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Original Research

Improving understanding of expository texts through structured self-monitoring of reading comprehension (SSM-RC): A concurrent multiple-baseline single-case study with fourth-grade students

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Abstract: This study examined the effects of Structured Self-Monitoring of Reading Comprehension (SSM-RC), an approach previously studied with older students reading narratives, adapted here for expository texts among three German fourth-grade students with persistent comprehension difficulties despite adequate decoding skills. Using a multiple-baseline design across participants, we assessed performance daily with parallel expository passages and open-ended comprehension questions. We evaluated intervention effects through visual inspection, descriptive statistics, overlap-based indices, including the Nonoverlap of All Pairs (NAP) and Tau-U (a nonoverlap effect-size index), and hierarchical piecewise regression. Mean comprehension scores increased from 4.33 to 6.73, 2.75 to 5.00, and 2.40 to 4.88 correct responses (out of 10). Tau-U values ranged from .70 to .79, and NAP values ranged from .82 to .94. Regression indicated a significant improvement in slope (B = 0.56, p = .009), but no significant immediate level change. All participants rated SSM-RC positively. This conceptual replication extends preliminary evidence to younger students, informational texts, and a new educational context, although overlapping observations and short baselines limit conclusions about a functional relation.

Keywords: Reading comprehension, Expository texts, Self-monitoring, Single-case experimental design, Multiple-baseline design

1. Introduction

1.1 The importance of reading comprehension

Reading is not an end in itself but a means of developing an understanding of written language. Regardless of whether individuals engage with printed books, newspapers and magazines, or screen-based texts, the ultimate purpose is to interpret, integrate, and use the information conveyed through these different forms of written material. In educational contexts, the ability to construct meaning from written texts enables students to acquire knowledge across academic subjects (Cain, 2010; Oakhill et al., 2015). As students progress through elementary school, reading increasingly shifts from being an instructional goal in itself to serving as a means of acquiring new information (Chall, 1987). Consequently, difficulties in reading comprehension can negatively affect learning not only in language arts but also in subjects such as science, mathematics, and history (Cain, 2010; Seidenberg, 2017).

1.2 Understanding reading comprehension difficulties

Successful reading comprehension requires

Received: Jul. 27, 2026; Revised: Oct. 24, 2026; Accepted: Nov. 12, 2026; Published: Nov. 16, 2026
Copyright © 2025 Matthias Grünke, et al.
DOI: https://doi.org/10.55976/rppe.420261663179-189
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considerably more than accurate and fluent word recognition. According to the Simple View of Reading, the ability to construct meaning from text depends on the combination of efficient decoding and oral language skills (Andreou & Sepeti, 2026; Hoover & Tunmer, 2020). Proficient learners actively monitor their understanding while reading, integrate new information with prior knowledge, generate inferences, identify central ideas, and recognize when comprehension breaks down. These activities also rely on executive functions, particularly working memory and cognitive flexibility, which facilitate the integration of information and the regulation of comprehension processes (Cartwright, 2023). When readers encounter inconsistencies or confusion, they typically return to relevant sections or apply other repair strategies to regain a coherent interpretation of the text (Kendeou et al., 2016; Perfetti et al., 2005).

In contrast, students who struggle with reading comprehension often decode words accurately but experience difficulties constructing coherent mental representations of text (Grünke et al., 2024). They are less likely to monitor their understanding actively, frequently fail to detect when meaning is lost, generate fewer inferences, and often lack effective repair strategies. These difficulties may gradually reduce reading motivation and self-efficacy, thereby contributing to a widening achievement gap over time (Perfetti et al., 2005; Roberts et al., 2008).

Difficulties in understanding text are far from uncommon. Large-scale international assessments have repeatedly shown that a substantial proportion of elementary and secondary school students fail to attain the level of proficiency in this domain considered necessary for successful participation in academic learning. For example, recent findings from the Progress in International Reading Literacy Study (PIRLS) indicate that approximately one quarter of fourth-grade students across participating countries perform at or below the Low International Benchmark in reading comprehension, suggesting considerable difficulties in extracting and integrating information from texts (Mullis et al., 2023). These findings underscore the need for effective instructional approaches that specifically target the construction of meaning from written material rather than word recognition alone (Rice et al., 2024). Recent intervention research also demonstrates that targeted additional instruction can produce meaningful literacy gains among young students identified as being at risk for learning difficulties (Lacombe et al., 2026).

