

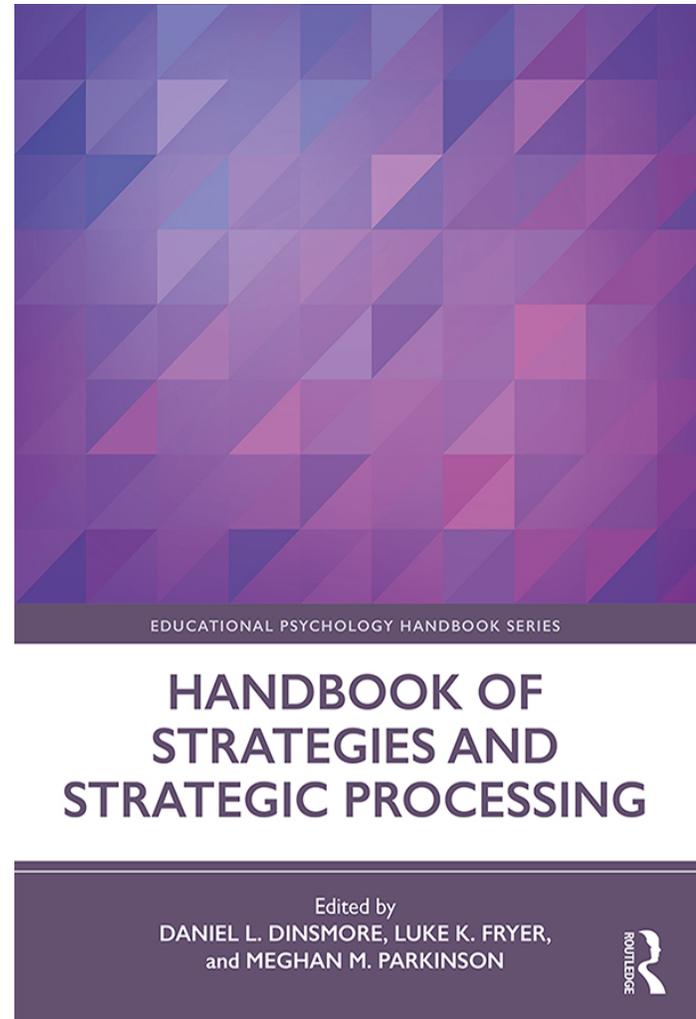
Handbook of Strategies and Strategic Processing

Edited by Daniel L. Dinsmore, Luke K. Fryer, Meghan M. Parkinson

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1. Introduction: What Are Strategies?

Daniel L. Dinsmore, Luke K. Fryer, and Meghan M. Parkinson

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-1>

Section I: Definitions, Forms, and Levels of Strategies

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-101>

2. Strategic Processing within and across Domains of Learning

Denis Dumas

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-2>

3. Level of Strategies and Strategic Processing

Daniel L. Dinsmore and Courtney Hattan

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-3>

4. A Lifespan Developmental Perspective on Strategic Processing

Amélie Rogiers, Emmelien Merchie, Fien De Smedt, Liesje De Backer, and Hilde Van Keer

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-4>

5. Negotiating Meaning and Engagement: Socially Shared Strategic Processing

Deborah L. Butler and Leyton Schnellert

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-5>

6. Commentary: A Conceptual Framework for Defining Strategies and Strategic Processing

Peggy Van Meter and Jacqueline M. Campbell

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-6>

Section II: Strategies in Action

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-102>

7. Reading Comprehension Strategy Instruction

Peter Afflerbach, Matthew Hurt, and Byeong-Young Cho

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-7>

8. Six Questions Regarding Strategy Use When Learning from Multiple Texts

Alexandra List

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-8>

9. Writing Strategies Interventions

Steve Graham, Gerardo Bañales, Silza Ahumada, Karen R. Harris, Pamela Muñoz, Priscila Alvarez, and Karen R. Harris

