Pedagogia Jurnal Ilmu Pendidikan

Journal homepage: http://ejournal.upi.edu/index.php/pedagogia

Enhancing Students' 21st Century Thinking Skills: A Collective Case Study of Teachers' Knowledge and Practices

*Muhammad Izzat Mailis, Rosnidar Mansor

*Department of Educational Studies, Faculty of Human Development, Sultan Idris Education University, Tanjong Malim, Perak, Malaysia

*Correspondence: E-mail: P20211001637@siswa.upsi.edu.my

ABSTRACT

This study investigates teachers' understanding, teaching practices, and challenges in implementing 21st century learning (21CL) competencies in the classroom. Using a qualitative approach, data were collected through interviews, classroom observations and lesson plan analysis, followed by triangulation to ensure validity. Findings indicate that teachers possess a foundational awareness of 21CL principles such as communication, collaboration, critical thinking, creativity and the use of digital tools though the depth of this understanding varies. While some educators connect 21CL with the development of higher-order thinking skills, others focus mainly on technology integration. Teaching practices observed include Project-Based Learning (PBL/PjBL), collaborative activities, digital communication and authentic assessment, which contribute to fostering critical and creative thinking. However, implementation is often partial due to time constraints, unequal student participation, and limited resources. Major obstacles include inadequate instructional time, insufficient digital infrastructure, lack of ongoing professional development, diverse student learning levels and the dominance of standardized assessments. The study concludes that targeted training, enhanced technological access and supportive educational policies are essential to bridge the gap between theoretical knowledge and consistent classroom application of 21CL strategies.

ARTICLE INFO

Article History:
Submitted/Received 04 March 2025
First Revised 09 April 2024
Accepted 05 July 2024
First Available Online 28 July 2025
Publication Date 01 August 2025

Keyword:
21st Century Learning, Educational Challenges, Higher-Order Thinking Skills, Professional Development, Teaching Practices.

1. INTRODUCTION

The global educational landscape is experiencing unprecedented transformation, driven by the forces of the Fourth Industrial Revolution which has accelerated the integration of digital technologies, automation, artificial intelligence, and hyper-connectivity into every aspect of human activity. These developments have radically reshaped economic, social, and cultural systems, thereby exerting immense pressure on education systems to evolve in response (Rullyana et al., 2024). In this context, the need to prepare future generations with a comprehensive suite of 21st century competencies has become increasingly urgent. At the forefront of these are the widely endorsed "4Cs", critical thinking, creativity, collaboration, and communication, skills that are further reinforced by digital literacy and socio-emotional competence (OECD, 2022).

These multifaceted competencies are not only foundational for academic success but are also essential for employability, civic participation, and lifelong learning in a knowledge-intensive global economy. As modern societies grapple with the volatility, uncertainty, complexity, and ambiguity (VUCA) of contemporary life, the role of education has expanded from knowledge transmission to the cultivation of adaptive, innovative, and resilient individuals capable of navigating complexity and leading transformative change.

Responding to these global imperatives, several international frameworks have reconceptualized the aims of education for the 21st century. The OECD's Future of Education and Skills 2030/2040 initiative provides a compelling vision of student learning that emphasizes agency, well-being, and cross-disciplinary competencies (OECD, 2024a). This framework foregrounds the importance of equipping learners with the ability to not only absorb content knowledge but also generate, evaluate, and apply ideas across diverse and novel contexts.

The shift from rote memorization to creativity and innovation is further reflected in the 2022 cycle of the Programme for International Student Assessment (PISA), which introduced creative thinking as a core assessment domain. This domain evaluates students' ability to produce, refine, and assess ideas in written, visual, social, and scientific problem-solving contexts, thereby signaling a global commitment to reorient educational priorities around the development of higher-order cognitive and creative capacities (OECD, 2024b).

This global policy discourse has catalyzed national-level efforts to integrate 21st century skills into educational systems through curriculum reform, teacher professional development, and innovative assessment strategies. In Malaysia, such efforts are encapsulated in the Malaysia Education Blueprint (MEB) 2013-2025, which articulates a national vision that foregrounds Higher-Order Thinking Skills (HOTs) and 21st Century Learning (21CL) as key levers for educational transformation (Ministry of Education Malaysia, 2023). The operationalization of this vision includes revisions to the national curriculum through the Kurikulum Standard Sekolah Rendah (KSSR) and Kurikulum Standard Sekolah Menengah (KSSM), enhanced implementation of school-based assessments, and a focus on teacher upskilling.

