

# Integrated Models of Reading Comprehension: Understanding to Impact Teaching: The Teacher's Central Role

Sally A. Brown

**Abstract**—Over the last 30 years, researchers have developed models or frameworks to provide a more structured understanding of the reading comprehension process. Cognitive information processing models and social cognitive theories both provide frameworks to inform reading comprehension instruction. The purpose of this paper is to (a) provide an overview of the historical development of reading comprehension theory, (b) review the literature framed by cognitive information processing, social cognitive, and integrated reading comprehension theories, and (c) demonstrate how these frameworks inform instruction. As integrated models of reading can guide the interpretation of various factors related to student learning, an integrated framework designed by the researcher will be presented. Results indicated that features of cognitive processing and social cognitivism theory—represented in the integrated framework—highlight the importance of the role of the teacher. This model can aide teachers in not only improving reading comprehension instruction but in identifying areas of challenge for students.

**Keywords**—Explicit instruction, integrated models of reading comprehension, reading comprehension, teacher's role.

## I. INTRODUCTION

WORKING to develop reading comprehension is critical when working to teach students to become proficient readers. In the field of literacy research, comprehension is a complex term to define. It is not a single process that happens within a reader's mind, but it encapsulates many different components, all of which are important for a reader to make sense of a text. Readers who decode the words on the page are not "reading" until comprehension is attained. Comprehension ultimately happens when a reader automatically constructs meaning while reading a text.

Reading comprehension models have developed and changed over the last 30 years to provide a more structured understanding of the reading comprehension process. Cognitive information processing models and social cognitive theorists both provide frameworks to inform reading comprehension instruction, particularly for diverse populations and students with reading difficulties.

## II. COGNITIVE INFORMATION PROCESSING MODELS

In response to the behaviorism era that ruled the education field in the early and mid-1900s, cognitive psychologists argued that students needed to do more than perform rehearsed skills

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[21]. By the 1950s, computers became mass produced and provided the perfect "metaphor for human learning" [21, p. 153]. Theorists aimed to explain the "internal workings of the mind" through various processing models [44, p.109]. The cognitive information processing model is a theoretical approach that describes "the processing, storage, and retrieval" of information [43, p.173]. For example, [20] described information processing in reading as a transformation of visual information "through a series of processing stages involving visual, phonological and episodic memory systems until it is finally comprehended" (p.293). As the automaticity of letter and word recognition and semantic meanings increase, more attention can be devoted to comprehension [12], [20].

Because information processing models highlighted the ways in which information is obtained, stored, and used, proponents who were interested in applying these models to teaching tended to focus on strategy instruction [21]. Strategies have been defined as "techniques, principles, or rules that will facilitate the acquisition, manipulation, integration, storage, and retrieval of information across situations and settings" [2]. Because many in the field were interested in what was going on in the mind of the reader, a multitude of studies were conducted in the area of strategy instruction that focused on cognitive processing [1]. Researchers demonstrated that they could improve students' reading comprehension through explicit strategy instruction to teach students the process of successful text reading [1], [26], [36]. Studies that focused on training students' text-processing strategies such as predicting, self-questioning, and summarizing were prevalent [6], [33], [46]. Even students with reading difficulties were able to improve their reading comprehension through explicit strategy instruction [10], [11], [15]. These successes gave strength and support to cognitive information processing models used to frame and interpret the process of reading.

## III. INTEGRATED MODELS OF READING

Instead of discarding previous cognitive or text-based models, theorists continued to build and revise the models to create a more integrated understanding of the reading process and its relationship to comprehension [27]. Theoretical models that focus on the cognitive processes used by a reader when approaching text showed to be successful frameworks in

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gaining a better understanding of the reading comprehension process. However, more defined and interactive reading models have demonstrated a more complete understanding of the reading comprehension process, opening the door for reading interventions to be implemented that address the various elements of comprehension. The Construction-Integration (C-I) model [17], [19] and the RAND Reading Study Group [30] heuristic both demonstrate an integrated approach helpful in analyzing the elements that contribute to reading comprehension [27].