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-9>

10. Mathematics Strategy Interventions

Kristie Newton

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-10>

11. Science Strategy Interventions

Doug Lombardi and Janelle M. Bailey

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-11>

12. Strategic Processing in History and Historical Strategy Instruction

Susan De La Paz and Jeffery D. Nokes

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-12>

13. Interplay of Strategic Processes, Executive Functions, and Autonomy Support in Students with Individual Differences

Ana Taboada Barber, Kelly B. Cartwright, and Susan Lutz Klauda

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-13>

14. Sharing the Load: A Strategy to Improve Self-regulated Learning

Martine Baars, Lisette Wijnia, Anique de Bruin, and Fred Paas

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-14>

15. Commentary: An Analysis of Learning Strategies in Action

Philip H. Winne

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-15>

Section III: Measuring Strategic Processing

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-103>

16. Surveys and Retrospective Self-reports to Measure Strategies and Strategic Processing

Jan D. Vermunt

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-16>

17. Concurrent and Task-specific Self-reports

Ivar Bråten, Joseph P. Magliano, and Ladislao Salmerón

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-17>

18. Exploring the Utilization of the Big Data Revolution as a Methodology for Exploring Learning Strategy in Educational Environments

Kimberly A. Lawless and Jeremy Riel

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-18>

19. Measuring Processing Strategies: Perspectives for Eye Tracking and fMRI in Multi-method Designs

Leen Catrysse, David Gijbels, and Vincent Donche

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-19>

20. Commentary: Measuring Strategic Processing in Concert: Reflections and Future Directions
David Gijbels and Sofie Loyens

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-20>

Section IV: Analyzing Strategic Processing

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-104>

21. Variable-centered Approaches

Rebekah Freed, Jeffrey A. Greene, and Robert D. Plumley

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-21>

22. Person-centered Approaches to Explaining Students' Cognitive Processing Strategies

Luke K. Fryer and Alex Shum

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-22>

23. Qualitative Approaches to the Verbal Protocol Analysis of Strategic Processing

Byeong-Young Cho, Lindsay Woodward, and Peter Afflerbach

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-23>

24. Commentary: Analyzing Strategic Processing: Pros and Cons of Different Methods

Jennifer G. Cromley

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-24>

25. The Future of Strategy Theory, Research, and Implementation: Roads Less Traveled

Patricia A. Alexander

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-25>

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The purpose of this chapter is two-fold. First, the chapter lays out the rationale for the Handbook and why it is essential given the conceptual, operational, and analytic difficulties associated with strategic processing in the literature. This is especially salient given the entanglement of metacognition, self-regulation, and the self-regulation learning literature with the strategic processing literature. Second, the chapter outlines how each section, and each chapter within a section, serves to help the reader more deeply understand the historical aspects of research on strategies and strategic processing, contemporary research on the topic, and, finally, how research on strategies and strategic processing can progress to help us better understand how they relate to task and problem-solving outcomes.

Section I: Definitions, Forms, and Levels of Strategies

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-101>

2. Strategic Processing within and across Domains of Learning

Denis Dumas

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-2>

Strategies are goal-directed procedures that are planfully or effortfully used to aid in the regulation, execution, or evaluation of a particular problem or task. Put another way, strategies are the processes that students actually do to improve their performance in school. However, the academic and school context is not monolithic, but is instead composed of a number of domains of learning (e.g., history, biology, music). Given the identification of these particular domains, some strategies can be useful across a number of domains (i.e., domain-general strategies) while other strategies are only useful within a single domain (domain-specific strategies). In this chapter, the particular conceptualization of strategic processing, the definition of a domain, and the empirical operationalization of generality are all interrogated in order to examine the distinction between domain-general and domain-specific strategies. Possible complications for this distinction, including the differential automaticity of procedural knowledge across domains, the unlikelihood of strategy transfer across domains, and the way expertise development interacts with domain-generality, are discussed. Throughout the chapter, open questions in strategy research are pointed out, and future directions for improving the field's understanding of strategic processing are posited.

3. Level of Strategies and Strategic Processing

Daniel L. Dinsmore and Courtney Hattan

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-3>

The influence of levels of processing on performance has seen increasing attention in the research literature over the past few decades. Although there are theories that certain types of processing or strategies should lead to better performance, such as deeper-level processing over surface-level processing, this is not always the case. Instead, there may be environmental or

individual differences which lead to changes in the efficacy of specific strategies (whether surface or deep level) for specific purposes. This chapter employs a review of reviews to provide a roadmap to how levels of processing have been considered in past research as well as the current scholarship on the topic. Evidence from the reviews indicates that the relation between levels of processing and performance is not simple and is not direct. Many other individual and contextual factors, as well as facets of the strategies themselves, play an important role in whether certain types and levels of strategies help performance.

