

The Spiral Model of Teacher Research (SMTR): Integrating Inquiry Spirals, Evidence Triangulation, and Decisional Capital for Professional Growth

Xinyue Pan

Sichuan Normal University, Chengdu, China

976537416@qq.com

Abstract. While teacher inquiry is widely recognised as a pathway for professional growth, practitioners often lack a structured process for accumulating professional judgment across repeated inquiry cycles. This paper synthesises three established frameworks—the spirals of inquiry, the hard-soft evidence distinction, and decisional capital—into the Spiral Model of Teacher Research (SMTR), a four-phase operational framework (Grounding, Probing, Echoing, and Leaping) that structures the accumulation of professional judgment through deliberate triangulation of quantitative metrics and qualitative narratives. The model is illustrated through a micro-level practitioner inquiry conducted in a Chinese high school geography classroom, focusing on student engagement with urbanisation theory. The findings suggest that methodological triangulation can uncover learning mechanisms that single evidence streams may not register, pointing to a concept-activation gap between students' lived experiences and their academic language. The SMTR thus offers a coherent and actionable protocol for transforming routine classroom reflections into cumulative professional wisdom, with implications for fostering research-engaged teaching cultures and offering a pathway for redefining teacher identity from knowledge implementers to knowledge generators.

Keywords: Teacher research, Spiral Model of Teacher Research (SMTR), methodological triangulation, decisional capital, practitioner inquiry.

1. Introduction

Globally, the professional identity of educators is increasingly understood not as a static set of traits, but as a dynamic construct continuously reshaped through inquiry [1], shifting from passive knowledge implementers to active researchers of their own classroom practice [2]. In the Chinese context, this evolution is increasingly supported by national policy mandates for "research-based education" [3]. Foundational action research models, such as the four-stage cycle of planning, acting, developing, and reflecting, provide a robust procedural baseline for resolving immediate problems of practice [4]. Furthermore, for such inquiry to be sustainable, it must move beyond individual motivation to be supported by collaborative institutional conditions [5].

While traditional teacher research is often perceived as a horizontal loop of problem-solving, the trajectory of genuine professional growth is better conceptualised as a vertical spiral. Three established theoretical frameworks collectively illuminate the mechanisms through which sequential research steps can be transformed into cumulative wisdom. First, the "spirals of inquiry" concept [6] frames teacher research as an iterative process of continuous deepening. Second, the distinction between "hard" and "soft" evidence [7] operationalises how multiple forms of data can be triangulated in daily practice. Third, the concept of "decisional capital" [8] defines the ultimate goal of teacher research as the accumulation of context-sensitive professional judgment.

Rather than proposing a novel theory, this paper synthesises these three frameworks into an actionable operational framework, the Spiral Model of Teacher Research (SMTR), and validates it through empirical application. The SMTR structures teacher inquiry into four synergistic phases—Grounding, Probing, Echoing, and Leaping—each designed to deliberately couple quantitative metrics with qualitative narratives. The model is empirically grounded through a micro-level practitioner inquiry conducted in a Chinese high school geography classroom addressing student conceptual disengagement with urbanisation theory. Specifically, this study aims to: (a) demonstrate

how the SMTR's methodological triangulation can diagnose deep-seated learning barriers that single evidence streams cannot register; and (b) illustrate how the systematic execution of the four-phase protocol enables the accumulation of transferable decisional capital.

The remainder of this paper is organised as follows. Section 2 elaborates on the theoretical foundations underpinning the SMTR. Section 3 details the four-phase operational framework and its core mechanism of evidence triangulation. Section 4 presents the empirical case study from the geography classroom to validate the model's applicability. Section 5 discusses the implications of the findings for teacher professional development and identity. Section 6 concludes with limitations and directions for future research.

2. Theoretical Foundations

The conceptual design of the Spiral Model of Teacher Research (SMTR) does not operate in a theoretical vacuum; rather, it represents a synthesis of three established paradigms in educational research: the spirals of inquiry framework, the epistemology of dual-track evidence (integrating hard and soft data), and the theory of professional decisional capital. Together, these frameworks provide the pedagogical scaffolding necessary to transform routine classroom reflections into systematic practitioner research.

