionnaire comprising 14 adapted items and analysed descriptively using frequency, percentage, mean, and standard deviation. The findings reveal that the overall practice of the 4C concepts was at a high level, with collaborative learning recording the highest mean score ($m = 4.72$) and creative thinking the lowest ($m = 4.48$). While all four concepts were positively rated, the findings suggest that critical and creative thinking require further enhancement to ensure a more balanced development of 21st-century pedagogical concepts. Overall, the study underscores the importance of strengthening the 4C framework in teacher education to better prepare future teachers who are collaborative, reflective, communicative, and intellectually responsive in contemporary classroom settings.</p>



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Introduction

The rapid advancement of globalisation and the digital economy has fundamentally redefined the competencies required of the modern workforce. In this era of unprecedented technological change, education systems worldwide are confronted with the pressing challenge of equipping learners — and those who teach them — with skills that extend far beyond traditional academic content knowledge. Central to this challenge is the concept of 21st century learning, which prioritises the development of higher-order thinking, adaptability, collaborative capacity, and effective communication as core educational outcomes (Thornhill-Miller et al., 2023).

Among the most widely recognised frameworks for organising these competencies is the '4C'

model, which identifies Critical Thinking, Creative Thinking, Collaboration, and Communication as the foundational pillars of 21st century learning. Originally articulated by the Partnership for 21st Century Skills (P21) and subsequently endorsed by major international organisations such as the World Economic Forum and the OECD, the 4C framework has become a benchmark against which the quality of pedagogical practice is increasingly measured (Thornhill-Miller et al., 2023; OECD, 2023).

In Malaysia, the importance of embedding 21st century skills into the national education system has been explicitly acknowledged at the highest policy levels. The Malaysia Education Blueprint (MEB) 2013–2025 identifies critical and creative thinking, collaboration, and communication as core student attributes and explicitly calls for the revision of curricula and teacher training frameworks to develop these competencies (Ministry of Education Malaysia, 2013). The Blueprint articulates a vision in which the education system produces graduates who are not merely knowledgeable, but who are also thoughtful, collaborative, communicative, and innovative — qualities that collectively align with the 4C framework.

Within this policy landscape, teacher education institutions in Malaysia — particularly the Institut Pendidikan Guru Malaysia (IPGM) — occupy a strategically critical role. As the primary bodies responsible for producing qualified primary school teachers, IPGMs are tasked with ensuring that teacher trainees enrolled in the Program Ijazah Sarjana Muda Perguruan and Program Persediaan Ijazah Sarjana Muda Perguruan (PISMP & PPISMP) are not only knowledgeable in their subject specialisations but are also deeply competent practitioners of 21st century pedagogy. The PISMP is a four-year Bachelor of Education (Honours) programme and one year as foundation program offered by the Malaysian Ministry of Education to prepare future educators for national primary schools (Ministry of Education Malaysia, 2024).

The Malay Women's Teacher Training Institute (Institut Pendidikan Guru Kampus Perempuan Melayu, IPGK PM) holds a unique and distinguished position within the IPGM network as one of the oldest teacher training institutions in Malaysia. As an institution that trains a significant cohort of PISMP teacher trainees each year, IPGK PM provides an important context for examining the extent to which the 4C concept is actively being applied in teaching and learning practice.

Despite the extensive policy rhetoric surrounding 21st century pedagogy, empirical evidence on the actual practice of the 4Cs among PISMP teacher trainees in Malaysia remains limited. Earlier research by Mohd Zailani and Mohamad Khairi (2021) found that while PISMP Islamic Education trainees demonstrated generally high levels of 21st century pedagogical practice, the critical thinking dimension consistently recorded the lowest mean scores across cohorts, suggesting a persistent gap requiring targeted intervention. Similarly, a study by Badrul Hisham and Mohd Nasruddin (2016) noted that critical thinking in instructional practice was the weakest dimension among IPG lecturers. More recently, international research has confirmed that the integration of 4C competencies into instructional materials and lesson plans continues to challenge educators, with most falling below the 'meets competency' threshold across all four dimensions (Wulandari et al., 2024).

Given this context, the present study aims to investigate the level of 4C application among PISMP teacher trainees at IPGK PM. By obtaining empirical data on the four dimensions of critical thinking, creative thinking, collaborative learning, and communication, this study contributes to the growing body of evidence on 21st century pedagogical practice in Malaysian teacher education, and offers actionable insights for curriculum developers, teacher educators, and policymakers committed to improving the quality and readiness of Malaysia's future teaching workforce.

