

Developing Teachers' Paradigms for Applying Pedagogical Content Knowledge Skills in Implementing the Deep Learning Curriculum at the Junior High School Level

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Abstract: *The successful implementation of the Deep Learning Curriculum requires teachers to possess not only strong subject-matter expertise but also the ability to transform knowledge into meaningful learning experiences through Pedagogical Content Knowledge (PCK). However, limited research has examined how teachers develop their paradigms for applying PCK skills within curriculum reform, particularly at the junior high school level in Indonesia. This study explored how teachers develop such paradigms in implementing the Deep Learning Curriculum. A qualitative descriptive design was employed, involving three junior high school teachers from English, Science, and Mathematics. Data were collected through semi-structured interviews, classroom observations, and document analysis, and were analyzed using thematic analysis. The findings revealed six major themes: (1) PCK as the integration of content mastery and pedagogical transformation; (2) contextualization and student-centered learning as core pedagogical principles; (3) deep learning as meaningful, reflective, and contextual learning; (4) the shift from teacher-centered to student-centered instructional paradigms; (5) persistent challenges including diverse student needs, limited instructional time, administrative workload, technological constraints, and the influence of artificial intelligence; and (6) collaborative professional learning as a driver of teacher growth. Teachers had begun reconstructing their instructional paradigms by emphasizing critical thinking, inquiry, and student engagement, although implementation remained influenced by structural and institutional challenges. The study concludes that developing PCK-related paradigms is a continuous professional process requiring reflective practice, collaborative learning, and sustained institutional support, offering practical implications for teacher professional development programs.*

Keywords: *curriculum implementation; deep learning curriculum; junior high school; PCK; pedagogical content knowledge; teacher paradigm; teacher professional development*

INTRODUCTION

In the contemporary global educational landscape, the paradigm of teaching has shifted from traditional knowledge transmission toward facilitating meaningful, student-centered, and transformative learning experiences. Education

systems worldwide increasingly emphasize 21st-century competencies such as critical thinking, creativity, collaboration, communication, and character development as essential outcomes of schooling (OECD, 2018; UNESCO, 2021). UNESCO and the OECD stress that successful curriculum transformation depends heavily on teacher quality, particularly on teachers' ability to connect subject knowledge with effective pedagogical practice: UNESCO's curriculum transformation framework holds that curriculum reform must translate into tangible improvements in teaching quality and learner engagement, while the OECD emphasizes that teachers need professional knowledge that supports deeper and more meaningful learning rather than surface-level instruction (OECD, 2017; UNESCO, 2021).

In Indonesia, educational reform has moved in this direction through the implementation of the Merdeka Curriculum and broader transformation initiatives led by the Ministry of Education, Culture, Research, and Technology, which promotes student-centered learning, differentiated instruction, higher-order thinking skills (HOTS), and character education as key principles of curriculum implementation (Kemendikbudristek, 2022a, 2022b). Teachers are expected to facilitate deep learning experiences rather than rely solely on textbook completion and teacher-centered explanation. In practice, however, classroom instruction in many junior high schools remains procedural and examination-oriented, particularly in subjects such as English, science, and mathematics (Suryadarma & Jones, 2013; OECD, 2019). Teachers often understand curriculum documents conceptually but experience difficulty translating them into pedagogically effective classroom practice (Widodo, 2016). This situation illustrates that curriculum success depends not only on policy reform but also on teachers' professional paradigms and their ability to apply PCK meaningfully (Ball et al., 2008; Shulman, 1987).

At the national level, several recent studies indicate that Indonesian teachers' pedagogical practice, though improving, remains uneven across schools and subject areas. Chang, Annisa, and Chen (2025) found that Indonesia's pre-service teacher professional education program (Pendidikan Profesi Guru, PPG) produced a significant positive effect on science teachers' technological pedagogical content knowledge relative to teachers who had not completed the program, suggesting that structured, PCK-oriented training, rather than teaching experience alone, is what drives improvement. Consistent with this, Budirahayu and Saud (2023) found that Indonesian teachers' pedagogical innovation ability alone did not significantly predict student learning success; instead, the quality of teacher-student interaction and inter-teacher collaboration emerged as stronger predictors, echoing this study's Theme 6 finding on the centrality of collaborative professional learning. At the classroom level, junior secondary science teachers have been found to actively draw on problem-based, project-based, inquiry, and discovery learning to cultivate students' critical thinking, although that study cautions that such findings describe teachers' reported intentions and observed practice rather than confirmed gains in student thinking, a gap between enacted pedagogy and demonstrated outcomes that echoes the challenges reported by the teachers in the present study. A comparable pattern of uneven implementation has been identified in English language teaching, where grammar-focused instruction

often dominates over communicative and meaningful learning experiences (Lie, 2007; Widodo, 2016). Taken together, these findings suggest that PCK development is not automatically acquired through teaching experience alone but requires continuous, structured professional development, collaborative reflection, and institutional support (Hargreaves & Fullan, 2012; Voogt et al., 2013).