#### A. The Construction-Integration (C-I) Model

The majority of scholars agree that the C-I model of reading comprehension is the most comprehensive and complete model that describes text comprehension [23]. In some of Kintsch's earliest work, he described "comprehension as a paradigm for cognition" [18, p.807]. The purpose of the C-I model is to explain the cognitive processes readers use to understand text [31]. The C-I model emphasizes both a bottom-up approach that incorporates three levels of text representation—(1) a surface level; (2) a text-base or proposition level; and (3) a situation model performed by the reader—and a top-down approach that emphasizes the macrostructure of the text [17].

The text levels proposed in the C-I model [17] allow teachers or researchers to gain an understanding of how to more explicitly teach students the cognitive processes that are used in reading. The surface form of the model the reader uses to access the text is the text structure, which includes the words as well as the decoding process, and does not necessarily include a comprehension component [17], [27]. The second level of text representation includes a text-base or propositional level. Propositions constitute ideas in the text, also known as idea units [16], [14]. This is part of the construction phase and the reader uses higher-level cognitive processes such as background knowledge, vocabulary knowledge, and grammatical structures to "construct" meaning [31]. The reader then combines the network of propositions to create the microstructure of the text or the details that support the topic [6], [16]. The macrostructure represents the higher-order units or the big-idea topic of the passage [6], [7], [17]. Finally, the reader creates a situational model that includes the integration phase where processes activated in the previous levels are then integrated with the new knowledge presented [27], [31]. To create the situation model, readers must rely on relevant long-term memory and prior knowledge to create an integrated meaning from the text [18].

Kintsch's C-I model [17], [19] describes text processing in detail and can specifically identify textual factors that may inhibit or contribute to comprehension. Additionally, [38] suggests that the C-I model infers that the explicitness of the text matters when teaching students the process of constructing and integrating knowledge presented by the text.

Though the C-I model [17], [19] does not address reading instruction per se, the model provides implications that are essential in teaching students explicitly how to strengthen the cognitive processes that happen as a reader constructs meaning [38]. As a student moves through a text, each sentence is read,

constructed, and then integrated [40]. The three levels of text representation provide a guide of how to explicitly teach students how to read a text. Students will successfully be able to demonstrate comprehension if they can learn to identify idea units (key words and phrases) in the text, create a network of these propositions (microstructure) and generate main idea sentences, and construct a big-idea topic (macrostructure). Successful execution of these processes then enables the reader to integrate new knowledge by generating a summary.

The model [17] also guides teachers or researchers in selecting appropriate texts (decodable) for reading comprehension instruction and provides a framework for evaluating the comprehension level of students—text base and situation model.

Researchers have demonstrated application of the C-I model in reading research [40], [41]. Specifically, studies that have focused on main idea and summarization instruction to improve comprehension have relied on the C-I model [17] to not only guide interventions but also evaluate student outcomes [6], [13], [32], [34]. Thus, the C-I model addresses reading comprehension components that happen within the reader's mind and that are text-based. The model has also contributed to the understanding of components that are situated in the instruction or "activity" as it is noted in the RRSg heuristic.

#### B. The RRSg Framework

The RRSg [30] heuristic has offered a framework for reading intervention work for more than 20 years. This heuristic has contributed to scholars' thinking in designing interventions to improve reading comprehension among diverse student populations and/or students with reading difficulties [10]. The framework shows how the elements of reading comprehension interrelate to better understand reading comprehension, and the interaction between the elements helps the field examine how proficient readers approach text [30].

The heuristic demonstrates the interaction between the three elements of comprehension: (a) the text, (b) the reader, and (c) the activity situated within the sociocultural context shaped by the reader [30]. A reader's skill level, background, and time on-task can all mediate his/her successful or unsuccessful comprehension outcomes across texts, while the features of the text impact the comprehension level of the reader as well. The "activity" or interventions implemented can improve the comprehension of students with reading difficulties when reader characteristics and text features are taken into account.