Literature Review

The 4C Framework in 21st Century Education

The concept of 21st century skills has gained substantial momentum in educational research and policy over the past two decades. Among the various frameworks proposed to define and operationalise these

skills, the 4C model encompassing Creativity, Critical Thinking, Communication, and Collaboration has emerged as one of the most internationally recognised and widely adopted. Originally introduced by the Partnership for 21st Century Skills (P21), the 4C framework places these competencies at the apex of future-oriented education, emphasising that students and teachers alike must develop these skills as foundational learning and innovation capacities (Thornhill-Miller et al., 2023).

Thornhill-Miller et al. (2023), writing in the *Journal of Intelligence*, provide a comprehensive review of the 4Cs, noting that these skills are consistently ranked by both students and teachers as the highest priority competencies for workforce readiness by 2030. The authors note that while each of the 4Cs constitutes a distinct domain, they are deeply interrelated: creativity and critical thinking are described as 'inseparable attitudes and abilities for innovation', while communication and collaboration are characterised as 'fundamental life skills' those students draw upon across all aspects of their academic and professional lives. Similarly, the OECD (2023) has developed a Professional Learning Framework for fostering and assessing creativity and critical thinking, further cementing the institutional recognition of these skills as global educational priorities.

Wulandari et al. (2024), in a study published in *Heliyon*, investigated the integration of 4C competencies in the instructional materials of teachers at an Indonesian Faculty of Education. Their findings, based on content analysis of 54 instructional documents, revealed that the majority of teachers' materials fell in the 'Not yet reached competency' category across all four dimensions, with Collaboration recording the weakest integration ($M = 1.57$) and Communication the highest ($M = 1.89$). The study concluded that teachers' understanding and familiarity with the 4Cs is a prerequisite for their meaningful incorporation into instruction, calling for focused professional development and institutional support. This aligns with concerns raised in the Malaysian context, where the quality of 4C integration has been similarly identified as an area for improvement.

Collaborative Learning in the 21st Century Classroom

Collaborative learning, the practice of working together towards a shared educational goal, is one of the most extensively researched constructs in the 21st century skills literature. Within the P21 framework, collaboration is understood not merely as group work but as a sophisticated social and cognitive process requiring students to engage in joint problem-solving, co-construction of knowledge, and mutual accountability (Nearpod, 2024). Research consistently demonstrates that collaborative learning environments foster higher-order thinking, enhance student engagement, and improve academic outcomes across subject areas (Listiana et al., 2023).

In teacher education, collaborative practice is particularly significant. Rohani et al. (2010) found that teacher-student relationships are a significant factor in increasing student learning commitment, and that collaborative environments in teacher training institutions contribute meaningfully to the professional identity formation of pre-service teachers. More recently, Goh et al. (2023) demonstrated in a study of Malaysian secondary schools that collaborative school culture and principal support are critical enablers of teacher leadership—a finding with clear implications for the type of collaborative dispositions that should be cultivated during initial teacher preparation.

A 2024 study published in *Accounting Education* examined the role of collaborative learning in developing critical thinking through a partial pre-release assessment format over two academic years. The study found a statistically significant relationship between collaboration and the level of critical thinking demonstrated by students, reinforcing the view that collaboration and critical thinking are not independent constructs but rather mutually reinforcing dimensions of effective 21st century learning (Sahd & Rudman, 2024).

Critical Thinking as a Pedagogical Imperative

Critical thinking—the capacity to analyse, evaluate, synthesise, and reason effectively—is widely regarded as the most demanding and yet most transformative of the 4C competencies. The OECD (2023) emphasises that critical thinking involves executive functions, the ability to overcome cognitive bias,

and meta-cognitive processes, all of which can be trained and enhanced through educational programmes. In the Malaysian context, the ability to think critically has been explicitly incorporated into the Higher Order Thinking Skills (HOTS) agenda embedded within the national curriculum, reflecting an institutional recognition that critical reasoning must be systematically taught rather than assumed to develop spontaneously.

Despite its acknowledged importance, critical thinking consistently emerges as the weakest dimension in studies of 21st century pedagogy among Malaysian teacher trainees. Mohd Zailani and Mohamad Khairi (2021) found that among PISMP Islamic Education trainees, critical thinking recorded the lowest mean score ($M = 4.37$) across the four 4C constructs, with the item relating to the ability to provide arguments and evidence for one's own opinion recording the lowest individual item mean ($M = 4.33$, $SD = 0.72$). Badrul Hisham and Mohd Nasruddin (2016) similarly reported the lowest mean for critical thinking among IPG Kampus Ipoh lecturers. These findings suggest a systematic and persistent challenge in the development of argumentation and evidential reasoning skills within the Malaysian teacher training context.