1.3 Effective reading-comprehension instruction

During the past three decades, a substantial body of meta-analytic evidence has identified several principles that consistently improve reading comprehension among students experiencing difficulties in this domain. Original intervention research likewise suggests that programs integrating explicit instruction in comprehension and vocabulary with attention to word-level skills, motivation, engagement, and assessment can improve outcomes among struggling readers (Brasseur-Hock et al., 2021). Although individual interventions differ in their specific procedures, effective approaches appear to share six central components:

(1) Explicit teaching of relevant text structures and strategies helps students identify which information deserves attention and how it should be processed (Berkeley et al., 2010; Sencibaugh, 2007).

(2) Structured self-questioning directs attention toward central ideas and promotes purposeful engagement with the material (Berkeley et al., 2010; Sencibaugh, 2007; Ueno et al., 2025).

(3) Continuous monitoring enables students to detect breakdowns in understanding and determine when corrective action, such as rereading, is needed (Berkeley et al., 2010; Sencibaugh, 2007; Ueno et al., 2025).

(4) Active responding requires learners to retrieve, organize, and record relevant information rather than process it passively (Joseph et al., 2023).

(5) Identifying main ideas, summarizing sections, and restating key content support the construction of a coherent representation of the material (Berkeley et al., 2010; Sencibaugh, 2007; Ueno et al., 2025).

(6) Modeling, guided practice, corrective feedback, scaffolding, and a gradual transfer of responsibility support the development of increasingly independent strategy use (Joseph et al., 2023; Rice et al., 2024).

The effectiveness of these key tenets appears to depend less on any isolated technique than on the coordinated integration of these metacognitive, cognitive, and instructional components (Berkeley et al., 2010; Joseph et al., 2023; Rice et al., 2024; Ueno et al., 2025).

1.4 Structured self-monitoring of reading comprehension

One intervention that closely reflects these evidence-based principles is Structured Self-Monitoring of Reading Comprehension (SSM-RC), originally described by Crabtree et al. (2010). In their multiple-baseline single-case study, high school students with learning disabilities were taught to pause at three predetermined points while reading, answer a fixed set of self-monitoring questions targeting narrative story elements (e.g., characters, setting, conflicts, and resolution), and record their responses before continuing to read. The SSM-RC procedure integrates explicit strategy instruction, comprehension monitoring, self-questioning, active responding, scaffolded practice, and systematic fading of instructional support, precisely the instructional components that have subsequently been identified as particularly effective across numerous meta-analyses of reading-comprehension instruction (e.g., Berkeley et al., 2010; Joseph et al., 2023;

Rice et al., 2024; Ueno et al., 2025).

However, the available empirical evidence on SSM-RC remains limited to this single study, which was conducted more than 15 years ago with three high school students at a single U.S. school and exclusively employed narrative texts organized around story grammar. These findings suggest that this approach can effectively support comprehension among older students with adequate reading fluency. Nevertheless, it remains unclear whether the same procedures are equally effective for younger students at the end of elementary school who struggle with understanding what they read. This question is particularly important because reading instruction at this stage increasingly shifts from narrative to expository texts (that is, informational texts designed primarily to explain, describe, or convey factual knowledge). As students make the transition from learning to read to reading to learn, successful comprehension of expository texts becomes essential for acquiring new knowledge across virtually all academic subjects (Chall, 1987).

Although the original findings are encouraging, SSM-RC has, to the best of our knowledge, neither been independently replicated with elementary-school students nor extended to expository texts, although related self-questioning approaches have been investigated with elementary-school students. Moreover, no published study has evaluated the intervention in a German-speaking educational context. Given that the evidence base for single-case interventions is established through systematic replication across participants, settings, interventionists, text genres, and geographical locations, further research is warranted to determine the generalizability and robustness of the effects originally reported by Crabtree et al. (2010).

1.5 Research questions

Building on the promising findings reported by Crabtree et al. (2010), we sought to provide an independent conceptual replication of SSM-RC by extending this established instructional approach to three German fourth-grade students, expository texts, and a German-speaking educational setting. Thus, the contribution of this research lies in extending the existing approach to a new population, text type, and educational context rather than in introducing a new theoretical framework or instructional method. In addition to examining the effectiveness of the intervention, we also evaluated students' perceptions of SSM-RC to determine its social validity. Specifically, the study addressed the following research questions:

1. Does SSM-RC improve the reading comprehension performance of fourth-grade students with persistent comprehension difficulties despite adequate decoding skills?