2.1. The Epistemology of Teacher Inquiry: Linear Loops versus Vertical Spirals

Teacher inquiry has long been operationalised through cyclical action research models [9, 10, 11]. While such cycles provide a clear procedural baseline – planning, acting, developing, reflecting – they risk being perceived as horizontal loops that return the practitioner to the same cognitive starting point after each round. In contrast, contemporary educational literature increasingly advocates for an iterative, open-ended framework [6] that conceptualises professional growth as a vertical ascent, where each completed cycle feeds into a higher level of understanding and practice. The crucial distinction lies not in the presence of cyclical steps—which both models share—but in the cognitive trajectory: horizontal loops risk stagnation, whereas vertical spirals ensure that each turn deepens the practitioner's understanding and elevates their subsequent practice.

By organising inquiry into an ascending spiral, practitioners come to recognise that the resolution of one pedagogical tension inevitably uncovers deeper layers of student learning mechanisms. This vertical movement ensures that a teacher avoids "single-loop learning" [12]—the application of repetitive, technical fixes to surface-level classroom symptoms. Instead, it facilitates a deeper reframing of the problematic situation [13], shifting the focus from short-term problem-solving to long-term transformative professional evolution.

The spiral metaphor offers a useful structural logic for teacher inquiry. Its primary emphasis is on how cycles of inquiry can build upon each other over time. Building on this, the following section introduces a complementary perspective—focusing not on the shape of inquiry, but on the forms of evidence teachers might draw upon at each turn.

2.2. The Typology of Evidence: Triangulating Hard Metrics and Soft Narratives

Having established the structural logic of the spiral, we now turn to the question of what evidence teachers should collect at each turn. To operationalise the spiral progression, teachers must critically examine what counts as evidence in the classroom. Driven by widespread mandates for data-driven decision making [14], contemporary educational accountability systems often privilege hard evidence—quantifiable, standardised metrics such as test scores and objective diagnostic data [7]. While these metrics offer valuable macro-level visibility into aggregate student performance, relying exclusively on them risks introducing a form of data-driven myopia that ignores the socio-emotional and cognitive complexities of learning [15]. This over-reliance can lead to systematic reductionism, where the pedagogical focus shifts from understanding the holistic learning process to merely manipulating numerical outcomes.

Robust practitioner research requires the systematic integration of "soft evidence," which encompasses qualitative indicators such as student emotional demeanor, verbal hesitations, and localised learning narratives. Hard evidence alone reduces learning to measurable outputs; soft evidence alone risks subjective misinterpretation. Triangulating both streams allows the teacher to examine the generative tension between what students score and how they experience the curriculum [16]. This epistemic balance is essential for diagnosing deep-seated learning barriers that standardised numbers alone cannot register. The hard-soft evidence distinction offers a methodological vocabulary for teacher inquiry. The following section builds on this by examining what teachers ultimately gain from sustained inquiry over time.

2.3. Decisional Capital: The Ultimate Asset of Practitioner Research

The structural logic of the spiral and the methodological framework of dual-track evidence together raise a further question: what exactly accumulates through repeated cycles of inquiry? Professional growth in teaching transcends the mere acquisition of discrete instructional techniques [17]; fundamentally, it entails the cultivation of decisional capital – the accumulated professional judgment that enables teachers to make wise, context-sensitive decisions over time [8]. Unlike human capital (individual knowledge and skills) or social capital (collaborative networks), decisional capital grows exclusively through repeated cycles of action, reflection, and adaptation. It is the capacity to diagnose a classroom situation, choose an appropriate intervention, and adjust course based on emerging evidence. The spiral model proposed in this essay is designed to make the growth of decisional capital visible and actionable by explicitly linking each phase to the collection and triangulation of hard and soft evidence. Consequently, decisional capital operates as both the driving engine and the ultimate enduring asset yielded by sustained practitioner research.

Decisional capital helps clarify what teachers might aim to build through research—the capacity to make context-sensitive professional judgments. Its focus is on the outcome of sustained inquiry. Building on this, the following section brings the three strands together and explains why, for the purpose of developing a practical protocol for classroom teachers, synthesising them may be more helpful than using any one alone.

