

Book review: Teaching and Learning with Research Cognitive Theory: Unlocking Curiosity and Creativity for Problem-Solving Skills

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Springer Cham

Switzerland

2025

ISBN 978-3-031-87543-4 (Softcover) and 978-3-031-87544-1 (eBook)

DOI [10.1007/978-3-031-87544-1](https://doi.org/10.1007/978-3-031-87544-1)

Review DOI [10.1108/SEAMJ-05-2026-102](https://doi.org/10.1108/SEAMJ-05-2026-102)

Introduction

Teaching and Learning with Research Cognitive Theory: Unlocking Curiosity and Creativity for Problem-Solving Skills represents a significant contribution to the field of educational psychology and pedagogy, offering a comprehensive framework for integrating research-based learning across all educational levels. Authored by Noora J. Al-Thani and Zubair Ahmad from Qatar University Young Scientists Center, this SpringerBriefs volume bridges theoretical insights with practical applications, presenting the Research Cognitive Theory (RCT) as a transformative approach to fostering 21st-century skills. The book is particularly timely, as contemporary education increasingly demands competencies in critical thinking, problem-solving, creativity, and collaboration – skills that traditional pedagogical approaches often struggle to cultivate effectively.

The central thesis of the book posits that intellectual learning occurs most effectively within dynamic research environments characterized by reciprocal interactions among individuals, their behaviors, and their surroundings. This proposition extends Bandura's Social Cognitive Theory into the domain of research-based education, arguing that structured exposure to inquiry-driven activities can systematically develop learners' cognitive capabilities, research attitudes, and intrinsic motivation. The authors draw upon their extensive experience at the Qatar University Young Scientists Center to substantiate their theoretical framework with empirical evidence and practical implementations.

Content overview

The book is organized into six thematically coherent chapters that progressively address the application of RCT across different educational tiers, from primary school through teacher education. Chapter 1 establishes the theoretical foundations by examining Research Learning (RL) and its relationship to existing learner development theories. The authors define research as a systematic process involving investigation, information gathering, detailed assessment, and conclusion formulation. They introduce two primary RL models – Learning through Independent Research and Learning through Integrated/Embedded Research – and trace their historical evolution. The chapter culminates in the formal introduction of RCT as an extension of Social Cognitive Theory, emphasizing components such as self-efficacy, behavioral capability, expectations, self-control, observational learning, and reinforcements.

Chapters 2 and 3 focus on primary and middle school applications, respectively. Chapter 2 explores the scope of Problem-Based Learning (PBL) and integrated research education for



primary learners, emphasizing how curiosity serves as a fundamental driver of intellectual growth. The discussion of scientific inquiry and its relationship to problem-solving skills draws on frameworks like the Information-Gap Decision Theory and examines interventions such as Technology-Enhanced Problem-Based Learning Activities (TEPLA). Chapter 3 transitions to Project-Based Learning (PjBL) and PBL in middle school contexts, discussing the integration of RCT into these methodologies and addressing both challenges and opportunities in implementation.

Chapter 4 examines high school research experiences, with particular emphasis on the Chemistry-Based High School Research Experience (CHSRE) program as a model for implementing RCT. The chapter advocates for dynamic multidisciplinary research experiences and introduces the near-peer mentoring model as a strategy for supporting cognitive and social development within research settings.

Chapter 5 extends the discussion to undergraduate research, detailing how Course-Based Undergraduate Research Experiences (CUREs) can be enhanced through RCT to foster work readiness and research proficiency. The chapter draws on established frameworks like the Research Skill Development (RSD) Framework by Willison and O'Regan.

Chapter 6 addresses teacher education, exploring how research-based methodologies can transform both pre-service and in-service teacher training. The chapter examines the relationship between teacher competencies and student learning behaviors, emphasizing the reciprocal influence between educators' research engagement and their instructional effectiveness.

Strengths of the book

One of the book's most significant strengths lies in its comprehensive theoretical framework. The authors successfully synthesize multiple learning theories – including Social Learning Theory, Social Cognitive Theory, and situated learning theory – into a coherent model that explains how research environments facilitate cognitive development. The proposed RCT framework provides a nuanced understanding of how dynamic research settings foster intrinsic motivation, self-efficacy, and various cognitive skills through reciprocal interactions within research communities.

The practical applicability of the framework is another notable strength. Rather than presenting RCT as an abstract theoretical construct, the authors provide concrete implementations across multiple educational contexts. The CHSRE program, for instance, offers a detailed model for how high school students can engage in multidisciplinary research that develops both research competencies and positive research attitudes. Similarly, the discussion of CURE models for undergraduate education provides actionable guidance for faculty seeking to integrate research experiences into their curricula.