4. A Lifespan Developmental Perspective on Strategic Processing

Amélie Rogiers, Emmelien Merchie, Fien De Smedt, Liesje De Backer, and Hilde Van Keer

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-4>

From a developmental perspective, learning is conceptualized as a process wherein change unfolds through different stages (i.e., acclimation, competence, and proficiency). The purpose of this chapter is to elaborate on a developmental orientation of strategic processing. Accordingly, we present an overarching framework on strategic processing that encompasses changes in learners' strategy use across the lifespan. This framework is multi-staged in nature and illuminates essential characteristics throughout distinct stages for diverse individuals who are learning in markedly different contexts. Derived from this developmental framework, implications for practice are put forward.

5. Negotiating Meaning and Engagement: Socially Shared Strategic Processing

Deborah L. Butler and Leyton Schnellert

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-5>

This chapter explores how strategic processing occurs in situations where learning is socially shared. The authors present a framework for studying strategic processing as socially and culturally situated, identify productive principles and practices for supporting social forms of strategic processing, and, with a particular focus on collaborative activities, suggest ways in which teachers can facilitate quality strategic processing in their students.

6. Commentary: A Conceptual Framework for Defining Strategies and Strategic Processing

Peggy Van Meter and Jacqueline M. Campbell

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-6>

The goal of this section of the Handbook is to forward a definition and conceptualization of strategies and strategic processing that can shed light on the past as well as illuminate a path to the future. In this commentary chapter, we argue that this effort to define and clarify these constructs is necessary. Definitions are necessary because of their role in scientific communication. Strategies and strategic processing are particularly worthy of this effort because students' strategic processing is both proximal to learning outcomes and amenable to instruction. We present definitions of both strategies and strategic processing that are based on a synthesis of the chapters on which this commentary is based as well as the educational research literature as a whole. Critical features of these definitions are discussed to develop a conceptual frame for understanding strategies and strategic processing.

Section II: Strategies in Action

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-102>

7. Reading Comprehension Strategy Instruction

Peter Afflerbach, Matthew Hurt, and Byeong-Young Cho

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-7>

This chapter focuses on reading comprehension strategies instruction. We begin the chapter by noting that a lack of consistency in conceptualizing strategies poses immediate challenges to effective instruction. Then, we provide an overview of the evolution of reading comprehension strategy research and related instruction research, especially in relation to theoretical models of reading. We next consider contemporary concerns with strategy instruction, in conjunction with the pressing need for students' enhanced reading comprehension strategies. We propose that instruction that focuses on students' reading comprehension strategies (a form of procedural knowledge) must be supported by related declarative knowledge, conditional knowledge, epistemic knowledge and disciplinary knowledge. We conclude the chapter with ideas about future directions for both reading comprehension strategy research and instruction.

8. Six Questions Regarding Strategy Use When Learning from Multiple Texts

Alexandra List

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-8>

This chapter is focused on strategic processing when students learn from multiple texts and from (multiple) multimedia representations. In this chapter I have three goals. First, I integrate two strategy frameworks to conceptualize strategy functions (i.e., aims) and referents (i.e., foci) during multiple text use. Second, I posit what I consider to be essential questions when thinking about strategy use during learning from multiple texts. In particular, I suggest that prior work has focused on what strategies students use during multiple text use. In this chapter, I argue that the where, when, who, why, and how of strategy use ought to be considered as well. Third, I consider work in the areas of learning from multiple texts and from multiple multimedia representations that begins to address each of these focal questions and suggest directions for future work.

9. Writing Strategies Interventions

Steve Graham, Gerardo Bañales, Silza Ahumada, Karen R. Harris, Pamela Muñoz, Prisila Alvarez, and Karen R. Harris

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-9>

This chapter makes the case that strategic processing is an integral part of the writing process. Since writing is complex and multifaceted, these strategies are necessary to guide the writer within the context of writing communities. The role of strategies is overviewed in light of other important factors (e.g., declarative knowledge), and interventions are evaluated in terms of their effectiveness to scaffold these writing strategies. The chapter concludes with suggestions for both future research as well as practice that teachers can implement in their classrooms.