In the local context of junior high schools, the challenge becomes more complex due to limited professional development opportunities, insufficient collaborative reflection practices, and continued dependence on textbook-oriented instruction. Teachers may be familiar with the terminology of deep learning and curriculum change, yet their instructional paradigms often remain rooted in traditional transmission models (Kemendikbudristek, 2022a). Lesson planning frequently focuses more on syllabus completion and administrative requirements than on fostering students' conceptual understanding, metacognitive awareness, and meaningful engagement (Darling-Hammond et al., 2020). This indicates that the issue is not merely technical but paradigmatic: teachers need to reconstruct how they perceive teaching, learning, and student development through the lens of Pedagogical Content Knowledge (Schön, 1983; Shulman, 1987).

Although many studies have examined PCK and curriculum implementation separately, a significant research gap remains regarding how teachers develop their paradigms for applying PCK skills specifically in implementing the Deep Learning Curriculum at the junior high school level. Most previous studies focus on measuring PCK components (Ball et al., 2008; Magnusson et al., 1999) or evaluating curriculum implementation outcomes (OECD, 2019; Kemendikbudristek, 2022b), rather than examining how teachers reshape their professional beliefs, instructional thinking, and classroom decision-making to integrate both. Limited research has specifically addressed this issue within the Indonesian junior high school context under the current curriculum reform. This study therefore investigates how teachers develop their paradigms for applying PCK skills in implementing the Deep Learning Curriculum, contributing both theoretically to teacher education research and practically to sustainable teacher professional development.

LITERATURE REVIEW

One of the most influential concepts explaining teacher professionalism is Pedagogical Content Knowledge (PCK), introduced by Shulman (1986, 1987). Shulman (1987) defines PCK as the “special amalgam of content and pedagogy” that enables teachers to transform subject matter into forms that are understandable and meaningful for students. PCK encompasses knowledge of students' misconceptions, appropriate instructional strategies, curriculum understanding, and assessment approaches (Grossman, 1990; Magnusson, Krajcik, & Borko, 1999). Teachers with strong PCK are not merely content experts; they are professionals who can adapt knowledge to diverse classroom contexts and student needs (Ball, Thames, & Phelps, 2008). The OECD (2017) further reinforces that PCK is central to lesson planning, curriculum implementation, and effective classroom instruction, as it bridges theory and practice in teaching.

Countries with high-performing education systems place strong emphasis on PCK development in teacher education. In Finland, teacher preparation programs integrate educational theory, research, and classroom practice so that teachers can design inquiry-based and conceptually rich learning experiences (Sahlberg, 2015). In Singapore, teacher education emphasizes reflective practice, curriculum innovation, and continuous professional learning to strengthen teachers' pedagogical competence (Darling-Hammond et al., 2017). In Japan, lesson study serves as a collaborative professional development model through which teachers systematically reflect on instructional practice and student learning (Lewis, Perry, & Murata, 2006), and in South Korea, professional learning communities have supported science teachers' curriculum design, classroom assessment, and instructional strategies through collaborative PCK development (Yang & Choi, 2020). These international examples demonstrate that strong PCK is a key foundation for implementing meaningful and transformative learning across educational contexts (OECD, 2017; Voogt, Fisser, Pareja Roblin, Tondeur, & Van Braak, 2013).

The concept of the Deep Learning Curriculum further elevates the importance of PCK in modern education. Deep learning in education refers not merely to the use of digital technology but to meaningful learning processes through which students develop conceptual understanding, critical thinking, problem-solving abilities, creativity, collaboration, and character (Fullan, Quinn, & McEachen, 2018; Fullan, Quinn, Drummy, & Gardner, 2020). Countries such as Canada, Australia, and South Korea have integrated deep learning principles into their curriculum frameworks through inquiry-based learning, interdisciplinary projects, authentic assessment, and reflective practice (Fullan et al., 2018; OECD, 2018), while UNESCO (2021) similarly advocates pedagogical transformation to ensure that learning becomes relevant, contextual, and competency-based. In such contexts, teachers are expected to reconstruct their teaching paradigms from content delivery toward facilitating conceptual understanding and student agency, a process that depends strongly on the quality of their PCK (Darling-Hammond, Flook, Cook-Harvey, Barron, & Osher, 2020).

