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Zimmerman, Barry J. & Schunk, Dale H. (2011) *Handbook of Self-Regulation of Learning and Performance.* NY: Routledge.

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Reviewed by Susan Farber
Cincinnati Children's Hospital Medical Center

The concept of self-regulation of learning (SRL) and performance has been the focus of Barry Zimmerman's and Dale Schunk's research since the 1980s. Their research work emanates from educational psychology and has resonance for practitioners, to provide a theoretical support for designing instruction so students experience academic and personal success as learners. Zimmerman and Schunk invited their fellow researchers to contribute chapters to this handbook, the sixth volume in this series. Volume I appeared in 1989 and introduces the theoretical perspectives, which support the decision to embed self-regulation strategies within academic instructional activities. The chapters in volume II (1994) focus on the conceptual framework of self-regulation learning, providing added foundation to integrate these theories

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within instructional planning and implementation. The chapters of volume III (1998) share examples of detailed application of SRL strategies in classrooms and other educational venues. The chapters of volume IV (2000) extend our grasp of theoretical perspectives of SRL as this field of study matures. The chapters of volume V (2007) focus on the relationship between the motivational process and instructional design. Please note that some of these volumes have been updated and republished as second or third editions during the past decade. As a series, these handbooks can contribute to additional evidence and rationales for how instruction is designed to meet students' needs and encourage their personal and academic success.

Besides reading the chapters of earlier volumes of the handbook, researchers and practitioners can read issue 4 of volume 11 of *Contemporary Educational Psychology,* published in October 1986. Its six articles provide explanations of the concept of SRL. Additionally, Zimmerman (1990) provides definitions, traits and behaviors for educators and researchers seeking to understand how to help students and adults increase their use of these strategies to enhance their learning and performance. During the past 25 years, the ongoing investigation of these strategies and their resulting impact on academic and social development is documented in the preceding five volumes of the Handbook and various journal articles. Chapter authors in the 2011 Handbook volume are investigating the impact of SRL strategies and its relationship to academic and personal performance in the United States, Canada, Europe, Asia and Australia.

The contents of volume VI are presented in five sections. After sharing the background and historical overview of SRL, this review will present each of the five sections, so readers gain a sense of the components and aspects of SRL, as it is examined and distilled from related behaviors/activities, and, in some cases, its impact on academic and personal performance. Note: The copy reviewed here was missing chapters 17 and 18 and thus these comments refer to the rest of the book.

Background and Historical Overview

The formulation of self-regulation learning strategies (SRL) emanated from discussions during an American Educational Research Association symposium in 1986. Four research topics and their findings were integrated to define the scope of research investigating SRL:

- The identified need (and potential benefit) to guide students to activate meta-cognitive processes and strategies (Brown, Bransford, Ferrara and Campione, 1983)
- Social and motivational SRL (Bandura & Schunk, 1981) where self-judgment impacts beliefs of self and self-reactions (self-efficacy)
- Several studies between 1972 and 1977 investigated self-control, behavioral or cognitive-behavioral processes, specifically the research of Thoresen & Mahoney (1974) on antecedent-consequence-covert reaction
- Developmental issues emanating from Vygotsky's work on the socio-cultural basis of language development and self-verbalization training, leading to scaffolding, withdrawal of scaffolding, and delay of gratification (Gallimore & Tharp, 1990)

These discussions contribute to the definition of SRL, as Zimmerman (1986) pinpoints the degree to which students are meta-cognitively, motivationally and behaviorally active participants in their own learning. SRL is a process where individuals create self-oriented feedback loops to monitor their effectiveness in completing a task and adapt accordingly to experience success. SRL is viewed within the context of social interactions, as the process is ideally supported when students are interacting with peers, teachers and coaches.

The chapters in this handbook provide an overview of the author(s)' review of the research literature and perspective on the theoretical model or framework supporting an analysis of SRL strategies exhibited or described by learners (grade school through higher education). In some chapters, concerns about weaknesses in the literature or in study designs are shared. All chapters conclude with recommendations for future research in order to advance

this relatively young field of educational psychology, which has impact on instructional practices.