2. Are any observed improvements supported by visual analysis, overlap-based effect-size indices, and hierarchical piecewise regression analysis?

3. How do participating students evaluate the acceptability, usefulness, and overall social validity of SSM-RC?

2. Method

2.1 Participants and setting

The study was conducted at an inclusive public elementary school in western Germany that serves a socioeconomically diverse student population and maintains a longstanding partnership with the University of Cologne. It enrolls approximately 280 students across 12 classes and educates children with a broad range of learning needs, supported by a multidisciplinary staff.

Participants were three fourth-grade students (one girl, two boys; 8–9 years of age) who were nominated by their classroom teachers because of persistent difficulties in reading comprehension despite adequate oral reading. Following teacher nominations, the recruitment and consent procedures were conducted by a member of the research team who was not involved in the students' regular instruction or academic assessment. They are referred to as Amy, Ben, and Cole (pseudonyms). None had been formally identified as having special educational needs.

Eligibility was established through a two-step screening procedure. First, classroom teachers identified students who had consistently demonstrated marked comprehension difficulties during regular instruction over several months. Second, the nominated individuals completed school-based curriculum assessments routinely used by the participating school to monitor reading development. To be included, students were required to obtain a percentile rank of 25 or below on the reading comprehension measure while simultaneously achieving a percentile rank of 40 or above on the oral reading fluency measure. These locally developed curriculum-based assessments are aligned with the school's curriculum and have been used consistently across grade levels for instructional decision-making. Percentile ranks were derived from grade-specific local reference distributions based on routinely collected assessment data from students in the corresponding grade level. Raw scores were converted to percentile ranks by locating each student's performance within the empirical distribution of the local reference group. This screening procedure ensured that the intervention targeted difficulties in text comprehension rather than basic word-reading or decoding skills.

Amy was an 8-year-old girl who demonstrated age-appropriate decoding accuracy and fluency but consistently failed to identify central ideas and integrate information across expository texts. Her teachers described her as highly motivated and attentive but frequently unable to explain what she had read.

Ben was a 9-year-old boy whose reading was accurate

and fluent but characterized by weak monitoring of comprehension, resulting in incomplete recall of key story elements and difficulty answering inferential questions. His classroom performance suggested that comprehension weaknesses, rather than word-reading difficulties, limited his academic progress.

Cole was an 8-year-old boy who likewise exhibited adequate decoding skills but persistent difficulties in constructing coherent mental representations of expository texts. Although he engaged readily with reading activities, he rarely detected comprehension breakdowns independently and required frequent teacher prompts to monitor his understanding.

Instruction was delivered individually during regular school hours over three weeks in quiet rooms provided by the school for small-group or individualized instruction. Students were escorted from and returned to their classrooms for each session. The interventionist and child sat side-by-side at a table to facilitate modeling, guided practice, shared access to instructional materials, and consistent implementation across sessions. Whenever feasible, one session per participant was conducted each school day under comparable environmental conditions. School personnel observed selected sessions to support subsequent implementation of the intervention after completion of the study.

Enrollment was voluntary. Written informed consent was obtained from parents or legal guardians, and verbal assent was obtained from all participating students before data collection began. Students and their families were informed that participation was entirely voluntary and that they could withdraw at any time without negative consequences. In particular, withdrawal would not affect students' regular classroom instruction, academic assessment, or access to any educational support or benefits to which they were entitled.

The study was reviewed and approved prior to implementation by the independent Ethics Committee of Learning Disabilities Worldwide (LDW), as documented in its approval letter dated April 19, 2025. Participants' identities were protected through pseudonyms, all records were anonymized prior to analysis, and data were stored securely in accordance with applicable data protection regulations.

2.2 Design

Following staggered baseline phases (Amy = 3 sessions, Ben = 4 sessions, Cole = 5 sessions), the self-monitoring procedures were introduced sequentially across the three children, providing repeated opportunities to examine whether changes in performance corresponded with the introduction of the intervention. Phase changes followed the planned staggered sequence and were made after the preceding participant had entered intervention while the remaining participants continued to be observed under baseline conditions. Their concurrent baseline performance was examined descriptively to determine whether comparable changes occurred in the absence of the intervention. The first baseline phase comprised three sessions, consistent with recommendations that three baseline observations may be sufficient when a priori evidence documents stable low performance and extending baseline would unnecessarily expose students to repeated failure on the target academic task (Harris et al., 2019). Nevertheless, the relatively short baseline phases limit the strength with which experimental control can be inferred from the present data.