RESEARCH METHOD

This study employed a qualitative design to explore how teachers develop their paradigms for applying Pedagogical Content Knowledge (PCK) skills in implementing the Deep Learning Curriculum at the junior high school level. A qualitative approach was considered appropriate because the study aimed to investigate teachers' beliefs, experiences, instructional practices, and professional reflections within real classroom contexts. According to Creswell and Creswell (2018), qualitative research is well suited to understanding participants' perspectives and interpreting complex educational phenomena within their natural settings.

The participants consisted of junior high school teachers teaching English, Science, and Mathematics in selected public and private junior high schools; these subjects were chosen because they strongly reflect the implementation of deep learning principles, such as critical thinking, conceptual understanding, problem-solving, and student-centered instruction. Participants were selected using

purposive sampling based on the following criteria: (1) actively teaching at the junior high school level, (2) having experience implementing the Merdeka Curriculum or deep learning-oriented instruction, and (3) willingness to participate in interviews and classroom observations. A total of three teachers, one each from English, Science, and Mathematics, served as the main informants of the study.

Data were collected through three techniques: semi-structured interviews, classroom observations, and document analysis. Semi-structured interviews explored teachers' understanding of PCK, their teaching paradigms, and their experiences implementing deep learning practices. Classroom observations examined how teachers applied PCK in actual teaching situations, including instructional strategies, student engagement, questioning techniques, and assessment practices. Document analysis, covering lesson plans, teaching modules, curriculum documents, and reflective teaching notes, supported data triangulation and strengthened research validity.

The main research instruments were interview guidelines, observation checklists, and document analysis sheets. The interview guidelines were developed from Shulman's PCK framework and covered content knowledge, pedagogical strategies, knowledge of students' misconceptions, curriculum understanding, and assessment approaches. Observation checklists recorded teaching behaviors related to deep learning practice, such as inquiry-based instruction, collaborative learning, and meaningful student participation. Field notes and audio recordings were used to ensure the accuracy and completeness of the collected data.

Data were analyzed using thematic analysis following the interactive model of Miles, Huberman, and Saldaña (2020), comprising data reduction, data display, and conclusion drawing. Interview transcripts, observation notes, and documents were first organized and coded into categories related to teachers' paradigms and PCK application; the coded data were then grouped into broader themes such as teacher beliefs, instructional decision-making, curriculum adaptation, and professional reflection; finally, conclusions were drawn by interpreting patterns and relationships among the themes in relation to the research objectives.

To ensure trustworthiness, data triangulation and member checking were applied. Data from interviews, observations, and documents were compared to confirm consistency and credibility, and member checking was conducted by returning selected interview interpretations to participants for verification. Peer debriefing with fellow researchers was also used to reduce subjective bias during interpretation. These procedures were intended to strengthen the validity, reliability, and overall rigor of the findings.

FINDINGS AND DISCUSSION

Thematic analysis of the interview, observation, and document data generated six major themes describing teachers' understanding, classroom practices, challenges, professional learning experiences, and support needs in

applying Pedagogical Content Knowledge (PCK) within the implementation of the Deep Learning Curriculum. To make the participants' perspectives more concrete, illustrative statements are presented below in indented italics beneath each theme. These statements are paraphrased reconstructions drawn from the interview summaries reported for this study, written in a first-person, quotation-like style to aid readability; they are not verbatim transcript excerpts. For journal submission, these illustrations should be replaced with direct, verbatim quotations drawn from the original audio recordings or transcripts, with the corresponding line or page reference, in line with standard qualitative reporting practice.

PCK as the Integration of Content Mastery and Pedagogical Transformation

A dominant theme across all participants was the perception that PCK involves not only mastering subject content but also possessing the ability to transform knowledge into forms that students can understand. This conception recurred across all three subject areas represented in the study, suggesting that it is not specific to any one discipline but reflects a shared professional understanding of what makes teaching effective. Teacher 1 emphasized that teachers must master both the content and the skills needed to transfer knowledge effectively; Teacher 2 described PCK as the ability to understand not only what to teach but also how to teach it; and Teacher 3 highlighted the role of instructional strategies in simplifying difficult concepts so that students can grasp them more easily. Taken together, these responses can be illustrated as follows:

Teacher 1: For me, knowing the subject is only half of the job. I also have to know how to break that knowledge down and hand it to my students in a way that actually reaches them, otherwise, mastering the content by myself doesn't mean anything for the class.

Teacher 2: PCK is not just what I teach; it's also how I teach it. I can know my subject very well, but if I don't understand how to present it to this particular group of students, the knowledge stays with me and never really gets to them.

Teacher 3: When a concept is difficult, I look for a strategy that makes it simpler, an example, an analogy, a different way of explaining, so students are not just memorizing something they don't understand.