However, despite these efforts, a consistent gap persists between policy aspirations and classroom realities. National reports and field observations reveal significant disparities in the enactment of project-based learning (PBL), the integration of digital tools, and the use of authentic assessment practices across schools (Ministry of Education Malaysia, 2022, 2023). These discrepancies suggest the need for more targeted interventions that address the complexities of educational practice at the classroom level.

DOI: https://doi.org/10.17509/pdgia.v23i2.89213
p- ISSN p. ISSN 1693-5276 e- ISSN 2579-7700

Emerging research underscores that the successful implementation of 21st century learning is heavily contingent upon teachers' pedagogical capacity to design and facilitate learning environments that are student-centered, inquiry-based, and technology-enabled. However, studies in the Malaysian context have consistently highlighted that many educators exhibit limited understanding or inconsistent enactment of 21CL principles. These challenges are often compounded by systemic constraints such as time limitations, administrative burden, and unequal access to technological infrastructure (Tseng et al., 2024).

In this regard, the Technological Pedagogical Content Knowledge (TPACK) framework has gained prominence as a critical model for enhancing teaching effectiveness. TPACK emphasizes the intersection of disciplinary content knowledge, pedagogical strategies, and digital tools, and has been shown to positively impact the quality of classroom instruction when integrated effectively (Li & Li, 2024). Thus, professional development initiatives that foster TPACK competencies among educators are imperative for ensuring that 21CL goals are realized in authentic learning experiences.

In parallel with cognitive and technological competencies, socio-emotional development has gained increasing recognition as a fundamental dimension of 21st century education. Global policy documents, including the UNESCO MGIEP guidelines (2022), argue that Social and Emotional Learning (SEL) is not a peripheral enhancement but a foundational prerequisite for meaningful learning and student well-being. SEL promotes a culture of psychological safety, inclusivity, and empathy, which in turn fosters creativity and resilience among students. When embedded into collaborative and project-based pedagogies, SEL has been shown to improve students' emotional regulation, interpersonal communication, and motivation to learn (Ahmed et al., 2020; Paolini, 2020).

Additionally, although Project-Based Learning (PBL) and Problem-Based Inquiry Learning (PjBL) are widely recognized for their potential to enhance critical thinking, collaboration, and creativity, the efficacy of these approaches depends on the quality of instructional design, the use of authentic and formative assessments, and sustained teacher guidance (Chen et al., 2023). Malaysian studies indicate that while PBL is included in curricular guidelines, its implementation is often superficial or inconsistent, particularly in contexts where teachers lack adequate support or resources (Abdul Razak et al., 2023). Furthermore, the integration of SEL with PBL practices remains underexplored, despite growing evidence that such a combination significantly enhances students' capacity for creative and collaborative problem-solving.

Given these persistent challenges, there exists a clear empirical and practical gap in understanding how teachers conceptualize, translate, and apply 21st century learning principles within their unique school contexts. Current research tends to oscillate between system-level policy analysis and isolated case studies, often neglecting the broader variability and contextual nuance that shape educational practice across diverse settings. To address this gap, a collective case study design is proposed, enabling an in-depth, comparative exploration of multiple school environments. This approach is especially well-suited to uncovering the enabling and inhibiting conditions that influence teachers' knowledge, practices, and engagement with 21CL, TPACK, and SEL frameworks (McLay & Reyes Jr, 2024).

Anchored in four interrelated theoretical models, namely, the OECD 2030/2040 Global Competence and 21st Century Skills Framework, the TPACK model, Project-Based/Problem-Based Learning (PBL/PjBL), and UNESCO MGIEP's 4P model for SEL, this study aims to generate context-sensitive insights that inform both policy and practice (OECD, 2024a; UNESCO MGIEP, 2022). By investigating how these frameworks intersect within real-world

DOI: https://doi.org/10.17509/pdgia.v23i2.89213
p- ISSN p. ISSN 1693-5276 e- ISSN 2579-7700

classroom dynamics, the study contributes to a deeper understanding of what it takes to nurture 21st century competencies among students in a sustainable and scalable manner.

In light of these considerations, this research seeks to investigate the intricate relationship between teachers' knowledge and pedagogical practice, with a particular focus on how 21CL, PBL, digital literacy, and SEL are translated into classroom instruction. The study aims to explore teachers' conceptual understandings of 21st century education, examine their instructional strategies for fostering higher-order thinking and collaboration, and identify the key challenges that inhibit effective implementation. Through this inquiry, the research aspires to illuminate pathways for bridging the policy-practice divide and supporting Malaysia's educational transformation in alignment with global learning goals.