Part I: Basic Domains of Self-Regulation Learning and Performance

The four chapters of this section provide a foundation for understanding the varied aspects of SRL, an explanation of meta-cognitive strategies and the benefits for individuals to have opportunities to develop these strategies over time. A social cognitive model of SRL indicates that there are three phases of self-regulation: (1) forethought and planning; (2) performance monitoring; and (3) reflection on performance. Many of the chapters of the handbook present varying applications of this social cognitive model, enhanced by descriptions of integrated motivational variables with meta-cognitive processes, and analyses of findings of SRL research. Winne (2001) proposes an alternative model of SRL where individuals engage in four phases (sequentially and recursively): (1) defining the task; (2) setting goals and plans for completing the task; (3) engaging in the task; and (4) evaluating and adapting the task for future situations (also identified by Salomon and Perkins as *forward reaching transfer*, 1989). The research in this handbook is predicated on individuals engaging in phases (a sequential process) of SRL strategies as they complete discrete tasks to learn something new or perform a task in the workplace.

In chapter 2, Winne explains the challenge in identifying and describing meta-cognitive functioning and monitoring to complete tasks. Despite these challenges, Winne intends that our increased understanding of meta-cognitive functions and SRL strategies can inform future research designs. In chapter 3, Wigfield, Klauda, and Cambria review the literature on the development of SRL strategies, based on the three phases of self-regulation to highlight the role of four factors (cognitive, behavioral, affective, motivational) and an individual's biological capacity to perform tasks (due to maturity and one's gradual acquisition of knowledge, strategies and expertise). They underscore the impact of variance in classroom contexts on successful completion of task-defined activities across achievement domains. They cite research investigating how younger learners develop SRL strategies, as they receive feedback during the various phases when SRL

strategies are applied. In chapter 4, Zimmerman focuses on motivational sources supporting the application of SRL strategies to perform specific tasks, to enhance our understanding of underachievement. This chapter shares research that supports the cyclical 3-phase model of SRL and how addressing student motivation through structuring activities in suggested ways can alter student performance. Discussion of this area of research pinpoints discrete aspects of motivational behaviors, providing educators implications of how to refine instructional activities to reduce underachievement. In chapter 5, researchers from Canada and Finland focus on the role of social interaction and the milieu in guiding students to develop and apply SRL strategies. Hadwin, Järvelä, and Miller share findings from others' studies, which reveal the degree to which students engage in behaviors to co-regulate or socially share their efforts to perform tasks and gradually integrate SRL strategies. The power of diverse relationships (student-defined and established) create "distributed regulation of each other's learning in the context of collaborative work" (p.74). As readers continue to delve into SRL strategies, their benefit and complexities become more obvious, while the need for further investigation (to extend prior research or to respond to unanswered questions) is noted.

Part II: Instructional Issues of Self-Regulation of Learning and Performance

The four chapters of this section of the handbook provide a discussion of research investigating varying methods so students apply SRL strategies. The researchers represented in this section provide brief descriptions of how SRL strategies are integrated within common learning tasks (homework completion, mentorships, completion of digital learning activities and classroom interactions/activities). In chapter 6, researchers from Germany document how students' capacity to complete homework was impacted when five training modules were integrated within classroom activities. At the outset of this 2-year qualitative study, 32 participating teachers engage in lessons on meta-cognitive and self-regulatory behaviors as they received supports to develop and implement activities so students would gradually develop these SRL strategies as they complete homework tasks. The chapter authors include an evaluation of the training