In [10], synthesis on reading interventions for struggling readers, the authors address critical elements of the proposed heuristic. They categorize findings on the type of activity or intervention designed for students with reading difficulties and the type of text that was used. Both of these elements are essential to address when conducting reading interventions for students with reading difficulties.

Because the RRSg (2002) heuristic includes many constructs within the elements that make up the framework that are not defined explicitly, it can be challenging to use this model alone to interpret the reading comprehension process [30]. Besides Kintsch's C-I model for reading that defines the text in

greater detail and the processes the reader travels through, social cognitive approaches emphasize the interactions between personal, behavioral, and environmental factors in learning.

#### IV. SOCIAL COGNITIVE THEORY

Though cognitive processing theories provide a thorough representation of the components of reading comprehension, social cognitive theory emphasizes the areas that are essential in understanding the needs of diverse student populations including students with reading difficulties. Because students today come from diverse backgrounds and exhibit various academic challenges, measuring academic outcomes is essential in identifying the best interventions to develop student mastery of specific skills or behaviors [24]. Social cognitivism accounts for individual student's characteristics and needs, behavioral and academic outcomes, as well as vicarious learning and modeling [26].

Scholars describe social cognitive theory as a framework that combines social learning with features of cognitivism and behaviorism [3], [35], [44]. Albert Bandura, the psychologist credited with the development of the theory, postulated that cognitive processing models focus only on the processes and task demands of the mind; they cannot account for the "humanness" in learning [4, p.3]. Behaviorism makes use of "accessible subject matter" that is observable [42, p.785], but does not recognize the processes involved in the reader to produce these changes [3]. Therefore, a theoretical framework that combined these views was needed. Drawing on earlier work from social learning theories, Bandura aimed to address these theoretical problems in unifying and adding constructs not considered in the previous theories [3].

Bandura used the term triadic reciprocity to describe the interactions and bi-directional influences between behavior, personal, and environmental factors [5]. Emphasis is not placed on one factor over the others. Behavior not only includes an outward expression of an observable act, but social cognitive theory gives weight to introspections and the processes behind the behavior. Personal factors include biological factors, cognitive processes, mastery experiences, and affective notions including self-efficacy [3], [26]. Students' socioeconomic status, living conditions, and academic successes or failures do not affect behavior directly, but instead they influence students' emotional states, aspirations, and beliefs, which in turn can affect behavior and academic outcomes [3], [5], [26]. Environmental factors, on the other hand, include social systems, collective or individual efficacy, culture, vicarious learning, and modeling [5]. Though factors are balanced and bi-directionally influence each other [26], the constructs of self-efficacy and modeling were both introduced by Bandura as central to social cognitive theory [5].

##### A. Self-Efficacy

Self-efficacy is essential in understanding learning and is a key construct in social cognitive theory [5]. Self-efficacy is the belief that individuals can successfully and confidently achieve required tasks [5]. Bandura posited that self-efficacy influences behavior based on the notion that an individual will not repeat

actions if he or she does not believe that the actions will be rewarded [5]. This reward could simply be success in academic tasks. Additionally, students who demonstrate self-efficacy in academic tasks put forth greater effort and demonstrate more persistence in difficult tasks compared to students with a low self-efficacy [25]. Moreover, researchers have demonstrated that academic achievement and self-efficacy are linked, and that mastery experiences provide opportunities for students to increase their self-efficacy around academic tasks [39], [45].