2.4. The Necessity of Synthesis: Moving Towards the SMTR

Each of these three frameworks offers valuable insights individually. However, their synthesis is not merely additive. The spirals of inquiry [6] provide a structural metaphor for iteration, yet they tend not to specify what kind of evidence teachers should collect at each turn or how that evidence contributes to durable professional growth. The hard-soft evidence distinction [7] offers a practical methodology for data collection, but it does not fully explain how such evidence accumulates into long-term professional judgment. Decisional capital [8] defines a clear goal, yet it does not explicitly articulate a step-by-step process for how teachers can systematically build it through classroom inquiry. The synthesis of these three frameworks into the SMTR is therefore not merely additive but genuinely integrative. The SMTR addresses each framework's limitation by leveraging the strengths of the other two. It adopts the spiral structure from Timperley, Kaser, and Halbert [6] as its organisational backbone, ensuring that each inquiry cycle builds vertically upon the previous one rather than returning to the same starting point. It operationalises data collection through the hard-soft evidence distinction from Datnow and Park [7], embedding deliberate triangulation into each phase of the spiral. And it orients the entire process toward the accumulation of decisional capital [8], ensuring that each completed cycle yields not merely a solution to an immediate problem but a durable enhancement of the teacher's professional judgment. In this way, the SMTR transforms three complementary yet incomplete frameworks into a coherent, actionable protocol for sustained teacher inquiry. The following section operationalises this synthesis into four concrete phases. (See Fig. 1)

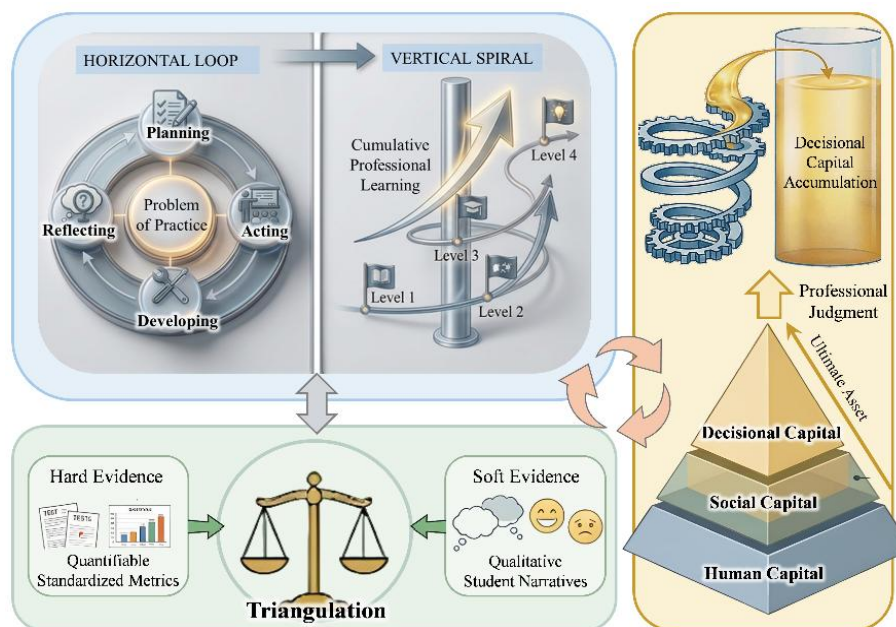


Fig. 1 Conceptual synthesis of the theoretical foundations underpinning the SMTR.

3. The Spiral Model of Teacher Research: A Framework for Evidence Synthesis

Building on the theoretical foundations discussed above, this section operationalises the Spiral Model of Teacher Research (SMTR). The model reinterprets the four canonical stages of classic action research into four evidence-driven phases designed to make the growth of decisional capital visible and actionable. Rather than executing a flat, linear procedure, each iterative turn of the SMTR requires the practitioner to systematically couple hard metrics (quantifiable, standardised outcomes) with soft narratives (qualitative, relational dynamics).

3.1. Grounding: Auditing the Hard-Soft Tension

The first phase, Grounding, moves beyond simple problem identification to perform a comprehensive system audit of the classroom baseline. In this phase, the teacher identifies a "problem of practice" by mapping the tension between two evidence streams: Specifically, the practitioner conducts hard evidence mapping by aggregating existing structural metrics, such as mean test scores, error frequencies, or standardised assessment data, to identify systemic patterns of magnitude. Concurrently, the teacher engages in soft evidence sensing by gathering qualitative insights into the students' internal mental states and the classroom's relational trust through informal dialogues or structured observations. By anchoring the research in this dual-evidence baseline, the teacher ensures the inquiry addresses not just what the problem is, but also the underlying mechanisms of why it exists. This dual-evidence approach guarantees that the subsequent intervention is contextually precise.