Repeated measures of reading comprehension were obtained during every session of both the baseline and intervention phases using identical assessment procedures and equivalent expository reading passages. Whenever possible, one session was conducted per school day, resulting in an approximately 24-hour interval between successive observations. All instructional, assessment, and data-collection procedures were implemented consistently across participants and phases to maximize procedural standardization and internal validity.

2.3 Dependent variable

Reading comprehension of expository texts served as the dependent variable and was operationalized as the number of correctly answered content-related questions. For each measurement, students independently read a previously unseen passage. They then responded in writing to ten open-ended comprehension questions assessing both literal and inferential understanding.

Responses were scored dichotomously (0 = incorrect, 1 = correct), yielding a maximum score of 10 points per session. We scored answers as correct when they accurately reflected either explicitly stated information or information that could reasonably be inferred from the text. Spelling and grammatical errors were disregarded provided that the intended meaning was clear. To assess scoring reliability, a second independent rater rescored at least 25% of all probes across participants and phases. Point-by-point interrater agreement was 97%.

2.4 Materials

To assess reading comprehension, we developed a pool of 14 parallel expository passages specifically for the present study. They covered age-appropriate nonfiction topics familiar to fourth-grade students (e.g., animals, natural phenomena, technology, and everyday life) while avoiding content requiring specialized prior knowledge. The deliberate use of expository texts reflected the study's objective of extending SSM-RC beyond the narrative story-grammar context examined by Crabtree et al. (2010) to the informational texts that increasingly characterize classroom reading during the transition from learning to read to reading to learn.

Each passage comprised approximately 300 words, was

written at a comparable linguistic level (Flesch Reading Ease = 80–90), and followed a similar informational structure consisting of a title and three to five short paragraphs organized around a central idea supported by factual details. Accompanying each passage were ten open-ended comprehension questions, five assessing explicitly stated information and five requiring students to integrate information and generate inferences. Equivalent passages were randomly selected for each assessment, and no passage was administered more than once. Although these procedures were intended to maximize comparability across probes, formal empirical equivalence of passage difficulty was not established. Variation in probe difficulty therefore cannot be ruled out as a source of measurement variability.

For the intervention itself, we developed 18 expository instructional texts. Similar to the reading-comprehension probes, they addressed age-appropriate nonfiction topics (e.g., animals, natural phenomena, technology, and everyday life) that were familiar to fourth-grade students and required no specialized background knowledge. Unlike the original SSM-RC study, which taught students to monitor comprehension while reading narrative texts by focusing on story elements, we adapted the self-monitoring procedure for use with expository texts. At each stopping point, students identified the central idea of the preceding section, summarized the most important information, evaluated whether they had understood the text, and decided whether rereading was necessary before continuing. The instructional texts increased progressively in length (approximately 100–300 words) and linguistic and conceptual complexity across the intervention.

To support motivation and make progress visible, students recorded their daily comprehension scores on individual progress graphs. Stickers (e.g., smiley-face stickers) were awarded for stable or improved performance relative to the previous assessment, with every fifth sticker exchangeable for a small classroom reward (e.g., a bookmark or colorful pencil). Thus, reinforcement was contingent on maintaining or improving individual performance relative to the preceding assessment rather than on attaining an absolute performance criterion.

2.5 Procedures

During baseline, observations were conducted over 20-minute periods. To control for attention and time-on-task effects while deliberately excluding reading-related instruction, participants first completed approximately 15 minutes of non-literacy activities (e.g., mathematical puzzles and visual search tasks). These tasks were selected to be engaging while remaining unrelated to reading comprehension.

During the final five minutes, students independently read a randomly selected expository assessment passage and answered ten written comprehension questions. The five-minute limit was applied consistently to all assessments across baseline and intervention phases. Items not completed within the allotted time were scored as incorrect. No instructional support, prompting, or performance feedback was provided. This procedure established a stable estimate of reading comprehension performance under controlled conditions.

During the intervention phase, each session lasted 20 minutes and implemented an adapted version of SSM-RC as a multicomponent instructional package based on the instructional framework described by Crabtree et al. (2010). The intervention began with a brief review of the student's progress graph, accompanied by standardized motivational feedback attributing performance changes to effort and strategy use.