modules and the impact of these modules on students' cognitive abilities and motivation. The authors of chapter 7 provide readers with a synthesis of research where hypermedia is used to assess students' use of SRL strategies. In particular, this chapter includes the findings from a National Science Foundation funded project where students use a hypermedia-learning environment (MetaTutor) as a pedagogical agent so students' use of embedded SRL strategies can be tracked and analyzed. By using a developmental process to iteratively evaluate the design of MetaTutor, the researchers uncover the degree to which specific SRL strategies were employed, the frequency and fluctuation of strategies' use. Pages 110-112 contain graphic results (aligned with specific SRL strategies of interest) of how low performers' outcomes compared with high performers' outcomes. In chapter 8, Canadian researchers, Perry and Rahim, examine how tasks, instructional practices and interpersonal relationships are interrelated with elementary students' level of engagement, when teachers are guiding students in the application of SRL strategies, as described in the literature. Perry and Rahim pinpoint several specific aspects to consider when designing studies on SRL strategies and potential research questions for future investigations. In chapter 9, Mullen shares her review of the literature of the impact of SRL strategies on doctoral students as recipients of a variety of models of mentorships. Mullen perceives that the modeling and embedding of SRL strategies during doctoral studies (by effective mentors) can address the changes within universities and support doctoral students in their completion of professional and personal goals. The contents of these four chapters reveal the extent to which embedding SRL strategies within instructional activities (and their supportive contextual features) can positively impact students' academic success and personal success.

Part III: Self-Regulation of Learning in Specific Content Areas

The six chapters in this section of the handbook focus on studies where self-regulatory principles support instruction in mathematics, reading, writing, science, athleticism, and music. Four of these six chapters describe the development and rationale for models designed to promote content area skill development through application of SRL

strategies. Earlier studies, discussed in chapter 10, (of how students, who apply SRL strategies as they complete activities, apply mathematical reasoning) provoke additional research questions. The American and European studies included in this chapter reveal that students "do not attain and master appropriate and efficient self-regulatory skills to a sufficient degree" (p. 162) and how this outcome informs students' beliefs and motivation concerning mathematical reasoning. A concern for creating meaningful activities for implementation within a nurturing environment, so students develop and use SRL strategies efficiently and appropriately, led the authors to promote a model for designing such learning environments, the CLIA Model (Competence, Learning, Intervention, Assessment Model). DeCorte, Verschafel, & Masui (2004) encourage teachers to use the CLIA Model, so students are inclined to actively develop mathematical reasoning, as this approach will integrate the cognitive, affective and conative components of learning.

Chapter 11 describes the multiple cycles of development and testing of the Concept-Oriented Reading Instruction Model (CORI). Guthrie, Wigfield, and Perencevich (2004) developed this model to nurture the assimilation of SRL strategies as students read trade books to become 'self-regulated readers' who can identify and fix misconceptions. They share a chart delineating the connections between self-regulated phases and components of the CORI Model on page 176 of this chapter. Despite the admitted challenge to document the fuzzy aspects of cognitive and motivational constructs, Guthrie, et. al., reveal the need for further investigation of the effects of the CORI Model on varied populations, specifically minority populations. Chapter 12 discusses the relationship between each step of using SRL strategies and specific aspects of the writing process, as scaffolded strategies are introduced and then gradually removed during instruction. Graham and MacArthur (1988) introduce the Self-Regulated Strategy Development (SRSD) method so students with identified disabilities can experience success as writers. Harris, Graham, MacArthur, Reid and Mason describe more recent developments and review other related models, which contribute to the evolving design of SRSD and its implementation as an intervention. They promote the need for further research of models which support students as

they develop writing acumen to include other competencies and skills to become skillful writers. Chapter 13 focuses on the role of SRL strategies so students develop inquiry and problem solving skills to complete critical tasks in science. Sinatra and Taasoobshirazi share ongoing investigation and implementation of the Cognitive Reconstruction of Knowledge Models (CRKM) (Dole & Sinatra, 1998) to document the continuum of cognitive engagement and SRL strategies so students "engage in self-regulatory intentional reconstruction of knowledge" (p. 211). Sinatra and Taasoobshirazi conclude the chapter by noting the need for students to develop "self-regulatory intentional reconstruction of knowledge" as it is one aspect of highly desirable 21st Century skills.