The data suggest that teachers conceptualize PCK primarily as a bridge between content expertise and instructional delivery, rather than as content knowledge alone. Across the three cases, participants consistently viewed teaching effectiveness as dependent on the teacher's ability to adapt subject matter into accessible learning experiences rather than merely transmitting information as it appears in a textbook or syllabus. This suggests that, at a conceptual level, all three teachers had already internalized something close to Shulman's (1987) original formulation of PCK as an "amalgam" of content and pedagogy, even where they had not been formally introduced to the term itself, a tension that becomes more visible later, in Theme 6.

This bridging function of PCK was expressed in two closely related ways across the interviews. First, teachers repeatedly associated PCK with the

successful communication of knowledge rather than with the accumulation of knowledge for its own sake. Participants believed that students' understanding depends largely on the teacher's ability to select appropriate strategies, methods, and approaches for a given topic and audience; PCK was therefore positioned less as a fixed body of knowledge and more as an active, situational skill, a mechanism that facilitates learning efficiency and comprehension in the moment of teaching, rather than a credential a teacher simply possesses. As Teacher 2 explained:

Teacher 2: It's not enough to just explain something once. I have to keep adjusting, sometimes I use a story, sometimes a diagram, sometimes I just slow down, until I can see from their faces that it has actually landed.

Second, rather than focusing exclusively on content delivery, participants repeatedly reframed instructional success in terms of students' comprehension rather than the amount of material formally covered. Several described feeling that a lesson had "failed" even when they had completed the planned material, if students could not later apply or explain the concept in their own words, indicating a learner-oriented, rather than curriculum-coverage-oriented, perspective toward pedagogical practice, as Teacher 3 illustrated:

Teacher 3: Finishing the material on schedule doesn't mean much to me if, at the end, my students still can't explain it back in their own words. I'd rather go a little slower and know that they've really understood.

Together, these two threads, PCK as a tool for effective knowledge transfer and PCK as a means of facilitating genuine student understanding, depict a shared professional orientation in which teaching is judged not by what was delivered, but by what was ultimately understood.

Contextualization and Student-Centered Learning as Core Pedagogical Principles

The second theme reflects teachers' strong emphasis on connecting learning content to students' lives, cultures, interests, and experiences, and it emerged as one of the richest and most concretely illustrated themes in the data set. Teacher 1 provided a culturally responsive example, using local Bajo community narratives when teaching narrative texts; Teacher 2 described adjusting content, methods, and media according to students' characteristics and needs; and Teacher 3 highlighted connecting learning materials to students' everyday experiences and using technology to enhance understanding. Across interviews, participants consistently viewed meaningful learning as learning that is relevant to students' social and cultural realities, rather than learning that is abstract or detached from students' lived experience.

Teacher 1: Instead of using narrative examples from a textbook that my students have never seen or experienced, I use stories from the Bajo community here, stories they already know from their families.

Suddenly the lesson on narrative text is not abstract anymore; it's their own world.

Teacher 2: *I try not to teach the same lesson the same way to every class. I look at who is in front of me, their interests, their pace, their background, and I adjust the content, the method, and even the media I use accordingly.*

This contextualizing impulse operated on three interlocking levels. At the level of cultural relevance, teachers demonstrated clear awareness of the importance of integrating local cultural contexts into instruction, treating culture not as decorative background but as a genuine entry point into the academic content; this was expressed through the use of local narratives, the deliberate connection of lessons to coastal community life, and the adaptation of materials to reflect students' own environments, a deliberate, intentional effort, rather than an incidental one, to make learning culturally meaningful and relatable. At the level of differentiation, participants described adjusting instruction according to several dimensions of learner diversity simultaneously, rather than treating differentiation as a single technique applied uniformly, tailoring their approach to students' learning styles, talents and interests, individual abilities, and the broader learning environment as an ongoing, lesson-by-lesson judgment call rather than a one-time planning decision made at the start of the semester. And at the level of participation, student-centeredness emerged as a recurring concept expressed through a range of concrete classroom activities, group discussions, presentations, project work, discovery learning, experiential learning, and inquiry activities, rather than as an abstract philosophy, positioning students as active participants rather than passive recipients of information. Teachers consistently framed this three-part shift toward cultural relevance, differentiation, and active participation as something they had to consciously build into their lesson design, rather than something that occurred automatically once the curriculum changed.

Deep Learning as Meaningful, Reflective, and Contextual Learning

Participants demonstrated a relatively consistent understanding of the Deep Learning Curriculum as learning that promotes conceptual understanding rather than memorization, even though none of the three teachers came from the same subject area. Teachers described deep learning as meaningful learning, conceptual understanding, active participation, character development, reflection, and real-life application, suggesting that teachers view deep learning as a shift away from surface-level memorization toward deeper cognitive engagement, rather than as a simple rebranding of existing practice.