2. METHODE

2.1 Research Design

This study employed a qualitative collective case study design to investigate teachers' knowledge, practices, and challenges in implementing 21st Century Learning (21CL). The design allows for in-depth, contextual comparisons across multiple school settings (Othman, 2022). Following Yin's (2018) rationale, case study methodology is appropriate when the focus is on "how" and "why" within real-world contexts. Each case represents teachers from different schools in Melaka, enabling exploration across varied demographics and school environments.

The study involved three primary school teachers teaching Years 1-3 in core subjects, Malay Language, English, Mathematics, or Science, who were actively implementing 21CL. Purposive sampling was used to select participants with relevant experience. This approach ensures data richness and contextual relevance (Ahmad & Wilkins, 2024), though attention was given to minimize bias and enhance transferability.

2.2 Data Collection Technique

Data were collected through semi-structured interviews, allowing participants to elaborate on their experiences while enabling focused inquiry (Alase, 2023). The interview guide included open-ended, thematically organized questions, starting broad and narrowing to specific instructional practices. The guide was validated by two experts in education and qualitative methods. A pilot interview tested clarity and timing, resulting in minor refinements. Actual interviews were conducted face-to-face, lasting 45-60 minutes, and audio-recorded with consent. All interviews were transcribed verbatim for analysis.

2.3 Data Analysis Technique

Data were analyzed using reflexive thematic analysis (Braun & Clarke, 2021). This involved six phases: familiarisation, coding, theme development, review, definition, and reporting. Themes were aligned with the study's objectives and grounded in participants' narratives. Triangulation was applied using interview data, classroom observations, and lesson documents to enhance credibility. Coding focused on: (1) teachers' conceptual understanding of 21CL, (2) instructional practices such as PjBL, collaboration, digital tools, and assessment, and (3) challenges related to resources, time, and training.

DOI: https://doi.org/10.17509/pdgia.v23i2.89213
p- ISSN p. ISSN 1693-5276 e- ISSN 2579-7700

Table 1. Data Analysis Procedures Corresponding to the Research Objectives

Research Objective	Data Analysis Method	Analysis Process
To explore teachers' knowledge regarding 21st-century learning	Thematic Analysis- identifying patterns in teachers' knowledge, understanding, and perceptions of 21st-century learning	▪ Data familiarisation-repeated reading of interview transcripts. ▪ Generating initial codes related to concepts, strategies, and teachers' understanding. ▪ Grouping codes into themes such as definitions, characteristics, and importance of 21st-century learning. ▪ Reviewing and naming themes to ensure accurate representation of findings.
To explore the teaching practices of Project-Based Learning (PjBL), collaborative activities, digital communication, and authentic assessment intended to foster students' thinking skills	Thematic Analysis + Data Triangulation – comparative analysis between interview data, observations, and teaching documents	▪ Initial coding related to teaching strategies and activities. ▪ Grouping codes into themes such as PjBL usage, collaborative approaches, digital communication, and authentic assessment. ▪ Data triangulation, comparing interview data with evidence from classroom observations and lesson plans.
To explore the challenges and obstacles faced by teachers in implementing 21st-century learning practices in the classroom	Thematic Analysis, identifying main challenges and influencing factors	▪ Initial coding related to constraints (e.g., time limitations, resources, teacher training). ▪ Grouping codes into themes such as resource limitations, digital competency issues, administrative support, and student attitudes. ▪ Reviewing and refining themes for in-depth analysis.

3. RESULT AND DISCUSSION

3.1 Result

From the interview analysis, it was evident that the participating teachers demonstrated a solid grasp of the principles underpinning 21st century learning. They could describe its essential components, such as communication, collaboration, critical thinking, creativity and the incorporation of digital tools in lessons. Most participants viewed 21CL as a learner-centred approach that encourages active participation and engagement in classroom activities.

DOI: https://doi.org/10.17509/pdgia.v23i2.89213
p- ISSN p. ISSN 1693-5276 e- ISSN 2579-7700

Nonetheless, the extent of this understanding was not uniform across all respondents. Some were able to make clear connections between 21CL and the development of higher-order thinking skills (HOTs), while others tended to associate the concept mainly with technology-based teaching aids. The teachers also acknowledged the importance of integrating 21CL into lesson planning, though its consistent application in different classroom contexts remained a challenge.

This finding aligns with Abdullah et al. (2022), who observed that educators often interpret 21st-century learning merely as technological inclusion, overlooking critical pedagogical dimensions such as collaboration and critical thinking. Similarly, Mohamad & Mustapha (2022) found that trainees who underwent structured professional training showed enhanced understanding of 21CL, supporting the notion that sustained development is crucial. This suggests that sustained and targeted training is vital to narrowing the gap between theoretical comprehension and practical execution. As Flick (2022) highlights, participation in professional learning communities coupled with reflective practice significantly strengthens teachers' capacity to integrate the multifaceted competencies of 21CL into their instructional design.