Instruction followed a gradual-release framework ("I do, We do, You do") designed to transfer responsibility for comprehension monitoring systematically from the interventionist to the student. The first three training sessions primarily emphasized explicit modeling ("I do"), during which each step of the strategy was demonstrated through think-aloud modeling. Guided practice ("We do") became increasingly prominent across the following six sessions, with students assuming progressively greater responsibility while receiving corrective feedback and prompts as needed. During the remaining sessions, instruction emphasized independent strategy application ("You do"), with support provided only when required. These stages reflected the primary emphasis rather than strictly separated components; modeling, guided responding, and increasingly independent strategy use could overlap within sessions depending on individual student performance. Across participants, Amy completed 11 intervention sessions, whereas Ben and Cole each completed eight; because the instructional stages reflected predominant emphasis rather than fixed session blocks, increasingly independent strategy use could occur within guided-practice sessions rather than only during a separate final stage.

During the modeling stage ("I do"), the interventionist read an instructional text aloud while explicitly modeling the complete self-monitoring procedure. At three predetermined stopping points, she identified the central idea of the preceding section, summarized its most important information, evaluated whether the section had been fully understood, completed the self-monitoring recording sheet, verbalized the reasoning underlying each response, and demonstrated how to determine whether rereading was necessary before continuing.

During guided practice ("We do"), the student and interventionist read a second instructional text together. At each stopping point, the main idea was identified, the preceding section was summarized, understanding was evaluated, and the recording sheet was completed with structured guidance, corrective feedback, and prompting provided as needed. Support was gradually reduced as students demonstrated increasing accuracy.

During independent practice ("You do"), students

subsequently completed the same procedure using new instructional texts with minimal assistance. The interventionist provided support only when necessary, following a least-to-most prompting hierarchy. Prompt fading was performance-contingent rather than session-based; if strategy use deteriorated, additional support was temporarily reinstated before being faded again.

Throughout SSM-RC instruction, students were consistently prompted to pause at designated stopping points, identify the central idea of each section, summarize the most important information, evaluate whether they had fully understood what they had read, and determine whether rereading was necessary before continuing. To promote independent strategy use, externally provided guiding questions were gradually withdrawn and replaced by student-generated self-questioning.

Each intervention session concluded with the same standardized reading-comprehension probe used during baseline. Administration procedures, testing conditions, scoring criteria, and the absence of performance feedback were identical across phases.

2.6 Treatment fidelity

The extent to which the procedures were implemented as planned was assessed during at least 20% of all intervention sessions by trained school support staff using a structured observation checklist assessing session duration, instructional sequence, prompting procedures, reinforcement delivery, and standardized administration of the reading-comprehension probes. We calculated treatment fidelity by dividing the number of correctly implemented components by the total number of applicable checklist components and multiplying the result by 100. Across all observed sessions, we obtained an overall fidelity score of 92%, indicating high implementation integrity.

2.7 Social validity

The extent to which participants perceived the intervention as acceptable, useful, and worthwhile was examined at the conclusion of the intervention using a brief, child-friendly questionnaire adapted from Grünke (2019). It consisted of eight items with three-point response options ("yes," "a little," "no") addressing perceived usefulness, enjoyment, and willingness to continue using the strategy.

Items were read aloud when necessary to ensure comprehension, and administration procedures were standardized across participants. Responses were summed to yield a total score ranging from 8 to 24, with higher scores indicating more positive evaluations.

2.8 Data analysis

Descriptive statistics, effect-size calculations, regression analyses, and graphical displays were computed using the SCAN package for R (Wilbert, 2025). Visual analysis focused on level, trend, variability, overlap, immediacy of change, and consistency of data patterns across tiers. Intervention effects were additionally examined using Tau-U and Nonoverlap of All Pairs (NAP), followed by hierarchical piecewise regression analysis. The regression model treated repeated observations as nested within participants and estimated fixed effects for baseline trend, immediate level change at intervention onset, and change in slope during the intervention, with participant-specific differences represented by a random intercept. Measurement occasion was coded sequentially within each participant, and the phase transition defined the point at which level and slope changes were estimated. Missing observations due to absence were not imputed. Because improvement following intervention onset was expected, one-tailed tests were used for the intervention-related level and slope coefficients, whereas the baseline-trend coefficient was evaluated two-tailed.

3. Results

3.1 Visual and descriptive analysis

Figure 1 presents the session-by-session reading comprehension performance of all three participants across baseline (A) and instructional (B) phases. Individual line graphs display the number of correctly answered comprehension questions per session, allowing inspection of level, trend, variability, and immediacy of change associated with the phase transitions.