Though the research is limited, researchers have found that self-efficacy can contribute to overall academic achievement. Reference [39] investigated the relationship between self-efficacy and outcome expectancy beliefs of achievement in reading and writing. The researchers found that for undergraduate students, there was a significant positive correlation between reading outcome expectancy and reading achievement ( $r = 0.25$ ). This means that an individual's beliefs about reading achievement affected their reading outcomes. Furthermore, the results of the study indicated that self-efficacy beliefs accounted for the variance of reading achievement among mature readers [39]. Reference [29] also investigated the relationship between self-efficacy in reading and writing on writing performance among undergraduate students. The researchers reported that both self-efficacies were correlated with writing achievement for first- and second-year students ( $r = 0.78$ ;  $r = 0.84$ ). Though both of these studies include participants that were undergraduate students, the results linking self-efficacy to reading achievement can inform future research for other ages of students as well.

Reference [8] investigated strategy use in a supplemental reading program and its effects on motivation and self-efficacy. Participants in the study included low-achieving sixth-grade students who read at least two grade levels below their current grade level. They found that participants with reading difficulties increased cognitive strategy use over time—a characteristic of more proficient readers. Additionally, participants indicated that the supplementary reading class increased their self-efficacy around difficult reading tasks. This may lead to more persistence among students with reading difficulties [3]. Though reading achievement was not directly impacted as measured by a standardized reading assessment, the findings can inform instruction. The researchers posited that though self-efficacy and reading achievement are linked as demonstrated in previous research [29], [39], reading achievement may not be demonstrated immediately. More intensive instruction may be warranted for readers with various reading difficulties.

Reference [5] proposed that self-efficacy mediates the application of existing skills and that performance increases as skills are mastered. Because students that have reading difficulties have experienced previous academic failure, teaching and guiding students to "master" a strategy to improve reading comprehension could improve their self-efficacy in reading difficult texts. In turn, this may demonstrate improved reading outcomes. Modeling, a critical feature present in explicit instruction, may also provide a means to increase students' self-efficacy and reading achievement [37].

### B. Modeling

Besides self-efficacy, modeling is a key construct in social cognitive theory, and it plays a significant and essential role in student learning [3]. Reference [37] described modeling as the “process when observers pattern their thoughts, beliefs, and behaviors after those displayed” by a model. In Bandura’s early work, he also contended that vicarious learning happens through observation [3]. The current practice of modeling during instruction stemmed from this idea. Researchers have demonstrated that modeling is an effective instructional component in reading instruction [9], [27]. Using modeling within instruction can promote mastery learning among students with reading difficulties [37].

### V. SOCIAL COGNITIVISM AND READING COMPREHENSION

Combining these integrated models provides a framework to better understand the role of a teacher during reading comprehension instruction [8] (see Fig. 1). The teacher is central to instruction and bi-directionally influences the reader, the text, and the activity as defined by the RRSR [30]. The teacher selects the text that is appropriate for the reader and creates a teaching environment that promotes self-efficacy and mastery. The three elements in the integrated RRSR heuristic influence and are influenced by the personal, behavioral, and environmental factors as defined by [5] in the social cognitive theoretical framework (see Fig. 1). The “reader” uses cognitive processes when reading in order to implement a strategy and improve comprehension. Reference [5] explains that social cognitive theory identifies personal factors that also influence the reader, such as self-efficacy around reading tasks, biological and environmental factors, and previous failure and mastery experiences.

Research shows that students who improve and recognize the cognitive processes involved in reading comprehension can improve overall reading comprehension [14], [22]. Research grounded in social cognitive theory emphasizes the need to recognize personal factors such as self-efficacy, behavioral factors demonstrated through reading achievement, and environmental factors such as modeling and how each can play an important role in improving reading comprehension for students with reading difficulties [8], [37], [39]. This integrated model of reading can guide the interpretation of these various factors, while the C-I model guides interpretation of reading comprehension performance among students.

### VI. UNDERSTANDING THEORETICAL MODELS TO IMPACT TEACHING

The purpose of reading is to understand. For students from diverse backgrounds or for those who demonstrate reading difficulties, making meaning from complex texts is a challenging endeavor. Teachers also struggle understanding the complexity of comprehension and implementing instruction that will aid their students in improving their understanding of text.