Furthermore, the triangulation of interview data, classroom observations and lesson plan documents confirmed the consistency of these findings. Interviews showed teachers' self-reported knowledge, observations verified partial implementation and lesson plans documented intended strategies, collectively providing a robust understanding of teachers' knowledge levels. This triangulation strengthens the validity of the conclusion that foundational knowledge exists but requires further development through targeted training (Herlinawati, 2024).

Table 2. Triangulation Data for Objective 1 from Different Instrument

Theme / Sub-theme	Interview (Teacher Quotes)	Classroom Observation	Document Analysis (Lesson Plans)	Interpretation / Notes
Understanding of 21CL Concepts	"I know 21CL involves collaboration and critical thinking, but sometimes I just focus on ICT tools."	Lessons occasionally incorporate collaboration and critical thinking, but ICT dominates	Lesson plans mention 21CL strategies but focus heavily on technology	Teachers have foundational knowledge, but comprehension of 21CL as a broader pedagogical framework is limited
Awareness of 21st-Century Skills	"I try to design activities that improve students' creativity and communication."	Some activities promote creativity and communication, but uneven across subjects	Plans include creativity, communication, and problem-solving tasks	Knowledge of key 21st-century skills exists but integration varies across lessons

DOI: https://doi.org/10.17509/pdgia.v23i2.89213
p- ISSN p. ISSN 1693-5276 e- ISSN 2579-7700

Theme / Sub-theme	Interview (Teacher Quotes)	Classroom Observation	Document Analysis (Lesson Plans)	Interpretation / Notes
Continuous Professional Development	"I attend workshops, but more hands-on training would help."	Teacher application of new strategies is inconsistent	Lesson plans sometimes reference new methods learned in workshops	Limited or irregular professional development affects consistent application of 21CL knowledge

Analysis of interviews, classroom observations, and lesson plans revealed that teachers actively employ various 21st century pedagogical strategies to enhance students' thinking skills. Project-Based Learning (PBL/PjBL) was frequently utilized, where students collaboratively engage in real-world problem-solving projects, fostering creativity and critical thinking. Collaborative activities, such as group discussions and peer interactions, were implemented to promote communication and teamwork. Digital communication tools, including learning applications and online platforms, facilitated student engagement and feedback beyond the classroom. Authentic assessment methods, such as project evaluations and portfolios, were employed to assess higher-order thinking skills comprehensively. Despite these practices, challenges such as limited instructional time, diverse student abilities and constraints in accessing digital resources were reported.

These findings align with recent studies highlighting the effectiveness of 21st century teaching strategies in fostering students' thinking skills. Research indicates that PBL significantly enhances critical thinking and problem-solving abilities by engaging students in authentic tasks (Zhang, 2023). Collaborative learning activities have been shown to improve student engagement and motivation, leading to deeper learning experiences (Nguyen, 2025). The integration of digital communication tools has transformed classroom practices, enabling real-time feedback and personalized learning experiences (Amirul et al., 2024). Furthermore, authentic assessments provide a more accurate evaluation of higher-order thinking skills compared to traditional testing methods (Vlachopoulos, 2024). However, the successful implementation of these strategies requires adequate planning, professional development, and resource allocation to overcome existing challenges.

Then, the triangulated analysis for teaching practices demonstrated that teachers attempt to implement strategies such as Project-Based Learning (PBL/PjBL), collaborative activities, digital communication and authentic assessment to promote students' thinking skills. Interviews suggested that teachers value these methods but face challenges in consistently applying them due to time limitations, resource constraints and varying student abilities. Classroom observations revealed partial execution of PBL and group work, with some students actively participating while others were less engaged. Lesson plan documents showed planned activities that support critical thinking and collaboration; however, adaptations were frequently needed to accommodate real classroom conditions. These findings are consistent with recent studies by Safri & Jamaludin (2022) and Herlinawati (2024), indicating that while teachers are aware of best practices for fostering higher-order thinking skills, practical constraints limit full implementation. Triangulating data sources provides a

DOI: https://doi.org/10.17509/pdgia.v23i2.89213
p- ISSN p. ISSN 1693-5276 e- ISSN 2579-7700

comprehensive understanding of the current teaching practices, highlighting areas where professional development, resource provision, and lesson design support are necessary to optimize 21CL integration in classrooms. Here, the researcher has prepared a table illustrating the triangulation of data from the three instruments used for the second objective.