Research from the broader Asian higher education landscape further contextualises this challenge. Le and Chong (2024), in a phenomenographic study of Malaysian and Vietnamese undergraduates published in *Thinking Skills and Creativity*, noted that Asian students may possess distinct conceptions of critical thinking shaped by cultural and pedagogical norms, and that these conceptions can affect the application of critical thinking in classroom settings. The study emphasised that critical thinking is a dynamic, developable characteristic and that its cultivation requires deliberate, contextually sensitive instructional design a conclusion with direct relevance to pre-service teacher education programmes.

Creative Thinking and Pedagogical Innovation

Creative thinking the generation of novel, useful, and contextually appropriate ideas — is a multifaceted construct that encompasses divergent thinking, imagination, problem-solving through unconventional approaches, and the capacity to envision future possibilities. Within the 4C framework, creativity is understood not as an innate gift possessed by few but as a learnable competency that can be systematically developed through appropriate instructional design (Thornhill-Miller et al., 2023). The OECD has emphasised that creativity can be fostered both through direct instruction in creative techniques and through the creation of supportive environments that encourage risk-taking and experimentation.

In the context of teacher education, creative thinking encompasses what Noor Shah and Mohd Uzi (2013) describe as a combination of specific creative expertise, knowledge of creativity techniques, and understanding of student developmental processes. These capacities collectively enable teachers to generate novel instructional approaches and produce new ideas in their pedagogical practice. Ismail and Othman (2021) reported a mean score of 4.44 for creative thinking among PISMP trainees, suggesting a generally high level of perceived creative competence, though with scope for further development — particularly in the item concerning the generation of many new ideas, which recorded the lowest individual mean within the construct.

Communication Skills in Teacher Education

Effective communication spanning oral, written, digital, and non-verbal modalities — is universally acknowledged as a fundamental professional competency for teachers. Thornhill-Miller et al. (2023) note that communication skills are ranked among the highest priorities for workforce readiness by 2030 across multiple international surveys, and emphasise that all dimensions of communication (linguistic, pragmatic, and social) must be explicitly taught and assessed within educational institutions. In the digital age, communication has become even more nuanced, extending beyond face-to-face interaction to encompass online collaboration, digital media literacy, and the ability to convey ideas clearly across multiple platforms (Nearpod, 2024).

In Malaysian teacher training research, communication consistently emerges as the strongest of the four 4C constructs. Ismail and Othman (2021) reported that communication recorded the highest overall mean ($M = 4.56$, $SD = 0.55$) among PISMP Islamic Education trainees, with all three communication items recording identical mean scores of 4.56. Khairul Anuar (2012) affirms that effective communication is essential for teachers to convey knowledge clearly and build lasting pedagogical relationships with students, while Teven et al. (2004) established that communication competence is directly linked to teaching effectiveness. These findings underline the importance of sustaining and building upon the communication strengths identified in the Malaysian PISMP cohort while simultaneously addressing weaker dimensions.

The Malaysian Teacher Education Context

Malaysia's commitment to 21st century education is codified in the Malaysia Education Blueprint (MEB) 2013–2025, which identifies 21 century skills including the 4Cs as central to the national educational transformation agenda. The Blueprint calls for the revision of curricula to embed critical and creative thinking, and for the development of teacher training programmes that model and develop these competencies in pre-service teachers (Ministry of Education Malaysia, 2013). More recently, Malaysia has signalled its intention to introduce a new national education policy that further emphasises 21st century skills including critical thinking, problem-solving, creativity, and communication across all levels of the education system (BeED, 2023).

Within this context, the PISMP programme serves as the primary vehicle through which the Malaysian government prepares teachers for national primary schools. As articulated in the Malaysian Qualifications Framework (MQF), PISMP graduates are expected to demonstrate competence across multiple learning domains, including collaborative practice, critical and creative thinking, and effective communication (Malaysian Qualifications Agency, 2016). The programme's ability to produce graduates who embody the 4C competencies is therefore not merely a matter of institutional quality but a direct determinant of the extent to which 21st century learning will be realised in Malaysian primary school classrooms.