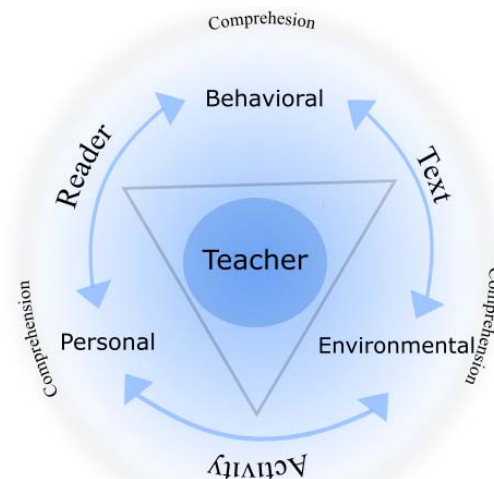


Fig. 1 Social Cognitivism and Reading Comprehension [8]

Over the course of reading research development, both cognitive information and social cognitive theorists have provided frameworks to inform the field about reading comprehension instruction and evaluation. These frameworks are essential in understanding reading comprehension and instruction. However, they have not necessarily emphasized the essential importance of the teacher.

The integrated framework proposed, combining the components of two of the models, places the teacher at the center of the model [8] (see Fig. 1). Thus, emphasizing the critical notion that as teachers gain a depth of understanding about reading comprehension and reading instruction, they will be able to model reading tasks and increase self-efficacy among their students, which in turn affects reading achievement. Using the C-I model [17], the teacher is able to design and explicitly teach students the cognitive processes that are used in reading enabling students to construct meaning [31]—the overall purpose of reading.

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### REFERENCES

- [1] Alexander, P. A., & Fox, E. (2013). A historical perspective on reading research and practice. In D. E. Alvermann, N. Unrau, & R. Ruddell (Eds.), *Theoretical models and processes of reading* (6th ed., pp. 33-68). Newark, DE: International Reading Association.
- [2] Alley, G. R., & Deshler, D. D. (1979). *Teaching the learning disabled adolescent strategies and methods*. Denver, CO: Love.
- [3] Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84(2), 191-215. doi:10.1037/0033-295X.84.2.191
- [4] Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY: Freeman.
- [5] Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual Review Psychologist*, 52, 1-26. doi:10.1146/annurev.psych.52.1.1
- [6] Bean, T. W., & Steenwyk, F. L. (1984). The effect of three forms of summarization instruction on sixth graders’ summary writing and comprehension. *Journal of Reading Behavior*, 16(4), 297-306. doi:10.1080/10862968409547523