3.2. Probing: The Teacher-as-Researcher in Action

The second phase, Probing, translates the grounded baseline into a targeted, low-stakes intervention. In this phase, the teacher acts as an active researcher, implementing a manageable pedagogical activity while simultaneously harvesting real-time data from both hard and soft domains. On the one hand, the teacher records immediate, quantifiable hard evidence, such as task accuracy rates or the frequency of student-led questions during the intervention. On the other hand, the teacher captures process-oriented soft evidence, paying close attention to shifts in emotional energy, student engagement levels, or the quality of peer-to-peer dialogue. This synchronised collection prevents the practitioner from relying on anecdotal observations alone: interpreting aggregate score changes

without understanding their underlying cognitive processes (hard evidence alone), or relying on anecdotal observations without confirming their prevalence (soft evidence alone). It ensures that the subsequent analysis is grounded in a complete picture of the intervention, setting the stage for the Echoing phase.

3.3. Echoing: Methodological Triangulation

The third phase, Echoing, is the analytical core of the spiral model, where the focus shifts from collection to the systematic dialogue between evidence tracks. The teacher performs methodological triangulation [18] to move beyond surface observations and uncover the deeper causal mechanisms of the intervention. The process begins by juxtaposing the evidence types, placing hard baselines of magnitude side-by-side with soft narratives that offer interpretative depth. To structure the analytical comparison, the teacher interrogates the juxtaposed data through three distinct lenses: first, where do hard and soft evidence agree? second, where do they disagree or show tension? third, what complementary insight emerges when both are considered together? This triangulation moves the teacher beyond a binary assessment of "success or failure" to a nuanced pedagogical diagnosis. It is in this phase that raw data is refined into decisional capital—valid, context-sensitive professional judgment. This accumulated judgment becomes the raw material for the final phase.

3.4. Leaping: Consolidating Decisional Capital and Elevating the Baseline

The final phase, Leaping, represents the vertical movement of the spiral. The teacher consolidates newly acquired professional judgments through a critical micro-to-macro scale transition, abstracting localised classroom observations into transferable, overarching pedagogical principles. This leap involves refining the initial research question based on the newly identified causal mechanisms, thereby formulating a higher-level starting point for the subsequent inquiry cycle. Because the accumulated capital elevates the educator's baseline, the next Grounding phase begins from a significantly more advanced cognitive vantage point. By completing this leap, the educator successfully transitions from a passive knowledge implementer into a strategic knowledge generator of their own practice. (See Fig. 2)

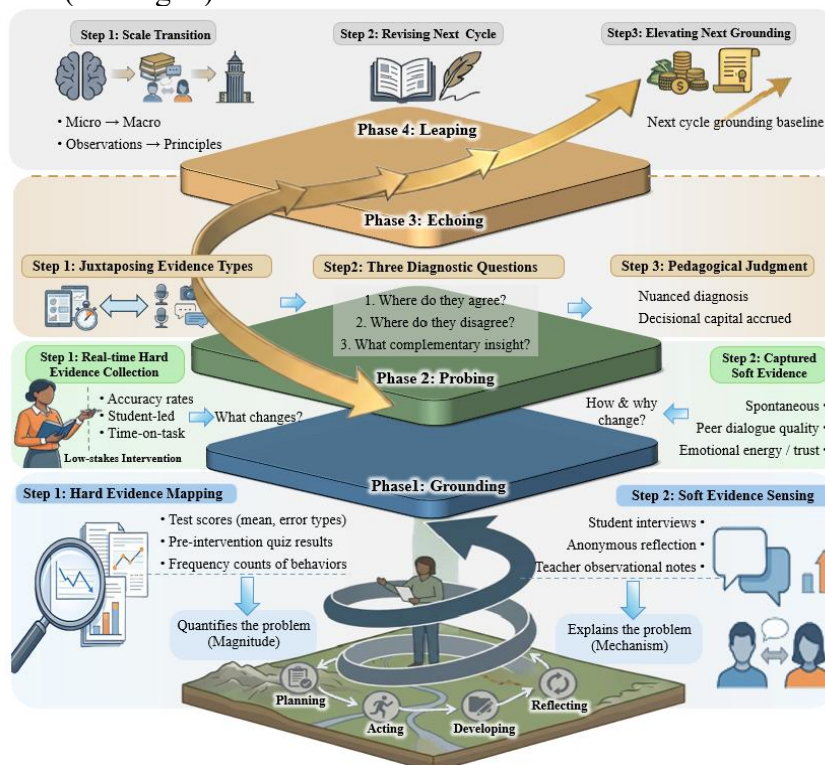


Fig. 2 Four phases of the Spiral Model of Teacher Research: Grounding, Probing, Echoing, and Leaping.