Amy exhibited a relatively stable baseline with low variability. There was no immediate increase at the phase transition, as the first intervention score was lower than the final baseline observation. Some overlap between baseline and intervention scores was also evident. Across the intervention phase, however, performance generally increased and reached levels that were higher than those observed during most baseline sessions, indicating a positive change in trend and overall level despite the absence of a clear immediate effect.

Ben showed moderate variability during baseline. Following the introduction of the intervention, performance improved gradually rather than through an immediate level change. Baseline and intervention values overlapped, and several intervention observations were missing because of absence. Nevertheless, the overall intervention phase was characterized by an upward trend and higher performance during later sessions. The combination of overlap, missing observations, and limited immediacy makes the visual evidence for an intervention effect less convincing for Ben than for the other participants.

Cole's baseline was characterized by generally low performance but an upward movement immediately

before the phase change. The first intervention observation was lower than the final baseline observation, providing no evidence of an immediate level increase at intervention onset. Performance subsequently increased across the intervention phase, however, producing a positive intervention trend. Some overlap between baseline and intervention values remained, and the pre-intervention increase reduces the strength of the visual evidence that the subsequent improvement was uniquely attributable to SSM-RC.

Across participants, visual inspection showed improvements following intervention onset, but consistent immediate level changes and complete separation between baseline and intervention observations were not observed across tiers. These patterns reduced the strength of the visual evidence for a replicated functional relation. Overall, the visual data provide suggestive rather than unequivocal evidence of an intervention-related effect across participants.

Descriptive statistics were consistent with the visual analysis. Amy's mean score increased from 4.33 during baseline (SD = 1.16) to 6.73 during intervention (SD = 2.10). Ben's mean performance rose from 2.75 (SD = 1.26) to 5.00 (SD = 1.60), whereas Cole's mean score increased from 2.40 (SD = 0.89) to 4.88 (SD = 1.46).

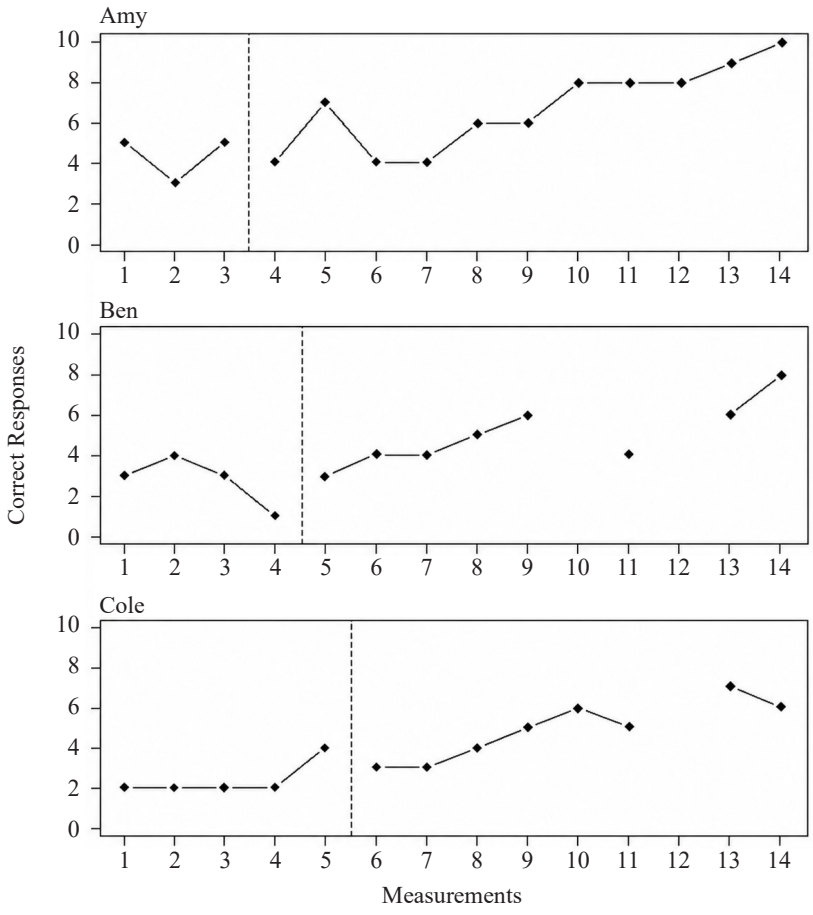


Figure 1. Reading comprehension performance across baseline and intervention phases

3.2 Effect-size analysis

Tau-U adjusted for baseline trend indicated moderate to strong effects of SSM-RC for all three participants (Amy = .70, Ben = .79, Cole = .71). Because this index controls for pre-intervention trend, the obtained values were consistent with improved performance during the intervention phase rather than systematic changes occurring during baseline. NAP values were likewise high (Amy = .82, Ben = .89, Cole = .94), indicating substantial nonoverlap between baseline and intervention scores and, thus, consistently higher performance following introduction of SSM-RC. Taken together, these effect-size indices were consistent with the overall pattern observed in the visual analysis.