- [7] Brown, A. L., & Day, J. D. (1983). Macrorules for summarizing texts: The development of expertise. *Journal of Verbal Learning and Verbal Behavior*, 22, 1-14. doi:10.1016/S0022-5371(83)80002-4
- [8] Cantrell, S. C., Almasi, J. F., Rintamaa, M., Pennington, J., Buckman, D. M. (2014). The impact of supplemental instruction on low-achieving adolescents' reading engagement. *The Journal of Educational Research*, 107(36), 36-58. doi:10.1080/00220671.2012.753859
- [9] Carnegie Council on Advancing Adolescent Literacy. (2010). *Time to act: An agenda for advancing adolescent literacy for college and career success*. New York, NY: Carnegie Corporation of New York.
- [10] Edmonds, M. S., Vaughn, S., Wexler, J., Reutebach, C., Cable, A., Tackett, K. K., & Schnakenber, J. W. (2009). A synthesis of reading interventions and effects on reading comprehension outcomes for older struggling readers. *Review of Educational Research*, 79(1), 262-300. doi:10.3102/0034654308325998
- [11] Gersten, R., Fuchs, L. S., Williams, J. P., & Baker, S. (2001). Teaching reading comprehension strategies to students with learning disabilities: A review of research. *Review of Educational Research*, 71(2), 279-320. doi:10.3102/00346543071002279
- [12] Gough, P. B., & Tunmer, W. E. (1986). Decoding, reading, and reading disability. *Remedial and Special Education*, 7(1), 6-10. doi:10.1177/074193258600700104
- [13] Hare, V. C., & Borchardt, K. M. (1984). Direct instruction of summarization skills. *Reading Research Quarterly*, 20(1), 62-78. doi:10.2307/747652
- [14] Jitendra, A. K., Burgess, C., & Gajria, M. (2011). Cognitive strategy instruction for improving expository text comprehension of students with learning disabilities: The quality of evidence. *Exceptional Children*, 77(2), 135-159. doi:10.1177/001440291107700201
- [15] Joseph, L. M., Alber-Morgan, S., Cullen, J., & Rouse, C. (2016). The effects of self-questioning on reading comprehension: A literature review. *Reading & Writing Quarterly: Overcoming Learning Difficulties*, 32(2), p. 1-22. doi:10.1080/10573569.2014.891449
- [16] Kintsch, W. (1998). *Comprehension: A paradigm for cognition*. New York, NY: Cambridge University Press.
- [17] Kintsch, W. (2004). The construction-integration model of text comprehension and its implications for instruction. In R. Ruddell, & N. Unrau (Eds.), *Theoretical models and processes of reading* (5<sup>th</sup> ed., pp. 1270-1324). Newark, DE: International Reading Association.
- [18] Kintsch, W. (2013). Revisiting the construction-integration model of text comprehension and its implications for instruction. In D. E. Alvermann, N. J. Unrau, & R. B. Ruddell (Eds.), *Theoretical models and processes of reading* (6<sup>th</sup> ed., pp. 807-839). Newark, DE: International Reading Association.
- [19] Kintsch, W., & van Dijk, T. A. (1978b). Toward a model of text comprehension and production. *Psychological Review*, 85(5), 363-394. doi:10.1037/0033-295X.85.5.36
- [20] LaBerge, D., & Samuels, S. J. (1974). Toward a theory of automatic information processing in reading. *Cognitive Psychology*, 6, 293-323. doi:10.1016/0010-0285(74)90015-2
- [21] Mayer, R. E. (1996). Learners as information processors: Legacies and limitations of educational psychology's second metaphor. *Educational Psychologist*, 31(3/4), 151-161.
- [22] McMaster, K. L., Espin, C. A., & van den Broek, P. (2014). Making connections: Linking cognitive psychology and interventions research to improve comprehension of struggling readers. *Learning Disabilities Research & Practice*, 29(1), 17-24. doi:10.1111/ldrp.12026
- [23] McNamara, D. S., & Magliano, J. (2009). Towards a comprehensive model of comprehension. In B. H. Ross (Eds.), *Psychology of learning and motivation* (Vol. 51, pp. 297-384). Amsterdam, The Netherlands: Elsevier. [https://doi.org/10.1016/S0079-7421\(09\)51009-2](https://doi.org/10.1016/S0079-7421(09)51009-2)
- [24] Neuman, S. B. (2011). Single-subject experimental design. In N. K. Duke & M. H. Mallette (Eds.), *Literacy research methodologies* (pp. 383-403). New York, NY: Guilford.
- [25] Pajares, F. (1996). Self-efficacy beliefs in academic settings. *Review of Educational Research*, 66(4), 543-578. doi:10.3102/00346543066004543