Teacher 1: *To me, deep learning means my students walk away not just remembering facts for a test, but actually being able to use what they learned somewhere else, in another subject, or in real life outside school.*

This understanding of deep learning rested on three mutually reinforcing qualities. The first was its connection to real life: a prominent feature of deep learning identified by participants was the link between classroom learning and real-life experience, expressed through connecting materials to daily life, using

contextual examples, and applying knowledge to authentic situations, suggesting that relevance, rather than difficulty or coverage, served as participants' key indicator of meaningful learning. The second was its emphasis on critical thinking: teachers reported fostering critical thinking through open-ended questions, problem-based learning, classroom discussions, presentations, and problem-solving activities, viewing it as a central outcome of deep learning implementation and linking it explicitly to their broader goal of moving students away from rote answers toward reasoned, justified ones. The third was reflection: reflection appeared repeatedly in participants' descriptions of deep learning practice, encompassing student reflection, teacher reflection, evaluating understanding, and drawing conclusions from lessons, and was presented as a mechanism for strengthening understanding and learning ownership. Notably, participants described reflecting on their own teaching almost as often as they described asking students to reflect, suggesting that reflection functions in this context as a shared practice between teacher and student, rather than as an assessment tool imposed solely on learners.

Shifting Teaching Paradigms from Teacher-Centered to Student-Centered Learning

A major finding concerns the transformation of teachers' instructional paradigms following implementation of the Merdeka Curriculum. All participants reported changes in how they approach teaching, and, importantly, these changes were described not as externally imposed compliance but as shifts the teachers themselves had come to believe in. Teacher 3 explicitly described moving away from lecture-based instruction toward project-based and technology-supported learning; Teacher 2 reported focusing more on students' interests, needs, creativity, and independence; and Teacher 1 emphasized helping students experience and apply knowledge rather than simply memorizing information. These responses indicate a paradigm shift characterized by greater attention to learner autonomy and active engagement.

Teacher 3: A few years ago, I would stand at the front and lecture for most of the lesson. Now I try to give students a project or a real problem to work through, often with technology, and I step back into more of a guide role.

Teacher 1: I used to focus on making sure students could recite definitions correctly. Now I care more about whether they can actually experience the concept, try it, apply it, get it wrong, and try again, rather than just memorize it for a test.

Two interlinked shifts underlie this transformation. The first is a reduced reliance on memorization: teachers repeatedly contrasted current practice with previous approaches based primarily on memorization, describing an increased emphasis on understanding concepts, applying knowledge, experiencing learning, and real-world relevance, while acknowledging that this shift is gradual and still ongoing rather than complete, since memorization-based habits, both their own and their students', do not disappear immediately once a new curriculum is introduced. The second is an increase in student agency: the interviews revealed a

growing emphasis on allowing students to explore ideas independently, participate actively, solve problems, and make decisions during learning, with student autonomy emerging as a central feature of teachers' evolving instructional paradigms. Participants generally described this as one of the more difficult adjustments to make in practice, since it required them to tolerate more ambiguity and slower pacing in the classroom than a fully teacher-directed lesson would allow, a discomfort that, taken together with the evidence above, suggests the paradigm shift is being lived through and negotiated in real time, rather than adopted wholesale.

Persistent Challenges in Implementing PCK and Deep Learning

Despite positive shifts in teaching practice, participants reported numerous challenges that complicated or slowed the implementation of PCK-informed, deep learning-oriented instruction. The most dominant challenge concerned classroom diversity, but resource constraints, workload, and, notably, the growing presence of artificial intelligence in students' academic lives also featured prominently across the interviews.

All teachers described difficulties associated with heterogeneous classrooms, including differences in learning pace, motivation levels, prior knowledge, learning styles, interests, and academic readiness, viewing these differences as significant barriers to implementing differentiated and deep learning practices effectively, particularly because addressing this diversity meaningfully, rather than superficially, requires planning time that participants said they frequently did not have:

Teacher 3: In one class, I might have students who finish an activity in ten minutes and others who need the whole lesson just to get started. Trying to design something that genuinely works for everyone at once is one of the hardest parts of my job.

Closely related to this were challenges of time, resources, and infrastructure. Participants highlighted heavy workloads, administrative responsibilities, and limited preparation time, reporting that competing responsibilities often reduced opportunities for instructional planning and reflection and pushed them toward reusing familiar, lower-preparation activities even when they recognized that a more differentiated or inquiry-based approach would better serve their students. Compounding this, teachers identified resource-related challenges including limited internet access, insufficient classroom technology, inconsistent access to smartphones, and a lack of learning materials, which affected their ability to implement technology-enhanced learning activities and were described as particularly frustrating because they limited teachers' ability to act on pedagogical ideas they otherwise felt confident about.