Despite the strong policy framework, empirical research specifically examining the 4C practices of PISMP trainees remains concentrated in particular specialisation areas and campuses. This study addresses an identified gap by examining 4C application among trainees at IPGK PM, contributing new data to the evolving empirical picture of 21st century pedagogy in Malaysian teacher education.

Methodology

Research Design

This study employed a quantitative survey research design to examine the research objectives. A quantitative approach was deemed appropriate as it enables the systematic collection of numerical data and allows for statistical analysis to identify patterns, relationships, and generalisations across a sample population (Creswell & Creswell, 2023). Survey research design was specifically adopted as it facilitates the efficient collection of data from a large number of respondents within a relatively short period (Fowler, 2022).

Research Instrument

Data were collected using a structured questionnaire distributed via Google Forms, an online survey platform. The use of an online survey instrument offers several advantages, including wider reach, cost-effectiveness, and ease of data compilation (Evans & Mathur, 2018). The questionnaire items were adapted from Zailani (2021), ensuring content validity through the use of a previously validated instrument. Minor modifications were made to the original items to suit the context of the current study while preserving the original constructs and meaning.

The questionnaire consisted of closed-ended items measured using a five-point Likert scale, ranging from 1 (*Strongly Disagree*) to 5 (*Strongly Agree*), which is widely used in social science research to capture respondents' attitudes and perceptions (Joshi et al., 2015).

Sampling and Data Collection

Respondents were recruited through purposive or convenience sampling (adjusted according to the research method). The Google Form link was distributed electronically via relevant platforms such as Whatsapp group and Telegram group. Participation was voluntary and respondents were assured of the confidentiality of their responses in accordance with ethical research standards.

Data Analysis

Collected data were analysed using appropriate statistical techniques. Descriptive statistics including mean, standard deviation, and frequency distribution were computed to profile the respondents and summarise the data (Pallant, 2020).

Findings

The data collected in this study were used to address the study's objective, which was to identify the self-perceived practices of teacher trainers in the Bachelor of Education Program (PISMP & PPISMP) at the Institute of Teacher Education, Malay Women's Campus, Melaka, in applying the 4C concepts through the 21st-Century Learning Approach. The study findings were based on the scores shown in Table 1 and on the four constructs tested, namely the collaborative learning construct, the critical thinking construct, the creative thinking construct, and the communication construct, as follows:

Table 1
Interpretation of Min Score

Score Min	Interpretation
1.00 - 2.33	Low
2.34 - 3.66	Moderate
3.67 - 5.00	High

Source: Adapted from Julie Pallant (2010)

Demographics Information

The study respondents comprised 121 female trainee teachers from the IPGK PM, Melaka, who were undertaking pre-service training. The respondents were among the trainee teachers in the fields of Early Childhood Education, Malay Language, Special Education, and Islamic Education. The respondents were students of the Foundation Program for the Bachelor's Degree (PPISMP) and the Bachelor's Degree Program (PISMP). The number of PPISMP student respondents was 64%, while the number of PISMP student respondents was 36%.

Construct 1: Collaborative Learning

The distribution of mean and standard deviation based on the collaborative learning construct items was as shown in Table 2. The highest mean was for Item 1, "I collaborate with my peers to learn new things" (mean = 4.83). The lowest mean was for Item 2, "I discuss differences in opinions with my peers during active learning" (mean = 4.65).

Table 2
Distribution of Mean and Standard Deviation of the Collaborative Learning Construct

Item	f (%) Strongly Disagree	f (%) Disagree	f (%) Slightly Disagree	f (%) Agree	f (%) Strongly Agree	Mean	Standard Deviation
I collaborate with my peers to learn new things.	1 (0.8%)	2 (1.7%)	21 (17.4%)	100 (82.6%)		4.83	0.38
I discuss differences in opinions with my peers during active learning.		1 (0.8%)	38 (31.4%)	81 (66.9%)		4.65	0.52
I collaborate with my peers to complete tasks actively.		1 (0.8%)	19 (15.7%)	101 (83.5%)		4.74	0.46
I consistently share and explain my understanding with my peers.		2 (1.7%)	30 (24.8%)	90 (74.4%)		4.73	0.27
I receive useful feedback on assignments from my lecturer.				32 (26.4%)	86 (71.1%)	4.67	0.56

Construct 2: Critical Thinking

The distribution of means and standard deviations based on the critical thinking construct items was as shown in Table 3. The highest mean was for Item 2, “I consider diverse opinions from others” (mean = 4.74). The lowest mean was for Item 3, “I am able to provide arguments and supporting evidence for my opinions” (mean = 4.30).