3.3 Regression analysis

To complement the results obtained thus far, a hierarchical piecewise linear regression using the model

specified above was conducted using the combined data from all three participants. As shown in Table 1, neither the baseline trend (B = −0.07, p = .739, two-tailed) nor the immediate level change at intervention onset (B = 0.55, p = .222, one-tailed) was statistically significant. In contrast, SSM-RC was associated with a significant positive change in slope (B = 0.56, p = .009, one-tailed), indicating that reading comprehension improved progressively across intervention sessions rather than through an immediate performance gain.

Table 1. Hierarchical piecewise linear regression results

	B	SE	*t*	*p*
Intercept	3.21	0.55	5.83	< .001
Trend	-0.07	0.22	-0.34	.739
Level	0.55	0.71	0.77	.222
Slope	0.56	0.22	2.50	.009

Note. B = unstandardized regression coefficient; SE = standard error. The p value for Trend is two-tailed; the p values for the intervention-related Level and Slope coefficients are one-tailed.

3.4 Social validity

Social validity ratings were positive for all three participants, although their responses differed somewhat in strength and emphasis. Amy obtained a total score of 23 out of 24 points. She indicated that she found SSM-RC helpful for identifying the most important information in a text and reported that she would like to continue using the strategy during future reading activities. Her responses were positive on all items, with one item concerning enjoyment rated as "a little" rather than "yes."

Ben obtained a total score of 21 out of 24 points. He rated the strategy particularly positively with regard to helping him remember important information and recognize when he did not fully understand a text. Although he indicated that some parts of the procedure required effort, he nevertheless reported that SSM-RC was useful and that he would be willing to use it again. Three items were rated as "a little," whereas the remaining items received a "yes" response.

Cole obtained a total score of 22 out of 24 points. He reported that the strategy helped him notice when his understanding of a text was incomplete and made it easier to organize important information while reading. He also indicated that he enjoyed using SSM-RC and would continue to use it in future reading tasks. Two items received an "a little" response, while all remaining items were rated "yes." None of the three participants selected "no" for any questionnaire item.

4. Discussion

4.1 Main findings

The present study sought to determine whether SSM-RC improves the reading comprehension of expository texts among fourth-grade students with persistent difficulties in this area despite adequate decoding skills. It also examined whether any observed effects were supported by multiple complementary analytic approaches and whether participating students perceived the intervention positively. Overall, the findings provide encouraging but preliminary support for the research questions. First, all children demonstrated improved comprehension of expository texts following the introduction of SSM-RC, although the magnitude and immediacy of the effects varied across individuals. Amy exhibited a gradual and sustained improvement, as did Ben and Cole, although the patterns of improvement varied across participants. Second, visual analysis indicated generally higher performance during training, although the absence of consistent immediate level changes and the presence of baseline–intervention overlap weakened the evidence for a clear functional relation. The descriptive, overlap-based, and regression analyses were consistent with an overall pattern of improvement, but these complementary analyses should not be interpreted as establishing causality independently of the visual evidence. The regression analysis further indicated that gains were characterized primarily by progressive growth over time rather than by an immediate level change, suggesting that students gradually acquired increasingly effective self-monitoring routines. Third, all participants evaluated the intervention positively, indicating high social validity concerning its usefulness, acceptability, and willingness to continue using the strategy.

The present findings extend those reported by Crabtree et al. (2010) in several important respects. Whereas the original study demonstrated that SSM-RC could improve comprehension of narrative texts among

high-school students with learning disabilities, the present investigation suggests that the same underlying instructional principles can also be successfully adapted to expository texts for younger students who have already mastered basic decoding but continue to struggle with constructing meaning from written information. This extension is theoretically important because expository reading becomes increasingly central toward the end of elementary school, when students are expected to acquire new knowledge from informational texts across virtually all academic subjects. Demonstrating that SSM-RC can be successfully adapted to this educational context therefore addresses a meaningful gap in the existing literature.