10. Mathematics Strategy Interventions

Kristie Newton

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-10>

Fractions and algebra represent important gatekeepers to higher level mathematics. In this chapter I overview some common incorrect strategies for these topics and recommended interventions. I also overview interventions to support the flexible use of strategies for solving these problems. Evidence-based recommendations to support learning of fractions and algebra

include interventions that highlight the meaning of the symbols and procedures. Representations such as the number line, manipulatives, and word problems can help foster understanding and help students notice important features. Other recommendations include using worked examples, comparing, varying the format of the problems, and asking students to solve problems in more than one way. Future directions are discussed.

11. Science Strategy Interventions

Doug Lombardi and Janelle M. Bailey

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-11>

Strategies and strategic processing within science education are designed to help students learn not only what scientists have come to understand about the world but also how they learn it. Although many domain-general strategies can be implemented in science classrooms, some strategies are either specific to science or are encouraged within science. Historically, concept development and conceptual change approaches and empirical investigations dominated science's strategies and strategic processing. More recently, argumentation, science as modeling, and the incorporation of socio-scientific topics dominate the strategies and strategic processing within science teaching and learning. Challenges to more widespread use of these approaches include lack of teacher experience and pedagogical knowledge around the strategies, as well as time and curricular limitations. Teacher education and professional development programs should seek to explicitly implement contemporary science strategy interventions to improve upon their use in K-12 classrooms and other learning environments. Doing so effectively will require well-researched and validated instructional scaffolds to facilitate the teaching and use of contemporary science learning strategies.

12. Strategic Processing in History and Historical Strategy Instruction

Susan De La Paz and Jeffery D. Nokes

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-12>

Regardless of the particular field, historians use strategic processes as they work with evidence. Such cognitive strategies occur automatically during reading, thinking, speaking, and writing; not surprisingly, they involve metacognitive functions. Such thinking is linked to experts' understanding of history, giving rise to the concept of disciplinary reasoning. It is this understanding that allows historians to generate interpretations and knowledge claims about the past. In contrast, novices' processing shows obvious differences that reflect a lack of experience as well as general naiveté about the discipline itself. There has been much educational research on classroom interventions that have addressed these challenges—and these efforts have demonstrated notable successes in terms of scaffolding more sophisticated reasoning among novices. However, the remaining issues and limitations point to opportunities for future work. We suggest researchers attend to new topics and lines of inquiry, for example, civic engagement.

13. Interplay of Strategic Processes, Executive Functions, and Autonomy Support in Students with Individual Differences

Ana Taboada Barber, Kelly B. Cartwright, and Susan Lutz Klauda

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-13>

In this chapter, we integrate theory and empirical findings on the development of strategic processes and executive functions and the provision of autonomy support to foster these skills in relation to children's reading comprehension development. From an individual differences

perspective, we consider how the interplay of these constructs may influence academic performance among English Learners and students with specific reading comprehension deficits. We provide a historical overview of the study of reading comprehension strategies and executive functions, as well as examine current work and its limitations. We spotlight training in the reading comprehension strategy of inference making, delineating how use of this strategy may benefit the development of executive function skills. Finally, with respect to future research directions, we focus on the potential key role of students' autonomy support in facilitating self-regulated use of strategic processes and thereby strengthening executive functions.

14. Sharing the Load: A Strategy to Improve Self-regulated Learning

Martine Baars, Lisette Wijnia, Anique de Bruin, and Fred Paas

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-14>

In order to support learners with their learning processes, using effective strategies is important. Students are expected to monitor and regulate their own learning to a great extent, especially when learning takes place in digital learning environments. However, students tend to overestimate their own performance, which is problematic for decisions on their future learning, especially with complex problem-solving tasks that impose a high cognitive load. Using collaborative learning as a strategy to divide the demands of learning, learners can create a collective cognitive capacity. Supporting the use of shared regulation of learning, collective working memory, and team cognition as strategies for learning, could theoretically improve self-regulated learning skills such as monitoring and regulation both at the individual and the group level. From this discussion, possible future research questions on how collaborative learning could be a strategy to support SRL will be suggested.

15. Commentary: An Analysis of Learning Strategies in Action

Philip H. Winne

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-15>

There can be no doubt about significant interest in learning strategies when a Google search for the literal string “learning strategies” returns approximately 7,830,000 results (2019 July 11, 13:45). Given that result, an astonishing finding is the relatively small volume of research about such a popular topic. Searching PsychINFO for academic journal articles with titles containing “learning” and either “strategies” or “strategy” yielded a considerably smaller set of just 1896 items (2019 July 11, 13:44). I speculate there may be much conjecture, hearsay, and even some misinformation about learning strategies populating the Internet. Educational practitioners and scholars can be thankful for chapters in this section of the Handbook that plumb research work on learning strategies.