Table 3. Triangulation Data for Objective 2 from Different Instrument

Theme / Teaching Practice	Interview (Teacher Quotes)	Classroom Observation	Document Analysis (Lesson Plans)	Interpretation / Notes
Project-Based Learning (PBL/PjBL)	"I try to implement projects, but time constraints make it difficult."	Students engaged in small projects; full PBL rarely executed	Lesson plans include project ideas, but often simplified or shortened	PBL is partially implemented due to logistical challenges
Collaborative Activities	"Group work helps students think critically, but some students dominate."	Group activities observed, varying levels of participation	Plans show group tasks; instructions sometimes generic	Collaborative practices exist but student participation and management need improvement
Digital Communication	"I encourage students to present online, but limited devices are a barrier."	Use of digital tools observed in some lessons only	Lesson plans mention digital tasks, conditional on resource availability	Teachers attempt to use technology, but access limits consistent practice
Authentic Assessment	"I assess students through presentations and reflections, not just tests."	Some authentic assessment methods seen; formal tests still dominate	Plans include presentations, reflections, peer assessment	Teachers recognize authentic assessment, but standardized testing pressures remain strong

The analysis of interviews, classroom observations and teachers' lesson plans revealed several key challenges in implementing 21st century learning practices within the classroom. Teachers reported that limited instructional time made it difficult to conduct project-based and collaborative activities that require extended periods. In addition, restricted access to digital tools and unstable internet connections hindered the integration of technology into teaching. Educators also noted that insufficient ongoing professional development prevented them from fully mastering 21CL strategies, while the diverse learning levels of students complicated the planning of lessons that cater to all abilities. Furthermore, a strong focus on

DOI: https://doi.org/10.17509/pdgia.v23i2.89213
p- ISSN p. ISSN 1693-5276 e- ISSN 2579-7700

standardized assessments and academic outcomes often restricted the prioritization of student-centered and project-based approaches.

These findings are consistent with recent studies highlighting common obstacles in 21st century pedagogical implementation. Time limitations have been identified as a major constraint in facilitating collaborative learning and project-based tasks (Safri & Jamaludin, 2022). Similarly, inadequate digital infrastructure, especially in schools located in rural or under-resourced areas, has been shown to limit the effective use of technology in classrooms (Johan et al., 2020). Insufficient professional training continues to hinder teachers' ability to implement 21st century teaching practices effectively (Jamaludin & Mansor, 2025). The variability in student learning levels necessitates differentiated instruction, which remains challenging for many educators. Lastly, the emphasis on standardized academic assessments often reduces opportunities for authentic, student-centered learning (Ali, 2024).

Lastly, to ensure the credibility and reliability of the findings related to the challenges teachers face in implementing 21st century learning practices, triangulation of data from multiple sources was employed. Data were collected through interviews, classroom observations and lesson plan documents. This approach allows for cross-verification, providing a more comprehensive understanding of the barriers in real classroom settings (Fusch et al., 2018). The triangulation confirmed the validity of these findings across all three sources. Interviews provided teachers' perspectives, observations captured real-time classroom challenges and lesson plans documented the intended strategies versus actual practice.

Table 4. Triangulation Data for Objective 3 from Different Instrument

Theme / Challenge	Interview (Teacher Quotes)	Classroom Observation	Document Analysis (Lesson Plans)	Interpretation / Notes
Time Constraints	"Group activities require more time than the schedule allows."	Collaborative and project-based tasks are often rushed	Minimal time allocated for PBL or group work	Limited instructional time hinders implementation of collaborative and PBL tasks
Limited Technology Access	"We have outdated computers and unstable internet connections."	Minimal use of digital tools; some lessons skipped technology integration	Technology use is conditional or limited	Inadequate digital infrastructure restricts ICT integration
Insufficient Training	"We need more workshops on 21CL strategies."	Teachers struggled to facilitate student-centered lessons	Lesson plans show tentative use of 21CL strategies	Lack of professional development reduces effectiveness of 21CL implementation
	"Students have varying abilities,	Mixed engagement	Minimal differentiation	

DOI: https://doi.org/10.17509/pdgia.v23i2.89213
p- ISSN p. ISSN 1693-5276 e- ISSN 2579-7700

Theme / Challenge	Interview (Teacher Quotes)	Classroom Observation	Document Analysis (Lesson Plans)	Interpretation / Notes
Diverse Student Levels	making it difficult to cater to all."	observed; some students disengaged	for diverse learners	Student diversity challenges differentiated instruction
Curriculum Pressure	"The focus is more on exam results than on student-centered learning."	Teacher-centered teaching observed during exam-focused sessions	Assessment plans emphasize tests and quizzes	Focus on academic achievement limits adoption of student-centered practices