Beyond providing an independent conceptual replication in a different educational and cultural context, the present findings are also consistent with the broader evidence base synthesized in recent meta-analyses and systematic reviews. SSM-RC incorporates instructional components repeatedly identified as effective for improving reading comprehension, including explicit strategy instruction, think-aloud modeling, self-questioning, guided practice, scaffolded feedback, monitoring of understanding, and gradual transfer of responsibility from teacher to learner. Rather than teaching students merely to answer content-related questions correctly, the intervention explicitly targeted the self-regulatory processes underlying successful interpretation of informational texts. The progressive improvement observed across participants, together with the significant positive change in slope identified by the regression analysis, is consistent with the possibility that students became increasingly familiar with these metacognitive routines through repeated guided practice; however, independent strategy use was not measured directly.

4.2 Limitations

Despite these encouraging findings, several limitations should be acknowledged. First, the small number of participants and recruitment from a single school limit the generalizability of the present findings. However, the purpose of single-case methodology is not to estimate population parameters but to establish functional relations through systematic replication. Accordingly, confidence in SSM-RC will depend less on larger samples than on further independent conceptual replications across participants, educational settings, interventionists, languages, and text genres.

Second, several design and measurement features limit the strength of the evidence for a functional relation. The baseline phases were relatively short, changes were not consistently immediate across participants, and some overlap occurred between baseline and intervention observations. In addition, although the probes were standardized with respect to length, readability, structure, and question format, their empirical equivalence in difficulty was not independently established. Because reading and responding were completed within a fixed five-minute period, time pressure may have influenced performance and cannot be separated from comprehension difficulty in the present data. These factors warrant a cautious interpretation of the observed intervention-related improvements. Moreover, because SSM-RC was implemented as a multicomponent instructional package, the present design does not permit conclusions about which individual component or combination of components was responsible for the observed improvements.

Third, no maintenance or follow-up assessments were conducted. Consequently, it remains unclear whether the observed improvements were maintained after the intervention had ended. Future studies should therefore examine the maintenance of intervention-related gains over time.

Finally, the intervention was delivered individually under highly controlled conditions. Although this approach maximized instructional consistency and internal validity, it does not fully reflect typical classroom conditions in which teachers simultaneously deliver lessons to large numbers of students. Future research should therefore investigate whether comparable effects can be achieved in small-group or whole-class instruction and under routine school conditions.

4.3 Practical implications and conclusion

The present findings suggest that SSM-RC represents a promising instructional approach for students whose primary difficulty lies in constructing meaning from expository material despite adequate decoding skills. Because informational texts become increasingly prominent during the transition from learning to read to reading to learn, explicitly teaching students how to monitor, evaluate, and regulate their understanding while reading may be particularly beneficial during the final years of elementary school. The intervention requires only modest instructional materials and follows a clearly structured sequence of modeling, guided practice, and gradual transfer of responsibility, suggesting potential feasibility for classroom teachers, special educators, and reading specialists.

Future research should examine whether SSM-RC can be implemented effectively in small-group and whole-class settings and whether gains are maintained and transferred to authentic curricular reading tasks. These applications and longer-term outcomes were not examined in the present study.

Taken together, the present study provides promising preliminary evidence that SSM-RC may be adaptable from narrative to expository reading in elementary education. Given the limitations of the present design, additional independent replications are needed before firm conclusions can be drawn regarding its effectiveness and generalizability.

Declaration of generative AI use

The authors declare that ChatGPT (OpenAI) was used during the preparation of the original manuscript and its revision solely to improve language, grammar, punctuation, and readability. All AI-assisted suggestions were carefully reviewed and verified by the authors before incorporation. AI was not used for data analysis, scientific interpretation, or the development of conclusions. The authors remain fully responsible for the content and integrity of the manuscript.

Author contributions

Matthias Grünke conceived and designed the study, supervised its implementation, and prepared the initial draft of the manuscript. Anne Barwasser and Susanne Hoff contributed substantially to the critical revision of the manuscript, provided important intellectual input, and participated in incorporating revisions. All authors reviewed and approved the final version of the manuscript.

Funding

The authors received no external funding for this research.

Data availability

All individual data points underlying the findings are presented in Figure 1 and can be directly extracted from the graphs. The complete numerical dataset is also available from the corresponding author upon reasonable request.

Conflict of interest

The authors declare that they have no conflicts of interest.

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