4. The SMTR in Praxis: Geography Classroom Inquiry

To demonstrate how the Spiral Model of Teacher Research operates in authentic practice, this section applies the framework to a micro-scale practitioner inquiry conducted during a high-school geography teaching internship in Chengdu. The case follows the four-phase spiral logic (Grounding, Probing, Echoing, Leaping) and explicitly integrates hard and soft evidence to accelerate the accumulation of decisional capital. The intervention targeted an urbanisation module, specifically focusing on making the "Push-Pull Theory" conceptually accessible to students.

The inquiry involved 53 students from a Grade 11 geography class at a public high school in Chengdu, China. Data were collected through multiple sources: (a) classroom observations with field notes documenting student participation and verbal/non-verbal responses; (b) student work samples, including diagnostic quiz results and written reflections; (c) semi-structured dialogue with a subset of students during and after the intervention; and (d) a validation interview with the supervising mentor teacher to corroborate interpretations and mitigate bias. All data were anonymised, and informed consent was obtained.

4.1. Phase 1 (Grounding): Diagnosing Cognitive Barriers

The Grounding phase began with a baseline audit to identify underlying pedagogical tensions. Hard evidence from quiz scores showed an acceptable mean of 72%, indicating a basic grasp of factual content. However, soft evidence from classroom interactions revealed low conceptual engagement, characterised by eye-contact avoidance and hesitant verbal responses. This friction – acceptable standardised performance contrasting with socio-emotional disengagement – defined the problem of practice: students possessed mechanical knowledge but lacked authentic conceptual resonance.

4.2. Phase 2 (Probing): Targeted Intervention and Dual Evidence Collection

To address this disconnect, the Probing phase deployed a low-stakes, targeted intervention designed to capture dual-track evidence. The practitioner introduced a family-migration narrative activity, prompting students to share localised, intergenerational migration histories (soft evidence). Simultaneously, a diagnostic pre-quiz was administered to evaluate their retention of urbanisation terminology (hard evidence). This dual-capture mechanism ensured the intervention was monitored through both objective factual metrics and subjective lived experiences.

4.3. Phase 3 (Echoing): Triangulating Concept Activation

During the Echoing phase, methodological triangulation was applied to the juxtaposed datasets. Analysed in isolation, the pre-quiz (hard data) suggested a moderate knowledge deficit, while the migration narratives (soft data) confirmed that the majority of students possessed rich, personal migration experiences. Their complementary synthesis pinpointed the precise pedagogical gap: the barrier was not a lack of geographic knowledge or life experience, but a failure of concept activation—students' prior lived experiences remained untranslated into formal academic language. To ensure methodological rigor, this diagnostic resolution was corroborated through mentor cross-validation, effectively mitigating subjective researcher bias.

4.4. Phase 4 (Leaping): Consolidating Decisional Capital

The Leaping phase formalised the scale transition from localised discovery to institutionalised practice. Armed with the validated diagnosis, the practitioner integrated the story-sharing warm-up into the regular pedagogical repertoire to consistently bridge lived experiences with spatial theories. In addition, these micro-level findings were shared at a departmental meeting. This process illustrates the tangible accumulation of decisional capital: the educator developed the capacity to design low-cost probes, systematically triangulate dual evidence, and translate classroom insights into shareable, evidence-based professional practice. Ultimately, this successful micro-cycle validates the SMTR not

merely as a localised pedagogical tool, but as a transformative engine for reshaping the educator's professional identity. (See Fig. 3)