The book's developmental approach is particularly valuable for educators and curriculum designers. By organizing chapters according to educational tiers – from primary school through teacher education – the authors demonstrate how RCT can be adapted to meet age-specific cognitive needs while maintaining conceptual continuity. This structure allows readers to understand how early curiosity-driven inquiry in primary education can scaffold toward more sophisticated research capabilities in later educational stages.

Furthermore, the integration of digital technology throughout the discussion reflects contemporary educational realities. The authors' treatment of Technology-Based Inquiry Approaches (TBIA), mobile learning frameworks like SMILE, and various digital tools demonstrates awareness of how technology can enhance research-based learning while also acknowledging challenges in implementation, particularly in resource-constrained contexts.

Limitations

Despite its many strengths, the book presents certain limitations that merit consideration. The empirical foundation, while substantial in some areas, remains uneven across chapters.

The high school and undergraduate sections benefit from the authors' direct research experiences at Qatar University, but the primary and middle school discussions rely more heavily on secondary literature synthesis. More original empirical data from these earlier educational stages would strengthen the book's claims about RCTs' effectiveness across the full developmental spectrum.

The contextual specificity of much of the empirical evidence raises questions about generalizability. Many of the studies cited, including the authors' own research programs, were conducted in Qatar – a developed nation with substantial educational resources. The book could benefit from more explicit discussion of how RCT might be adapted for diverse socioeconomic and cultural contexts, particularly in developing nations where resource constraints and different educational traditions may present unique implementation challenges.

Additionally, while the book effectively argues for the benefits of research-based learning, it offers limited critical engagement with potential drawbacks or failures. Implementation challenges are acknowledged, but systematic analysis of cases where RCT-based approaches have been unsuccessful would provide valuable guidance for practitioners seeking to avoid common pitfalls. The discussion of assessment strategies, while present, could be expanded to address how learning outcomes specific to RCT can be reliably measured and evaluated.

Finally, the theoretical positioning of RCT could benefit from deeper engagement with critical pedagogy literature. While the authors situate their work within the tradition of Bandura's social cognitive frameworks, engagement with scholars like Pennycook, Canagarajah, or Freire would provide additional critical perspectives on how research-based learning intersects with issues of power, equity, and access in educational settings.

Scholarly contribution and relevance

Teaching and Learning with Research Cognitive Theory makes a valuable scholarly contribution by providing a cohesive theoretical framework that connects research-based learning to cognitive development across educational levels. The book successfully bridges the gap between academic theorizing and practical application, making it accessible to both researchers and practitioners. Its greatest contribution lies in articulating how structured research environments can systematically cultivate the dispositions and capabilities increasingly demanded by contemporary workplaces and societies.

The book aligns well with current educational priorities, including the development of 21st-century skills and the integration of inquiry-based methodologies into mainstream curricula. For educators grappling with how to foster critical thinking, creativity, and problem-solving in their students, RCT offers a theoretically grounded approach that moves beyond generic recommendations to provide actionable strategies.

The work is particularly relevant for educational policymakers seeking evidence-based frameworks for curriculum reform, teacher educators designing programs that prepare future teachers to implement research-based pedagogies, and researchers interested in the intersection of cognitive development and educational practice. The open-access format, supported by Qatar National Library, further enhances the book's accessibility and potential impact.

Conclusion

Teaching and Learning with Research Cognitive Theory stands as a thoughtful and practically oriented contribution to educational scholarship. Al-Thani and Ahmad have produced a work that successfully articulates a comprehensive framework for understanding how research-based learning environments can foster cognitive development and cultivate essential 21st-century competencies.

Despite certain limitations regarding empirical breadth and contextual generalizability, the book's integrated approach – linking theoretical foundations with practical implementations

across educational levels – ensures its relevance for diverse audiences. As educational systems worldwide continue to grapple with preparing learners for an increasingly complex and rapidly changing world, the Research Cognitive Theory framework offers a valuable lens through which to design and evaluate pedagogical interventions.

This volume will prove essential reading for scholars in educational psychology, curriculum studies, and science education, as well as for educators, curriculum designers, and policymakers committed to transforming educational practices through research-driven methodologies. The book's central message – that curiosity, when systematically nurtured through dynamic research environments, can unlock creativity and problem-solving capabilities – provides both inspiration and guidance for those seeking to enhance teaching and learning in the 21st century.

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Acknowledgments

I would like to convey my deepest gratitude and sincere appreciation to Universitas Ahmad Dahlan and Western Michigan University for their support in facilitating access to this book.