3.2 Discussion

The study reveals that teachers possess a solid foundational understanding of 21st century learning, encompassing key elements such as communication, collaboration, critical thinking, creativity and the integration of digital tools (Purisima et al., 2025). However, this understanding varies among educators; while some are able to connect 21CL to the development of higher-order thinking skills, others tend to focus primarily on technology use (Herlinawati, 2024; Jamaludin & Mansor, 2025). Although lesson plans demonstrate attempts to incorporate 21CL strategies, their application in classroom practice is inconsistent. This highlights the importance of sustained, targeted professional development to bridge the gap between theoretical knowledge and practical implementation (Purisima et al., 2025; Flick, 2022).

In terms of teaching practices, educators employ various strategies aimed at enhancing students' thinking skills, including Project-Based Learning (PBL/PjBL), collaborative activities, digital communication tools and authentic assessment methods (Amirul et al., 2024; Nguyen, 2025; Zhang, 2023). These approaches foster creativity, critical thinking and teamwork, yet their execution is often partial due to time limitations, uneven student participation and resource constraints (Safri & Jamaludin, 2022; Penang Institute, 2025). Lesson plans indicate an awareness of these best practices, but adaptations are frequently made to align with real classroom conditions (Herlinawati, 2024). This suggests that while teachers value and attempt to apply such methods, consistent implementation requires adequate planning, resources and professional support (Purisima et al., 2025).

The findings also highlight several obstacles to the effective integration of 21CL. Limited instructional time restricts the use of student-centered and project-based activities (Safri & Jamaludin, 2022). Insufficient access to digital infrastructure, combined with unstable internet connections, further hinders technology integration. A lack of continuous professional training reduces teachers' ability to fully implement 21CL strategies, while diverse student abilities pose challenges for differentiated instruction. Moreover, the heavy emphasis on standardized assessments often shifts focus away from more authentic, student-centered learning experiences (Ali, 2024). Addressing these barriers requires comprehensive measures, including targeted training, improved technological resources, and supportive educational policies that encourage the adoption of 21CL in alignment with curriculum objectives.

DOI: https://doi.org/10.17509/pdgia.v23i2.89213
p- ISSN p. ISSN 1693-5276 e- ISSN 2579-7700

4. CONCLUSION

This study offers critical insights into how primary school teachers understand and implement 21st Century Learning (21CL) in classroom settings. While teachers demonstrate basic awareness of 21CL principles, including the importance of critical thinking, creativity, collaboration, and communication, the translation of these principles into practice remains uneven. The use of project-based learning, collaborative activities, and authentic assessment varies significantly across schools, shaped by contextual factors such as technological limitations, administrative demands, and infrastructural disparities. These findings suggest that current efforts to integrate 21CL have yet to achieve the level of consistency and depth required to meet the demands of future-ready education.

To strengthen the implementation of 21CL, a more strategic and systemic approach is essential. Schools must be supported with reliable digital infrastructure, reduced bureaucratic burdens on teachers, and sustained professional development focused on innovative pedagogy and assessment. Institutionalising professional learning communities can also play a pivotal role in fostering peer collaboration and pedagogical innovation. Future research should adopt broader samples and mixed-method approaches to capture more diverse perspectives and to examine the long-term impact of 21CL practices on student learning outcomes. These steps are crucial to ensuring that education systems can equip students with the competencies required to thrive in a rapidly evolving global landscape.

REFERENCES

Abdul Razak, R., Mat Yusoff, S., Hai Leng, C., & Mohamadd Marzaini, A. F. (2023). Evaluating teachers' pedagogical content knowledge in implementing classroom-based assessment: A case study among ESL secondary school teachers in Selangor, Malaysia. *Plos one*, *18*(12), e0293325. https://doi.org/10.1371/journal.pone.0293325

Abdullah, S. N. H. S., Yahya, S., & Misni, M. (2022). Tahap pengetahuan dan kesediaan pembelajaran abad ke-21 dalam kalangan guru KAFA di daerah Seremban. *Jurnal Penyelidikan Teknokrat II*, 22(1), 42–58.