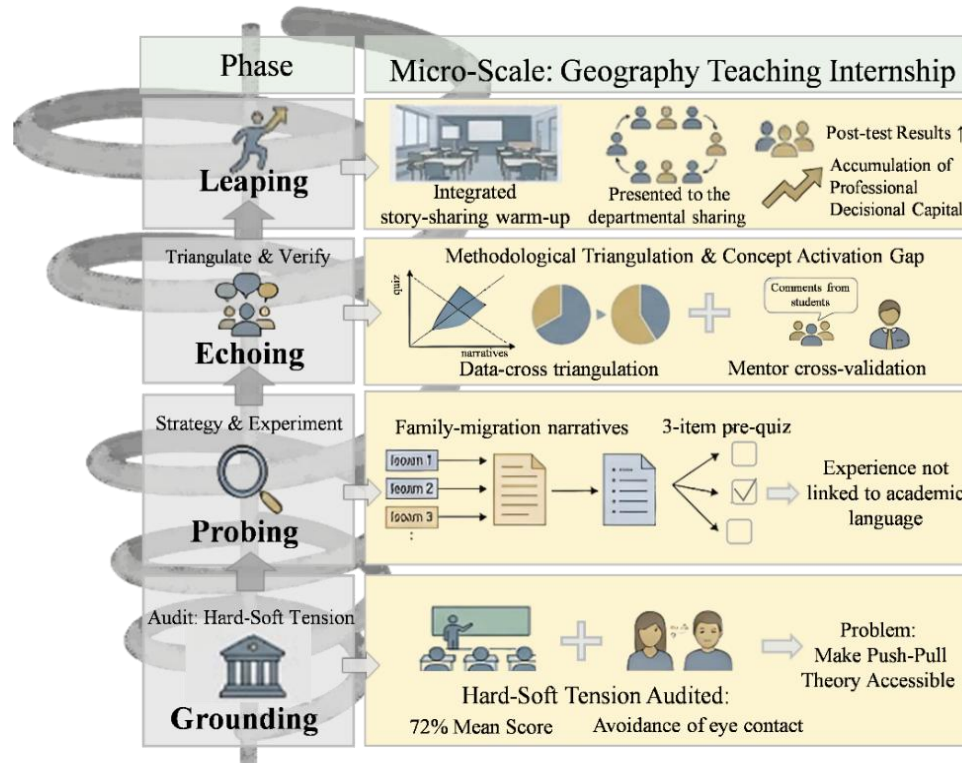


Fig. 3 Empirical application of the SMTR framework: A micro-level geography classroom inquiry.

5. Discussion

Through the micro-scale application of the SMTR framework, this study demonstrates how hard and soft evidence transforms traditional action research into a vertical spiral, thereby accelerating the continuous accretion of decisional capital. As demonstrated in the geography practicum, relying exclusively on hard evidence risks introducing a form of data-driven myopia that obscures the socio-emotional and cognitive complexities of learning. The deliberate triangulation of soft evidence successfully prevented systematic reductionism. However, it is important to acknowledge the practical tension inherent in this dual-track approach: systematically capturing qualitative student narratives demands significant time and emotional resources, a tangible challenge for practitioners in the fast-paced, high-stakes context of Chinese secondary education. Furthermore, the successful execution of the Leaping phase substantiates the theoretical shift from horizontal problem-solving to vertical professional growth. Traditional cyclical action research models often risk returning the practitioner to the same cognitive starting point after each round. In contrast, the SMTR ensures that resolving a localised pedagogical tension – in this case, bridging students' lived migration experiences with abstract spatial theories – fundamentally elevates the educator's diagnostic baseline for subsequent inquiry cycles. This vertical ascent explicitly operationalises the accumulation of decisional capital, demonstrating how raw classroom observations are converted into valid, context-sensitive professional judgment.

The SMTR framework contributes to a redefinition of the teacher's professional identity. It provides practical tools for avoiding single-loop learning. By learning to design low-cost probes, triangulate hard and soft evidence, and share classroom findings with colleagues, teachers can move beyond the role of knowledge implementers and become knowledge generators. This shift helps sustain practitioner inquiry beyond individual motivation, embedding it into school practice.