SRL strategies are useful in other areas of performance, as discussed in chapters 14 and 15. Chapter 14 focuses on the role of self-directed and systematic practice so individuals develop their motor skills for athletic competition. Research in the U.S. and the U. K. is reviewed to demonstrate how many of the SRL strategies are employed by athletes to impact their beliefs, definition of goals, motivation, and evaluation of their athletic performance. Kitstantas and Kavussanu point out how an analysis of the four sequential levels (observation, emulation, independent practice and self-regulation causing skills to become automatic) can help researchers distinguish between athletic experts, non-experts and novices. Chapter 15 focuses on musical skill development based on a longitudinal study of 157 musicians over 14 years. Citing McPherson and Zimmerman (2002), the "mastery of musical skills occurs most efficiently" (p. 235) when the musician, through scaffolding and within a social setting, develops a self-initiated capacity to monitor and control a performance. In addition, McPherson and Renwick (chapter authors) analyze prior research on the relationship between successful musical performance and invoking SRL strategies (through self-reflection, interviews and self-reported data) to reveal a cyclical process that values self-instruction to monitor and control concentration and the development of mental blueprints. These two chapters, which focus on athletic and musical skill development, reinforce the role of SRL strategies in developing expertise and successful performance, to benefit the entire individual, not just the areas of study

within formal schooling (often the focus of educational research), emphasized in chapters 10 - 13.

Part IV: Methodological Issues in Assessing Self-Regulation of Learning

Part IV contains nine chapters. Please recall that the review copy I received did not include chapters 17 and 18 of this section of the handbook. These two chapters (Methodological and Assessment Issues in Research on Help Seeking and Assessing Self-Efficacy for Self-Regulated Learning) did not appear and were not reviewed.

The other seven chapters were read and presented a review of the recent research that clarified the process, strengths and shortcomings of specific ways to collect and analyze the data on how SRL strategies are studied in formal and informal educational settings.

Much of the research design in the collection and analysis of data concerning SRL strategies tends to be defined by qualitative or quantitative data analysis. Much of this section of the handbook provides us descriptions of how researchers are using newly developed approaches or measurement instruments, such as think aloud protocols, meta-analyses, diary measures, in-depth case studies, microanalysis, data-mining and analyses, exploratory factor analyses, and protocol analysis to describe and pinpoint factors which help us describe or quantify the impact of SRL on individual learning and performance. While many of these chapters include references to assessment approaches developed in the past ten to twenty-five years, there are lessons to be learned from these findings that can inform future research in educational settings.

Chapter 16 shares the findings when German college students complete diary entries to record information for a cyclical, dynamic study of self-regulation. In this study, diaries are a vehicle to collect self-report data to "measure daily events over a certain period of time" (p. 252), and to foster meta-cognitive monitoring processes. Dividing the collection of subjective reactions and objective observations into pre-action and post-action phases, the reliability of the collected data is calculated using split-

half reliability. As diary entries are grounded within the context of the educational setting, Schmitz, Klug and Schmidt (chapter authors) report that this approach has high ecological validity, and that the "data of one person across various occasions can identify occasions that lead to changes in performance" (p. 256). Additionally, time series analyses and simple linear regressions are calculated to create a graphic representation of the patterns or trends of change in SRL strategy use. Schmitz, Klug and Schmidt share four advantages and five limitations of this approach for studying SRL strategies, while suggesting the inclusion of observation, archival and physiological measures, as Fahrenberg, Myrtek, Pawlik and Perrez (2007) advocate.

A discussion of methods used and related assessment instruments' (to measure self-regulation of motivation) strengths, weaknesses and implications is the focus of chapter 19. As noted in the research of SRL strategies' overlapping connection to motivation since 1995, there is a need to distinguish between motivation and the self-regulation of motivation through distilling students' deliberative thoughts and actions as they engage in planning, monitoring and reflecting upon their learning and performance. Wolters, Benzon, and Arroyo-Giner (chapter authors) evaluate five assessment methods and summarize their thoughts within a chart on page 303. Like other researchers in this field, the need to teach students these strategies is highly encouraged, as well as providing students to exchange feedback or peer model these SRL-motivational strategies. Acknowledging these challenges, Wolters, Benzon, and Arroyo-Giner, conclude that the methods for assessing motivational regulations require refinement, as well as increased consistency to provide reliable and valid measurements.