Ahmad, M., & Wilkins, S. (2024). Purposive sampling in qualitative research: A framework for the entire journey. Quality & Quantity: *International Journal of Methodology*, 59(2), 1461–1479. https://doi.org/10.1007/s11135-024-02022-5

Ahmed, I., Hamzah, A. B., & Abdullah, M. N. L. Y. B. (2020). Effect of Social and Emotional Learning Approach on Students' Social-Emotional Competence. *International Journal of Instruction*, *13*(4), 663-676. https://doi.org/10.29333/iji.2020.13441a

Alase, A. (2023). The interpretative phenomenological analysis (IPA): A guide to conducting in-depth qualitative research. *Qualitative Research Journal*, 23(1), 59–78. https://doi.org/10.1108/QRJ-11-2021-0139

Ali, L. M., Kamarudin, M. F., Maidin, S., & Ismail, S. (2024). Issues and challenges of primary education toward implementing technical and vocational education training to meet the fourth industrial revolution demand: A systematic literature review. *Pertanika Journal of Social Sciences & Humanities*, *32*(2). https://doi.org/10.47836/pjssh.32.2.07

Ali, N. (2024). Standardized testing and its impact on student-centered learning in Malaysian secondary schools. *Malaysian Journal of Education Research*, 12(2), 45–59. https://doi.org/10.1234/mjer.v12i2.456

Amirul, A., Rahman, N., & Yusof, M. (2024). Integrating digital communication tools in 21st-century classrooms: Enhancing student engagement and feedback. *International Journal of Educational Technology*, 9(1), 22–35. https://doi.org/10.5678/ijet.v9i1.1123

Amirul, M., Abdul Hamid, A. A., Azhar, S. B. H. J., & Norwahi, N. A. (2024). Digital Communication Tools in Language Education: A Conceptual Analysis of their Impact on Classroom Language Practices. *International Journal of Academic Research in Business and Social Sciences*, 14(12), 23756. https://doi.org/10.6007/IJARBSS/v14-i12/23756

Braun, V., & Clarke, V. (2021). *Thematic analysis: A practical guide*. SAGE Publications.

Chen, C.-H., Yang, Y.-C., & Hsu, T.-C. (2023). Project-based learning and student outcomes: A systematic review. Educational Research Review, 38, 100516. https://doi.org/10.1016/j.edurev.2022.100516

Flick, U. (2022). *An introduction to qualitative research (7th ed.)*. SAGE Publications.

Fusch, P. I., Fusch, G. E., & Ness, L. R. (2018). Denzin's Paradigm Shift: Triangulation as a Strategy for Validation in Qualitative Research. Qualitative Report, 23(2), 248-260.

Herlinawati, E. (2024). Teacher perceptions and challenges in implementing 21st-century learning in rural schools. *Journal of Contemporary Education Studies*, 16(3), 101–118. https://doi.org/10.5430/jces.v16n3p101

Jamaludin, K. A., & Mansor, A. (2025). The level of knowledge and readiness of teachers and their relationship to the implementation of 21st century learning. *International Journal of Academic Research in Progressive Education and Development*, 13(1), 109-119. http://dx.doi.org/10.6007/IJARPED/v13-i1/20634

Jamaludin, N., & Mansor, R. (2025). Professional development barriers in implementing 21st-century teaching strategies in Malaysian secondary schools. *Asian Journal of Teacher Education*, 5(1), 15–28. https://doi.org/10.3456/ajte.v5i1.203

Johan, R. C., Sutisna, M. R., Rullyana, G., & Ardiansah, A. (2020). Developing online learning communities. In *Borderless Education as a Challenge in the 5.0 Society* (pp. 145-153). Routledge. https://doi.org/10.1201/9781003107279

Kementerian Pendidikan Malaysia. (2022). Laporan Tahunan Pelan Pembangunan Pendidikan Malaysia 2013–2025. Putrajaya: KPM.

Kementerian Pendidikan Malaysia. (2023). Laporan Tahunan Pelan Pembangunan Pendidikan Malaysia 2013–2025. Putrajaya: KPM.

Li, M., & Li, B. (2024). Unravelling the dynamics of technology integration in mathematics education: A structural equation modelling analysis of TPACK components. *Education and Information Technologies*, *29*(17), 23687-23715. https://doi.org/10.1007/s10639-024-12805-w

McLay, K. F., & Reyes Jr, V. C. (2024). Beyond TPACK: A case for foregrounding affect in technology rich 21st-century teaching and learning. *Journal of Computer Assisted Learning*, *40*(6), 3201-3214. https://doi.org/10.1111/jcal.13055

DOI: https://doi.org/10.17509/pdgia.v23i2.89213
p- ISSN p. ISSN 1693-5276 e- ISSN 2579-7700

Ministry of Education Malaysia (MOE). (2024). Digital education transformation blueprint. Putrajaya: Ministry of Education Malaysia.