Section III: Measuring Strategic Processing

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-103>

16. Surveys and Retrospective Self-reports to Measure Strategies and Strategic Processing

Jan D. Vermunt

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-16>

This chapter is about surveys and retrospective reports as measurement tools for learning strategies and strategic processing. It starts with an historical overview of the first generation of surveys and self-report inventories in the area of student learning strategies from the early 1970s

onward. The emergence of research on metacognition in the mid-1980s gave rise to the development of a second generation of student learning strategy instruments, broader in nature and including metacognition as a central concept. Two widely used instruments will be discussed. The chapter continues with very recent developments in this area, characterized by new instruments, new measurement and analytical techniques, and inclusion of new populations and contexts including teachers' learning. This is followed by a critical discussion of the domains of applicability and limitations of inventories and questionnaires on learning strategies. The chapter closes with a discussion of future directions for research and implications for practice.

17. Concurrent and Task-specific Self-reports

Ivar Bråten, Joseph P. Magliano, and Ladislao Salmerón

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-17>

This chapter first presents theoretical models developed within educational psychology that highlight the important role of strategic processing. In particular, it discusses how strategic processing has been measured within these models. Based on a general definition of self-reports as utterances or answers to prompts or questions provided by individuals about their cognitions and actions during learning, comprehension, or problem solving, it then focuses on four different ways to assess strategic processing by means of self-reports. These are verbal protocol analysis, eye movement cued self-reports, task-specific self-report inventories, and diary methods. Each of these self-report methodologies is described, explained, illustrated, and problematized in the chapter, with particular attention to whether they produce results that can be trusted (i.e., validity issues). Finally, some issues regarding these methodologies that need to be addressed in future research are highlighted.

18. Exploring the Utilization of the Big Data Revolution as a Methodology for Exploring Learning Strategy in Educational Environments

Kimberly A. Lawless and Jeremy Riel

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-18>

Powered by the ubiquity of internet applications and the relative ease of collecting countless data points, Big Data approaches afford both industries and consumers with the ability to track patterns of how people use applications and predict the actions that users will take in those applications. Although industry has widely adopted multiple data analysis and prediction techniques under the Big Data, such approaches have not yet been widely implemented in educational applications. This chapter examines the latest trends related to Big Data analysis in various industries, including aspects of data collection, analysis, and prediction. A review of educational applications is provided, as well as the critical implications that big data approaches have for students, educators, and social equity. In short, this chapter seeks to heighten awareness of the potential affordances of Big Data for education to better understand and support learning strategy research and pedagogy as the field moves forward.

19. Measuring Processing Strategies: Perspectives for Eye Tracking and fMRI in Multi-method Designs

Leen Catrysse, David Gijbels, and Vincent Donche

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-19>

Up to now, empirical research on students' processing strategies in higher education has mainly focused on using self-report measures at a more general level (at the course level or at the level of several different courses). However, researchers in the field agree on the variability of processing strategies over learning tasks, but most empirical research is conducted at a more general level, thus ignoring this variability at the task level. More recently, with the advent of new psychophysiological measures, such as eye-tracking and functional magnetic resonance imaging (fMRI), there is a renewed interest in examining the task-specific processing strategies during a learning task. In this chapter, we will give an overview on how eye tracking and fMRI can be used in order to examine students' processing strategies in relation to learning from verbal material (i.e., words, paragraphs and texts).

20. Commentary: Measuring Strategic Processing in Concert: Reflections and Future Directions
David Gijbels and Sofie Loyens

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-20>

In this chapter we discuss each of the chapters and measurement approaches that have been reported in the section on measuring strategic processing in this volume and will provide the reader with suggestions for using these measurement techniques in concert in future research. Retrospective and concurrent self-report instruments, eye-tracking, functional magnetic resonance imaging and the use of Big Data to measure strategic processing are discussed along with issues in the triangulation of theories, methods, and data. We end our chapter with a call to combine data-driven and theory-driven approaches to give meaning to the wealth of data that result from the available measurements of strategic processing.