- [26] Pajares, F. (2002). Overview of social cognitive theory and of self-efficacy. Retrieved from <http://www.uky.edu/~eushe2/Pajares/eff.html>
- [27] Pearson, P. D., & Cervetti, G. N. (2015). Fifty years of reading comprehension theory and practice. In P. D. Pearson & E. H. Hiebert (Eds.), *Research-based practices for teaching common core literacy* (pp. 1-24). New York, NY: Teachers College.
- [28] Pearson, P. D., & Gallagher, M. C. (1983). The instruction of reading comprehension. *Contemporary Educational Psychology*, 8, 317-344. doi:10.1016/0361-476X(83)90019-X
- [29] Prat-Sala, M., & Redford, P. (2012). Writing essays: Does self-efficacy matter? The relationship between self-efficacy in reading and in writing and undergraduate students' performance in essay writing. *Educational Psychology*, 32(1), 9-20. doi:10.1080/01443410.2011.621411
- [30] RAND Reading Study Group. (2002). *Reading for understanding: Toward an R&D program in reading comprehension*. Santa Monica, CA: RAND.
- [31] Reutzel, D. R. & Cooter, R. B. (2012). *Teaching children to read: The teacher makes the difference*(6th ed.). Boston, MA: Pearson.
- [32] Reynolds, G. A., & Perin, D. (2009). A comparison of text structure and self-regulated writing strategies for composing from sources by middle school students. *Reading Psychology*, 30(3), 265-300. doi:10.1080/02702710802411547
- [33] Rinehart, S. D., Stahl, S. A., & Erickson, L. G. (1986). Some effects of summarization training on reading and studying. *Reading Research Quarterly*, 21(4), 422-438. doi:10.2307/747614
- [34] Rogevich, M. E., & Perin, D. (2008). Effects on science summarization of a reading comprehension intervention for adolescents with behavior and attention disorders. *Council for Exceptional Children*, 74(2), 135-154. doi:10.1177/001440290807400201
- [35] Ruddell, R. B., & Unrau, N. J. (Eds.). (2004). *Theoretical models and processes of reading*(5th ed.). Newark, DE: International Reading Association.
- [36] Scammacca, N. Roberts, G., Vaughn, S., Edmonds, M., Wexler, J., Reutebuch, C. K. & Torgesen, J. K. (2007). *Interventions for adolescent struggling readers: A meta-analysis with implications for practice*. Portsmouth, NH: RMC Research Corporation, Center on Instruction.
- [37] Schunk, D. H., & Zimmerman, B. J. (2007). Influencing children's self-efficacy and self-regulation of reading and writing through modeling. *Reading & Writing Quarterly*, 23(1), 7-25. doi:10.1080/10573560600837578
- [38] Schwanenflugel, P. J., & Knapp, N. F. (2016). Theoretical models of reading comprehension. In P. J. Schwanenflugel, & N. F. Knapp (Eds.), *The psychology of reading* (pp. 165-191). New York, NY: Guilford.
- [39] Shell, D. F., Murphy, C. C., & Bruning, R. H. (1989). Self-efficacy and outcome expectancy mechanisms in reading and writing. *Journal of Educational Psychology*, 81(1), 91-100.
- [40] Sinatra, G. M., & Broughton, S. H. (2011). Bridging reading comprehension and conceptual change in science education: The promise of refutation text. *Reading Research Quarterly*, 46(4), 374-393. doi:10.1002/RRQ.005
- [41] Singer, M., & Kintsch, W. (2001). Text retrieval: A theoretical exploration. *Discourse Processes*, 31(1), 27-59. doi:10.1207/S15326950dp3101\_2
- [42] Skinner, B. F. (1987). Whatever happened to psychology as the science of behavior? *American Psychologist*, 42(8), 780-786. doi:10.1037/0003-066X.42.8.780
- [43] Slavin, R. E. (2003). *Educational psychology: Theory and practice*(7th ed.) Boston, MA: Allyn & Bacon.
- [44] Tracey, D. H., Storer, A. W., & Kazerounian, S. (2010). Cognitive processing perspectives on the new literacies. In E. A. Baker (Ed.), *The new literacies: Multiple perspectives on research and practice* (pp. 106-130). New York, NY: Guilford.
- [45] Wang, C. W., & Neihart, M. (2015). Academic self-concept and academic self-efficacy: Self-beliefs enable academic achievement of twice-exceptional students. *Roeper Review*, 37, 63-73. doi:10.1080/02783193.2015.1008660
- [46] Wong, B. Y. L. (1985). Self-questioning instructional research: A review. *Review of Educational Research*, 55(2), 227-268. doi:10.3102/00346543055002227

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