The need to capture self-regulatory strategies in use and to provide opportunities to model and critique is echoed by the authors of chapter 20. Greene, Robertson, and Croker Costa review the literature of studies where think aloud protocols were used to document the actual process as well as the contextual factors where students apply SRL strategies to support meta-cognitive thinking. They cited Ericsson and Simon (1993) and Eveland and Dunwoody (2000) as two sources for useful techniques to elicit, capture and analyze verbalizations. Researchers have to become skillful at discerning when comments express

cognitive processing (undesirable) from comments that vocalize conscious verbal information and explicate cognitive processing (highly desirable). The need to carefully construct a research environment, supporting the use of these strategies, (so students have opportunities to practice and effectively use the technique of think aloud protocols) is emphasized.

In chapter 21, Cleary defines micro-analytic assessment as a "highly specific, fine-grained form of measurement that targets behaviors or processes as they occur in real time across authentic contexts" often used to "directly observe overt micro-level behaviors during authentic interactions" (p. 330). They sought to apply micro-analysis to evaluate, through systematic observation, the cyclical process and to balance the distortions that may exist in self-reported data (such as think aloud protocols, diary entries, surveys, etc.). While microanalysis supports data-based decision making and may measure the efficacy of an intervention, Cleary emphasizes the need to ascertain the psychometric properties of micro-analysis and raises the concern if these "protocols are able to predict or account for the unique variance in students' academic behaviors and outcomes" (p. 342).

In chapter 22, Butler provides an explanation of how case study methodology aligns with the examination of dynamic SRL strategies, as SRL shapes and is shaped by the context in which students use these strategies. Citing Stake's (2006) design of iterative cycles of data collection and progressively focusing or fine-tuning interpretation of these data, Butler suggests that in-depth case studies can identify converging lines of evidence to (1) investigate the relationship of individual agency and social influence as people learn; (2) develop, test and extend theory through deductive, inductive and abductive reasoning; (3) dovetail particularistic and generalizing analyses; (4) understand the complexity of dynamic, causal relationships among variables or contextual factors; and (5) bridge the research and practice divide so researchers communicate meaningful findings to practitioners.

In Chapter 23, Corno discusses the use of four assessment methods to identify the routines or habits of students (related to education or schooling) where SRL strategies are invoked "with little conscious deliberation" and

reflects "purposive striving" (p. 361) that rises beyond motivation. Corno explains that self-regulation requires an individual to be motivated (define and pursue a goal) and to intentionally strive to attain the goal despite difficulties, distractions, setbacks or challenges (volition). Corno's and others' studies are investigating another aspect of SRL that other researchers have not explored in this handbook. Discussing prior research, Corno explains these four assessment methods: (1) exploratory factor analyses of observed data collected during class observations; (2) analyses of open-ended interviews and observations of homework management techniques; (3) use of an online or digitally embedded performance-based measure (nStudy) to track college students' decisions as strategic online learners; and (4) analyses of mined data to ascertain if "responsible follow through" during high school can be an effective predictor of success in college. Corno notes the findings from Randi's (2009) study comparing/contrasting public and private school students' use of SRL strategies due to differences in school settings that can promote or limit exposure to SRL strategies (i. e., capacity to notate textbooks, peer/coach interactions during extra-curricular events). Besides providing experiences to develop and apply SRL strategies, educators are to become increasingly mindful of the role of volition in guiding students to become mindful, self-corrective, goal-focused and reflective upon the quality of their learning experiences and outcomes.

In chapter 24, Dignath van Ewijk shares her analyses of the findings from recently completed meta-analyses of studies investigating students' acquisition of self-regulated learning skills. She promotes the use of meta-analysis of studies of SRL strategies in order to: (1) note the features and methods of these studies; (2) ascertain the impact of these studies or evaluations (of SRL strategies); (3) distill new research designs for future studies; (4) detect population effects while potentially reducing the calculated standard error of averaged effect sizes; and (5) measure the validity and power of the evidence collected in prior studies. Dignath notes the three main problems associated with poorly designed meta-analyses and shares some recommendations: (1) increase sample size; (2) include other evidence of factors contributing to desirable outcomes to flesh out the relationship between variables under investigation; and (3) synthesize on a smaller scale

the experimental, in-depth research of SRL strategy acquisition.