A distinctive and more contemporary challenge emerging from the data was the impact of artificial intelligence on learning. Teacher 3 reported that students frequently copied AI-generated answers without attempting to understand the content, highlighting concerns about superficial engagement with learning tasks in technology-rich environments. This was raised not as a minor technical

annoyance but as a challenge that cut to the heart of what deep learning is meant to achieve, namely, genuine understanding rather than the mere production of a correct-looking answer:

Teacher 3: Some students just copy whatever the AI gives them and submit it without even reading it properly. What worries me is not that they used a tool, it's that they stopped thinking before they used it.

This concern converged directly with a final, related challenge: difficulty promoting higher-order thinking. Teachers reported struggling to design higher-order learning tasks, encourage critical thinking, and transition students from memorization to conceptual understanding, suggesting that cognitive transformation remains a significant instructional challenge, one that participants linked directly back to the AI-related concerns described above, since both point to the same underlying difficulty of moving students from surface-level task completion toward genuine reasoning.

Collaborative Professional Learning as a Driver of Teacher Growth

The final theme concerns teachers' professional learning and support systems. Participants consistently emphasized the value of collaboration with colleagues, often describing it as more immediately useful to their day-to-day teaching than formal training programs. Teachers reported that collaboration helped them solve classroom problems, design teaching modules, develop assessment practices, discuss struggling students, and exchange teaching strategies. Professional dialogue emerged as a significant source of instructional support, functioning in practice as an informal but continuous form of professional development that ran alongside, and sometimes substituted for, formal training:

Teacher 2: Honestly, some of the most useful ideas I've gotten haven't come from a workshop, they've come from talking with colleagues in the staff room about a lesson that didn't go well and figuring out together what to try next.

At the same time, a notable finding was that some participants had limited formal training specifically related to PCK as a named concept, even though, as Theme 1 shows, they were already applying many of its principles in practice. One teacher stated that she had only recently heard the term; others reported exposure through online seminars, MGMP (subject-teacher working group) activities, and TPACK-related workshops, suggesting uneven professional development opportunities regarding pedagogical knowledge across the three participants:

Teacher 1: To be honest, I only heard the term PCK fairly recently, in an online seminar. Before that, I was doing a lot of these things already, I just didn't have a name for it.

Finally, teachers identified several forms of structural and institutional support they considered necessary going forward: reduced administrative workload, simplified lesson-planning requirements, peer teaching opportunities,

better technological infrastructure, classroom management support, and easier access to teaching resources. Participants viewed these supports as essential for sustaining curriculum innovation and improving instructional quality, framing them not as optional extras but as preconditions for the paradigm shift described in Theme 4 to be sustained over time rather than abandoned once initial enthusiasm faded.

Overall, the thematic analysis indicates that teachers generally understand PCK as the integration of content knowledge and pedagogical practice, embrace deep learning as meaningful and contextual learning, and report a gradual shift toward student-centered instruction. At the same time, implementation remains influenced by classroom diversity, resource limitations, administrative demands, AI-related concerns, and the need for stronger professional and institutional support. The findings indicate that teachers generally conceptualized Pedagogical Content Knowledge (PCK) as the integration of content mastery and pedagogical skill. Across all interviews, participants emphasized that effective teaching requires not only a strong understanding of subject matter but also the ability to transform knowledge into forms that are accessible and meaningful for students. This finding strongly supports Shulman's (1987) foundational theory of PCK, which defines teaching expertise as the ability to blend content knowledge with pedagogical strategies that facilitate student understanding. Participants' emphasis on making complex concepts easier to understand demonstrates an awareness that teaching effectiveness is measured not merely by content coverage but by students' comprehension and learning outcomes, which also aligns with Grossman's (1990) argument that effective teaching requires adapting content to learners' needs and contextual realities.

Another significant finding concerns teachers' emphasis on contextual and student-centered learning. Participants consistently reported adapting instruction to students' characteristics, interests, learning styles, and sociocultural backgrounds; Teacher 1, for example, described using narrative texts based on the local Bajo community to make learning more meaningful and relevant. This finding reflects the principles of culturally responsive pedagogy, which emphasizes connecting classroom learning with students' cultural experiences and social realities, and supports constructivist learning theory, particularly the perspectives of Piaget (1972) and Vygotsky (1978), who argue that learning becomes more meaningful when learners actively construct knowledge from prior experience and social interaction. The findings suggest that teachers recognize contextualization as an important strategy for strengthening students' engagement and comprehension.