6. Conclusion and Implications

Ultimately, this essay argues that teacher research can be more than a tool for solving immediate classroom problems; it can also serve as a systematic pathway for building professional expertise over time. To achieve this, the essay has synthesised the spirals of inquiry, the hard-soft evidence distinction, and the concept of decisional capital into the SMTR as an operational framework. By integrating these established paradigms, the SMTR offers teachers a coherent, step-by-step roadmap for accumulating professional judgment. However, several limitations delineate avenues for future research:

First, because the empirical evidence is drawn from a single practitioner's experience within a specific geography module, the generalisability of the SMTR across diverse subjects and cultural contexts requires further validation. Second, the current study focuses on individual teacher research. How collective spirals—where a group of teachers share evidence and reflect together—might operate differently remains unexplored. Collaborative action research would be a natural extension. Third, longitudinal studies tracking multiple consecutive spirals over extended timeframes are necessary to robustly quantify the long-term growth of decisional capital. Finally, the practical and institutional implications of this framework are profound. By navigating through the stages of Grounding, Probing, Echoing, and Leaping, the spiral offers a low-threshold protocol for classroom teachers to move from surface-level troubleshooting to deep diagnostic research. For school leaders, it implies a necessary shift toward distributed leadership and supportive institutional cultures that actively value teacher-generated evidence. In the evolving landscape of Chinese education, fostering such a pervasive culture of continuous inquiry is essential for building a resilient, research-engaged teaching profession. In this way, the SMTR contributes to the ongoing reshaping of teacher identity—from a static role of knowledge delivery to a dynamic stance of inquiry-led professionalism.

References

- [1] Beijaard, D., Meijer, P. C., & Verloop, N. (2004). Reconsidering research on teachers' professional identity. *Teaching and Teacher Education*, 20(2), 107–128. <https://doi.org/10.1016/j.tate.2003.07.001>
- [2] Cochran-Smith, M., & Lytle, S. L. (1999). Relationships of knowledge and practice: Teacher learning in communities. *Review of Research in Education*, 24(1), 249–305. <https://doi.org/10.3102/0091732X024001249>
- [3] Li, Q., & Zhou, J. (2022). [How teachers understand research: Voices from educational practitioners]. *Educational Research*, 43(8), 85–92.
- [4] Mertler, C. A. (2021a). Action research as teacher inquiry: A viable strategy for resolving problems of practice. *Practical Assessment, Research & Evaluation*, 26(19), 1–12. <https://doi.org/10.7275/22014442>
- [5] Bergmark, U. (2020). The role of action research in teachers' efforts to develop research-based education in Sweden: Intentions, outcomes, and prerequisite conditions. *Educational Action Research*, 30(3), 427–444. <https://doi.org/10.1080/09650792.2020.1847155>
- [6] Timperley, H., Kaser, L., & Halbert, J. (2014). *Spirals of inquiry: For equity and quality*. BC Principals' & Vice-Principals' Association.
- [7] Datnow, A., & Park, V. (2014). *Data-driven leadership*. Jossey-Bass.
- [8] Hargreaves, A., & Fullan, M. (2012). *Professional capital: Transforming teaching in every school*. Teachers College Press.
- [9] Kemmis, S., & McTaggart, R. (1988). *The action research planner* (3rd ed.). Deakin University.
- [10] Lewin, K. (1946). Action research and minority problems. *Journal of Social Issues*, 2(4), 34–46. <https://doi.org/10.1111/j.1540-4560.1946.tb02295.x>
- [11] Mertler, C. A. (2021b). *Action research: Improving schools and empowering educators* (7th ed.). SAGE Publications.
- [12] Argyris, C., & Schön, D. A. (1978). *Organizational learning: A theory of action perspective*. Addison-Wesley.

- [13] Schön, D. A. (1983). *The reflective practitioner: How professionals think in action*. Basic Books.
- [14] Mandinach, E. B. (2012). A perfect time for data use: Using data-driven decision making to inform practice. *Educational Psychologist*, 47(2), 71–85. <https://doi.org/10.1080/00461520.2012.667064>
- [15] Jimerson, J. B. (2014). Thinking about data: Exploring the development of mental models for “data use” among teachers and school leaders. *Studies in Educational Evaluation*, 42, 5–14. <https://doi.org/10.1016/j.stueduc.2013.12.003>
- [16] Schildkamp, K. (2019). Data-based decision-making for school improvement: Research insights and future directions. *Educational Research*, 61(3), 257–273. <https://doi.org/10.1080/00131881.2019.1648413>
- [17] Cochran-Smith, M., & Lytle, S. L. (2009). *Inquiry as stance: Practitioner research for the next generation*. Teachers College Press.
- [18] Denzin, N. K. (1978). *The research act: A theoretical introduction to sociological methods* (2nd ed.). McGraw-Hill.