Part V: Individual and Group Differences in Self-Regulated Learning

The four chapters in this section of the handbook share analyses of the findings of selected studies, which examine specific traits of students or the context that can impact student acquisition and application of SRL strategies. The authors of chapter 25 selected 77 studies for inclusion in their analyses. The literature reveals an underlying premise that the domain of instruction could impact the research questions and design investigating students' application of SRL strategies. The tabled data of these analyses can be reviewed at: http://education.umd.edu?EDHD/faculty2/alexander/arl/publications/SRLdomains.html. The inclusion of data charts support a conclusion that there is a theoretical inconsistency within the literature included in this analysis, as 52% of the reviewed studies did not include any dedicated measure of individual differences (of specific variables – academic domains - delineated in these 77 studies). Alexander, et. al., include several data charts within the chapter to support this conclusion and note that "task knowledge and domain knowledge are not easily or clearly separated in research on SRL" (p. 401). In chapter 26, Boekaerts focuses on the role of emotional regulation (and emotional regulation training) on the learning process and individual use of SRL strategies. Boekaerts (2006) formulates the Dual Processing Self-Regulation Model (diagram on p. 410) to depict the dynamic nature of invoking SRL strategies and the role of emotional regulation in this process. The complexity of, and the impact of the range of emotions, with the increasing evidence that children may not receive adequate guidance or supports to develop emotional regulation, leads Boekaerts to suggest that "teachers are coached to determine both the zones of cognitive and motivation/emotion proximal development" (p. 423).

Since the theoretical framework for embedding SRL strategies within instructional activities is social cognitive, the last two chapters of the handbook review recent studies of SRL strategy use through a socially constructed lens. In chapter 27, Bussey shares her analysis of recent (1985 –

2008) literature to ascertain the role of self-beliefs, SRL strategies and gender on an individual's perceptions of their learning and performance in math and science domains. With the demands of 21st Century society and marketplace, Bussey suggests that educators create "mastery experiences" (p. 437) so students gain efficaciousness in a range of skills, recognize messages of gender stereotyping, and understand how to respond and modulate their performance toward success in science, technology and math. In chapter 28, McInerney focuses on the role of culture as students develop and apply SRL strategies. Reviewing recent studies from Europe, Australia and Asia, McInerney distills specific cultural beliefs and behaviors that reinforce or weaken effective use of SRL strategies, cognitive strategies and individual sense of confidence. He finds evidence that the model of SRL strategies is framed within European or Western cultural paradigms, that measurement instruments for SRL require systematization and guidelines for administration (to support worldwide research), and there is a need to scrutinize stereotyping and resulting generalizations.

Closing Thoughts

This volume of the *Handbook of Self-Regulation of Learning and Performance* covers varied aspects of this field of research and inquiry. The authors reviewed recent literature to share what is understood of the power of SRL strategies for students (to develop them) and individuals (to apply them). Despite the complexity of these strategies and their impact on performance and self-efficacy/beliefs, there remains considerable evidence of how embedding opportunities to develop SRL strategies over time can benefit students academically and personally. The challenge of (1) investigating "fuzzy" aspects of human behavior, (2) determining the reliability and validity of instruments (which measure SRL strategies and related beliefs and behaviors) and guidelines for their administration, (3) recognizing and addressing inconsistencies and weaknesses in theoretical frameworks, models, research designs and studies will provide many opportunities for the educational research community to pursue a greater understanding and appreciation of this aspect of meta-cognitive behavior and its impact on academic and personal achievement and personal beliefs.

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About the Reviewer

Susan Farber EdD Curriculum & Instruction (with a focus on Instructional Design and Technology) is an educational researcher, teacher educator, instructional designer and online course instructor. Susan has experience as a French immersion teacher, classroom teacher and intervention specialist.

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Editors

David J. Blacker
blacker@edrev.info
Gustavo Fischman
fischman@edrev.info
Melissa Cast-Brede
cast-brede@edrev.info
Gene V Glass
glass@edrev.info

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