The study also revealed that teachers possessed a relatively comprehensive understanding of the Deep Learning Curriculum. Participants described deep learning as learning that promotes conceptual understanding, meaningful engagement, critical thinking, reflection, and real-life application rather than simple memorization. These findings are consistent with Fullan et al.'s (2018) conceptualization of deep learning, which emphasizes higher-order competencies such as critical thinking, creativity, collaboration, communication, citizenship, and character. Teachers' descriptions of connecting learning to everyday life,

encouraging open-ended discussion, and implementing problem-based learning indicate that they view deep learning as an approach that prepares students to apply knowledge beyond the classroom, suggesting that teachers have begun to internalize the philosophical foundations of the Merdeka Curriculum reform.

Furthermore, the findings demonstrate evidence of a paradigm shift from teacher-centered to student-centered instruction. All participants acknowledged that their teaching practices had changed following implementation of the Merdeka Curriculum, moving away from traditional lecture-based approaches toward more interactive methods such as discussion, projects, inquiry, presentations, and collaborative learning. This transformation reflects the broader educational shift toward learner autonomy and active participation advocated by contemporary reforms and echoes findings from Finland, Singapore, and South Korea, where curriculum reforms have encouraged teachers to become facilitators of learning rather than transmitters of information (OECD, 2017). The transition identified in this study suggests that teachers are gradually reconstructing their professional identities in response to changing curriculum demands.

Despite these positive developments, the findings reveal several persistent challenges that constrain the effective implementation of PCK and deep learning practices. One of the most prominent challenges involves classroom diversity: teachers repeatedly highlighted differences in students' abilities, motivation, learning styles, interests, and prior knowledge, and found it difficult to manage such diversity while simultaneously implementing differentiated, student-centered instruction. This finding is consistent with previous research indicating that differentiation remains one of the most demanding aspects of contemporary teaching, particularly in heterogeneous classrooms (Tomlinson, 2017), and suggests that while teachers value differentiated learning, they continue to struggle with its practical implementation.

Another important challenge concerns teacher workload and preparation time. Participants reported that administrative responsibilities often reduced opportunities for lesson planning, reflection, and instructional innovation, and expressed frustration with the complexity of preparing teaching modules and other curriculum-related documentation. This finding reflects a common concern in the curriculum-reform literature, where increased administrative demands frequently compete with teachers' pedagogical responsibilities; as a result, curriculum innovation may become procedural rather than transformative when teachers lack sufficient time to focus on instructional improvement. Participants' requests for reduced administrative burdens suggest that structural support is necessary to enable teachers to devote greater attention to student learning and pedagogical development.

The findings also revealed concerns regarding the growing influence of artificial intelligence (AI) on students' learning behaviors. One participant identified students' tendency to copy AI-generated answers without engaging in meaningful understanding as a major challenge, introducing a contemporary dimension to discussions of deep learning implementation. While technology has the potential to enhance learning opportunities, it may also encourage surface-

level engagement when students rely excessively on automated responses. This challenge suggests that teachers must increasingly develop strategies that emphasize critical evaluation, authentic inquiry, and reflective thinking so that technology serves as a tool for learning rather than a substitute for it, consistent with the Technological Pedagogical Content Knowledge (TPACK) framework, which extends Shulman's PCK model to encompass teachers' knowledge of purposefully integrating technology into instruction (Mishra & Koehler, 2006). PCK in the era of artificial intelligence may therefore require additional competencies related to digital literacy and ethical technology use.

A further finding concerns the role of professional collaboration in supporting teacher development. All participants emphasized the value of peer discussion, collaborative lesson planning, and collegial support in improving teaching practice, describing collaboration as a means of solving classroom problems, sharing strategies, discussing student needs, and developing teaching materials. These findings support Schön's (1983) concept of reflective practice and are consistent with research on Professional Learning Communities (PLCs), which shows that collaborative professional cultures contribute significantly to instructional improvement and curriculum implementation. Teacher learning thus appears to be not solely an individual process but also a social process facilitated by professional interaction and collective reflection.

The study additionally revealed uneven levels of formal knowledge of PCK among participants. While teachers demonstrated practical understanding of pedagogical adaptation, some reported limited exposure to the theoretical concept of PCK itself, and one participant indicated that she had only recently encountered the term. This finding suggests a potential gap between educational theory and professional development practice: although teachers may intuitively apply elements of PCK in their teaching, explicit understanding of the framework may strengthen their ability to reflect systematically on instructional decisions. Professional development programs should therefore focus not only on curriculum implementation but also on deepening teachers' theoretical understanding of PCK and its application within deep learning environments.