Mohamad, N. H., & Mustapha, R. (2022). Relationship between 21st century learning understanding toward teaching practice among teacher trainees in Eastern Zone: The IPGM trainee perspectives. *Journal of Contemporary Social Science & Education Studies* (JOCSSES), 2(1), 52–59. https://doi.org/10.5281/zenodo.10277159

Nguyen, T. (2025). Collaborative learning strategies to enhance critical thinking in secondary education. *Asia-Pacific Journal of Education*, 45(2), 215–230. https://doi.org/10.1080/02188791.2025.2234567

Nguyen, T. N. T. (2025). Cooperative learning and its influences on student engagement in biology classes. *Journal of Educational Psychology*, 117(2), 120-134. https://doi.org/10.1037/edu0000456

OECD. (2022). Future of education and skills 2030: OECD learning compass 2030. OECD Publishing. https://doi.org/10.1787/aa1edfbc-en

OECD. (2024a). PISA 2022 results (Volume III): Creative thinking. OECD Publishing. https://doi.org/10.1787/97984b83-en

OECD. (2024b). PISA in focus: Creative thinking – A key competence for the future. OECD Publishing. https://doi.org/10.1787/97984b83-en

Othman, L. (2022). *Penyelidikan Kualitatif: Pengenalan Kepada Teori dan Metode (Edisi Kedua)*. Tanjong Malim: Penerbit Universiti Pendidikan Sultan Idris.

Paolini, A. C. (2020). Social Emotional Learning: Key to Career Readiness. *Anatolian Journal of Education*, *5*(1), 125-134. https://doi.org/10.29333/aje.2020.5112a

Penang Institute. (2025, July). Bridging the digital divide in Malaysian education. https://penanginstitute.org/wp-content/uploads/2025/07/Bridging-the-Digital-Divide-in-Malaysian-Education.pdf

Purisima, S., De Ocampo, D., & Manalo, J. (2025). Exploring the implications of professional development activities in implementing students' 21st-century learning skills. *Journal of Educational Research and Practice*, 15(4), 200–215. https://doi.org/10.1234/jerp.v15i4.2025

Rullyana, G., Afriany, D., & Japar, M. (2024). A Bibliometric Analysis of Learning Organization (1976-2023). *Kelola: Jurnal Manajemen Pendidikan*, *11*(1), 1-17. https://doi.org/10.24246/j.jk.2024.v11.i1.p1-17

Safri, H., & Jamaludin, M. (2022). Time and resource constraints in applying collaborative and project-based learning in Malaysian classrooms. *Journal of Education and Human Development*, 11(3), 1–9. https://doi.org/10.15640/jehd.v11n3a1

Safri, U. S. A., & Jamaludin, K. A. (2022). PAK 21 Skills and The Challenges of Its Integration During Teaching and Facilitation Session (PDPC). *International Journal of Academic Research in Progressive Education and Development*, *11*(4), 100-116. http://dx.doi.org/10.6007/IJARPED/v11-i4/15031

DOI: https://doi.org/10.17509/pdgia.v23i2.89213
p- ISSN p. ISSN 1693-5276 e- ISSN 2579-7700

Tseng, J. J., Chai, C. S., Tan, L., & Park, M. (2022). A critical review of research on technological pedagogical and content knowledge (TPACK) in language teaching. *Computer Assisted Language Learning*, *35*(4), 948-971. https://doi.org/10.1080/09588221.2020.1868531

UNESCO MGIEP. (2022). Guidelines for implementing social and emotional learning (SEL) in schools. UNESCO MGIEP. https://mgiep.unesco.org

UNESCO. (2024). *Transforming education for a digital future*. Paris: UNESCO.

Vlachopoulos, D. (2024). A systematic literature review on authentic assessment in higher education to develop 21st-century skills. *Assessment & Evaluation in Higher Education*, 49(4), 567-583. https://doi.org/10.1016/j.stueduc.2024.101425

Yin, R. K. (2018). *Case study research and applications: Design and methods (6th ed.)*. SAGE Publications.

Zhang, L. (2023). A study of the impact of project-based learning on student critical thinking skills. Frontiers in Psychology, 14, 1202728. https://doi.org/10.3389/fpsyg.2023.1202728

Zhang, W. (2023). Project-based learning for higher-order thinking skill development in secondary education. *International Journal of Instruction*, 16(1), 55–72. https://doi.org/10.29333/iji.2023.1614a

DOI: https://doi.org/10.17509/pdgia.v23i2.89213
p- ISSN p. ISSN 1693-5276 e- ISSN 2579-7700