Section IV: Analyzing Strategic Processing

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-104>

21. Variable-centered Approaches

Rebekah Freed, Jeffrey A. Greene, and Robert D. Plumley

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-21>

Proficiency in strategic processing is beneficial for accomplishing tasks in a variety of domains. It has been linked to achievement outcomes across the lifespan, though effective strategic processing varies across learning tasks and contexts. Given this, research methods that are capable of capturing dynamic strategic processing are helpful, though they can produce a lot of data that can be challenging to analyze. These data may be analyzed using variable-centered approaches, depending on the nature of the data and research aims. In this chapter, first we outline the differences between variable-centered and person-centered analyses in the study of strategy use and strategic processing. Then we outline different kinds of variable-centered analyses that can be employed to understand and represent these data. We conclude with a summary of observations about the use of variable-centered analysis in the extant literature, as well as practical implications and future directions.

22. Person-centered Approaches to Explaining Students' Cognitive Processing Strategies

Luke K. Fryer and Alex Shum

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-22>

This chapter presents a growing niche within the research on strategic processing – person-centered approaches to quantitative data analysis. First, person-centered approaches are situated

within the strategic processing literature. Second, the chapter overviews person-centered approaches in its current state in the field. And, finally, the chapter makes the case that person-centered approaches can – and should – play a more central role in investigations of strategic processing.

23. Qualitative Approaches to the Verbal Protocol Analysis of Strategic Processing

Byeong-Young Cho, Lindsay Woodward, and Peter Afflerbach

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-23>

In this chapter, we examine qualitative approaches to verbal protocol analysis and their role in constructing detailed accounts of strategic processing. To that end, we draw from diverse studies in the area of reading in which qualitative protocol data is extensively used to catalog and describe the readers' strategies engaged with a variety of texts, tasks, and goals. We argue for the importance of investigating strategic processing in reading, examine the scientific merits of qualitative verbal protocol analysis in examining such strategic processing, and discuss critical issues in the qualitative analysis of verbal protocol data and suggest possible means of addressing the issues to undertake rigorous analyses of strategic processing.

24. Commentary: Analyzing Strategic Processing: Pros and Cons of Different Methods

Jennifer G. Cromley

<https://www.taylorfrancis.com/books/9780429423635/chapters/10.4324/9780429423635-24>

This commentary on the previous data analysis chapters lays out a number of considerations for the data analyst, beginning with the research questions to be answered. These chapters focus on traditional variable-centered analyses (e.g., ANOVA, regression), person-centered analyses—looking for subgroups of participants with similar scores on a number of variables—and qualitative analyses of think-aloud protocols and other data about the learning process. Options are summarized with the pros and cons of each, depending on results of screening for statistical assumptions, sample size, data reduction (e.g., calculating factor scores), and some measurement considerations including whether multiple measures of construct(s) are gathered. Specific assumptions, sample size, and measurement needs for different tests are noted, as are approaches that may involve less stereotyping of demographic groups. Where the data analyst has more than one option for analysis, the choice that gives the most statistical power is noted.

25. The Future of Strategy Theory, Research, and Implementation: Roads Less Traveled

Patricia A. Alexander

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Since the 1970s, my academic life has been intricately intertwined with strategies—text-processing, cognitive, metacognitive, problem-solving, learning strategies, and more. I was drawn to strategy research because I saw these intentional, effortful, and planful processes as a part of the answer to the question that brought me to graduate school in the first place: How can I help students who struggle to learn, especially when learning requires them to make sense of written language? By serendipity, I became intrigued by this question at a time when certain forces aligned. The Center for the Study of Reading led by Richard Anderson was in its heyday (Anderson, Reynolds, Schallert, & Goetz, 1977), John Flavell (1979, 1987) and Ellen Markman (1977) were unfolding their theory and empirical work on metacognition, and Ruth Garner (1987), my advisor, was a young, brilliant Assistant Professor at the University of Maryland exploring the boundaries between cognitive and metacognitive strategies. When I completed my

PhD and headed to Texas A&M, more elements fell into place. I began to collaborate with Claire Ellen Weinstein (Weinstein, Goetz, & Alexander, 1988), a key player in learning and study strategies, along with colleagues like Diane Schallert and Ernest Goetz (Schallert, Alexander, & Goetz, 1988), who were alumnae of the Center for the Study of Reading. In a matter of a few short years, I was set on a path that I hoped would lead to deeper understanding about the very nature of strategies and the component processes they entailed—a path I continue to follow today.