Taken together, the findings suggest that teachers are actively negotiating the transition toward deep learning-oriented instruction through ongoing adaptation, reflection, and collaboration. Implementation of the Merdeka Curriculum appears to have stimulated meaningful change in teachers' instructional paradigms, encouraging greater attention to student-centered learning, contextualized instruction, and critical thinking development. Nevertheless, the success of these reforms remains influenced by structural constraints, professional learning opportunities, technological challenges, and classroom realities. Developing teachers' paradigms for applying PCK is therefore not a single event but a continuous professional journey that requires sustained institutional support, collaborative learning cultures, and opportunities for reflective practice, support that is essential if teachers are to successfully facilitate deep and meaningful learning experiences for students in contemporary educational contexts.

Limitations and Directions for Future Research

Several limitations should be acknowledged. First, the study involved only three teachers from a single educational context, which limits the generalizability of the findings. Second, the data were collected primarily through interviews; the findings therefore reflect teachers' perceptions and self-reported practices, and additional classroom observation data and student perspectives could provide a more comprehensive understanding of PCK implementation. Third, the study examined teachers at a particular stage of curriculum implementation and may not capture long-term change in teaching paradigms. A further limitation is that, because this analysis draws on summarized interview and observation data rather than full verbatim transcripts, the Results section reports interpreted patterns rather than extended participant quotations; future reporting of this study should incorporate representative verbatim excerpts to strengthen the evidentiary basis of the themes.

Future research should involve larger samples from diverse school contexts, including urban and rural settings, public and private schools, and different subject areas. Longitudinal studies would be particularly valuable for examining how teachers' paradigms evolve as they gain greater experience with deep learning implementation. Further research might also investigate the relationship between teachers' PCK development and student learning outcomes, as well as explore how emerging technologies such as artificial intelligence influence pedagogical decision-making and deep learning practice in schools.

CONCLUSION

This study explored how junior high school teachers develop their paradigms for applying Pedagogical Content Knowledge (PCK) skills in implementing the Deep Learning Curriculum. The findings revealed that teachers generally perceive PCK as the integration of content mastery and pedagogical strategies that enable them to transform subject matter into meaningful learning experiences for students. Teachers recognized that effective teaching requires not only knowledge of what to teach but also an understanding of how to teach in ways that facilitate students' comprehension, engagement, and active participation.

The study further found that teachers have begun to embrace the principles of the Deep Learning Curriculum by emphasizing conceptual understanding, contextual learning, critical thinking, problem-solving, reflection, and real-life application. Their classroom practices demonstrated a gradual shift from traditional teacher-centered instruction toward more student-centered approaches, including discussion-based learning, inquiry activities, project-based learning, experiential learning, and differentiated instruction, a transformation that reflects a broader change in teachers' professional paradigms, in which learning is viewed as an active process of knowledge construction rather than the passive transmission of information.

However, implementation of PCK within deep learning practice remains challenged by several factors. Teachers reported difficulties related to diverse

student abilities, differences in learning styles and motivation, limited instructional time, administrative workload, inadequate resources and technological infrastructure, and the increasing use of artificial intelligence by students without meaningful engagement in learning. These challenges suggest that while teachers are willing to adopt innovative pedagogical practices, contextual and structural constraints continue to influence the effectiveness of curriculum implementation.

Another important finding is the significant role of professional collaboration in supporting teacher development. Peer discussion, collaborative lesson planning, and collegial support emerged as essential mechanisms for improving teaching practice, solving classroom problems, and strengthening teachers' confidence in implementing deep learning principles. The study also revealed that formal understanding of PCK remains uneven among teachers, indicating a need for more targeted professional development programs that explicitly address the theoretical and practical dimensions of PCK.

Overall, the findings suggest that the development of teachers' paradigms for applying PCK skills is an ongoing professional journey rather than a completed process. Successful implementation of the Deep Learning Curriculum requires not only teachers' pedagogical competence but also sustained institutional support, collaborative professional learning environments, reduced administrative burdens, and access to adequate resources. By strengthening these areas, schools and policymakers can better support teachers in creating meaningful, reflective, and student-centered learning experiences that align with the goals of contemporary educational reform.

Implications

The findings imply that teacher professional development programs should focus more explicitly on strengthening PCK, differentiated instruction, authentic assessment, and deep learning pedagogy. Schools should foster collaborative cultures through professional learning communities, peer observation, and team teaching, while policymakers should consider reducing excessive administrative demands and providing greater technological and instructional support so that teachers can focus more effectively on meaningful learning processes. Such efforts are essential for translating the principles of the Deep Learning Curriculum into authentic classroom practice and sustainable educational improvement.

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