Table 3

Distribution of Mean and Standard Deviation of the Critical Thinking Construct

Item	f (%) Strongly Disagree	f (%) Disagree	f (%) Slightly Disagree	f (%) Agree	f (%) Strongly Agree	Mean	Standard Deviation
I think of alternative ways to understand what I have learned.			3 (2.5%)	51 (42.1%)	67 (55.4%)	4.53	0.55
I consider diverse opinions from others.			1 (0.8%)	30 (24.8%)	90 (74.4%)	4.74	0.46

I am able to provide arguments and supporting evidence for my opinions.	10 (8.3%)	65 (53.7%)	46 (38%)	4.30	0.62
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Construct 3: Creative Thinking

The distribution of means and standard deviations based on the creative thinking construct items was as shown in Table 4. The highest mean was for Item 1, “I am able to generate many new ideas” (mean = 4.54). The lowest mean was for Item 2, “I solve problems using different approaches” (mean = 4.43).

Table 4

Distribution of Mean and Standard Deviation of the Creative Thinking Construct

Item	f (%) Strongly Disagree	f (%) Disagree	f (%) Slightly Disagree	f (%) Agree	f (%) Strongly Agree	Mean	Standard Deviation
I am able to generate many new ideas.			5 (4.1%)	46 (38%)	70 (57.9%)	4.54	0.57
I solve problems using different approaches.			4 (3.3%)	61 (50.4%)	56 (46.3%)	4.43	0.56
I am able to produce ideas that may be useful in the future.			4 (3.3%)	57 (47.1%)	60 (49.6%)	4.46	0.53

Construct 4: Communication

The distribution of mean and standard deviation based on the communication construct items was as in Table 5. The highest mean was for Item 1, “The lecturer consistently fosters effective communication skills in me” (mean=4.73). The lowest mean was for Item 3, “I consistently diversify my communication approaches” (mean=4.66).

Table 5

Distribution of Mean and Standard Deviation of the Communication Construct

Item	f (%) Strongly Disagree	f (%) Disagree	f (%) Slightly Disagree	f (%) Agree	f (%) Strongly Agree	Mean	Standard Deviation
The lecturer consistently fosters effective communication skills in me.			3 (2.5%)	27 (22.3%)	91 (75.2%)	4.73	0.50
I use effective communication skills to achieve excellence.			2 (1.7%)	36 (29.8%)	83 (68.6%)	4.68	0.52

I consistently diversify my communication approaches.	41 (33.9%)	80 (66.1%)	4.66	0.47
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Discussion

The findings of this study show that trainee teachers at IPGK PM, Melaka generally reported a high level of 4C practice, indicating that the values associated with 21st-century learning were already present within their learning experience. At one level, this reflects positively on the teacher education environment, suggesting that the respondents are being exposed to pedagogical approaches that encourage interaction, participation, and active engagement. However, a closer reading of the findings reveals that the four competencies are not developed in the same way or to the same extent. While collaboration and communication emerged as clear strengths, critical thinking and creative thinking appeared comparatively less developed. This difference was important because it suggested that trainee teachers may be more comfortable with the visible and social aspects of learning than with the deeper intellectual work of questioning, reasoning, and generating alternative solutions. In this sense, the findings do not simply show that the 4Cs were present, but rather that they were being internalised unevenly across dimensions.

The strong score for collaboration suggested that the respondents were familiar with learning in ways that involve peer interaction, shared responsibility, and collective participation. This was unsurprising within teacher education, where students were often required to work in groups, discuss lesson ideas, and complete tasks collaboratively. Such practices were valuable because it helped future teachers to build interpersonal confidence and learn how to function within professional communities. At the same time, the slightly lower score for discussing differences of opinion suggests that collaboration may still be taking place at a relatively safe or procedural level. Working together is not necessarily the same as thinking together. If collaboration was limited to agreement and task division, then it may not yet reflect the kind of meaningful intellectual exchange required for deeper professional learning. This indicates that teacher education programmes may need to place greater emphasis on forms of collaboration that also involve dialogue, critique, justification, and respectful disagreement, so that collaboration becomes a space for thinking as well as participation.

A similar pattern can be seen in the area of communication, which also recorded a high mean and appears to be one of the more established competencies among the respondents. This suggests that trainee teachers were generally confident in expressing ideas, participating in academic interaction, and responding to lecturer guidance. In many ways, this was encouraging, since communication lied at the centre of teaching as a profession. Teachers did not only deliver content; they explained, guided, negotiated, questioned, reassured, and build relationships through communication. Yet, the lower score for diversifying communication approaches points to an important limitation. It may indicate that respondents were still relying on familiar or conventional ways of communicating, rather than demonstrating flexibility across different contexts, audiences, or modes. In today's classrooms, where learners are increasingly diverse and communication often extends into digital and multimodal spaces,

this adaptability is essential. As such, communication within teacher education should not only focus on speaking clearly or presenting confidently, but also on helping trainee teachers become more responsive, versatile, and pedagogically intentional in how they communicate.

The more concerning pattern emerges in relation to critical thinking and creative thinking, both of which, although still rated highly overall, recorded lower means than collaboration and communication. The weaker performance in critical thinking especially in relation to providing arguments and evidence to support opinions is particularly significant because it points to a possible gap between participation and intellectual independence. Trainee teachers may be actively involved in learning, yet still feel less confident when asked to defend ideas, challenge assumptions, or reason through issues in a more analytical way. Likewise, the lower score for creativity, especially in solving problems through different approaches, suggests that respondents may be able to generate ideas in principle, but may not yet be fully comfortable using creativity in situations that require flexibility, uncertainty, or pedagogical innovation. These two findings matter because the future classroom will require teachers who are not only cooperative and articulate, but also able to make thoughtful judgments, adapt teaching strategies, and respond imaginatively to real educational challenges. If critical and creative thinking remain comparatively underdeveloped during teacher preparation, then the long-term goal of producing truly future-ready teachers may remain only partially fulfilled.

Taken together, the findings suggest that the development of the 4C framework among trainee teachers at IPGK PM is promising, but not yet fully balanced. The study indicates that current teacher preparation appears to support the growth of social and interactional competencies more effectively than the more demanding cognitive dimensions of 21st-century learning. This does not mean that the programme is weak; rather, it suggests a developmental opportunity. Moving forward, teacher education should place more deliberate emphasis on learning experiences that require trainee teachers to justify instructional choices, explore multiple solutions, question ideas, and think more inventively about teaching and learning. In this way, the 4C framework can move beyond being a conceptual expectation and become a lived professional capability. Ultimately, if Malaysia aims to prepare teachers who can shape classrooms for a rapidly changing future, then teacher education must cultivate not only those who can work and communicate well with others, but also those who can think with depth, respond with originality, and teach with intellectual purpose.

Conclusion

This study highlights that trainee teachers at Institut Pendidikan Guru Kampus Perempuan Melayu (IPGK PM), Melaka generally demonstrate a strong orientation towards the 4C competencies of collaboration, critical thinking, creativity, and communication, all of which are central to 21st-century learning. The overall high scores suggest that these future teachers are already engaging with learning in ways that reflect current educational expectations. At the same time, the findings make it clear that not all dimensions are equally established. While collaboration and communication appear to be well developed, critical thinking and creative thinking remain comparatively less prominent, pointing to a need for more deliberate attention in teacher preparation.

This imbalance is important because effective teaching in contemporary classrooms requires more than confidence in working with others or expressing ideas clearly. Future teachers must also be able to reason carefully, respond flexibly, and make thoughtful pedagogical decisions in increasingly

complex learning environments. For this reason, the value of the present study lies not only in showing that the 4C framework is present among trainee teachers, but also in revealing where further growth is still needed. Strengthening the more cognitively demanding aspects of the 4Cs during teacher education is essential if these trainees are to become educators who can genuinely support meaningful, future-oriented learning.

Overall, this study reinforces the continuing relevance of the 4C concept within Malaysian teacher education and suggests that its implementation should be approached in a more balanced and intentional manner. Preparing teachers for the future is not simply about ensuring that they can participate, communicate, and collaborate effectively, but also about equipping them to think with depth, adapt with purpose, and teach with creativity and judgment. In this sense, the development of the 4Cs should be viewed not as an additional component of teacher preparation, but as a core part of what it means to educate teachers for the realities of contemporary schooling.

Co-Author Contribution

Author 1 carried out the fieldwork, did the data entry, carried out the statistical analysis and overlooked the whole article's write up. Authors 2, 3, 4 prepared the abstract, literature review, interpretation of the results and wrote the research methodology.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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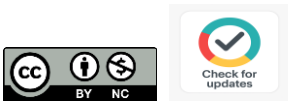
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