The Effects of Metacognitive Reading Strategy Training (MRST) on Elementary Literacy Teachers' Critical Reading Ability

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Some studies among literacy teachers revealed inadequate comprehension skills, suggesting the need to examine their knowledge and use of reading strategies and reading skills. This quasi-experimental study determined whether metacognitive reading strategy training (MRST) intervention would improve teachers' critical reading ability. Eleven public school elementary literacy teachers from southern Philippines completed 12 intervention lessons implemented over 63 sessions (96 hours) conducted at the school's professional learning community. The lessons, which adopted the explicit teaching procedure, focused on the key strategies Making Inferences, Making Judgments, Monitoring and Clarifying, and Summarizing. Applegate et al.'s (2008) Critical Reading Inventory (CRI) measured changes in critical reading ability. Wilcoxon signed-rank test results showed a significant increase in overall CRI score and subscale scores for literal and evaluative comprehension, but not for inferential comprehension. The comprehension difficulty type known as "Imprecise concept" in relation to things and events was found to be the main cause of difficulty in forming inferences. This difficulty came with the inability to synthesize information correctly from different parts of the text. Overall, explicit instruction of metacognitive reading strategies effectively improved participants' critical reading ability. School-based professional development interventions can be an effective avenue for improving literacy teachers' knowledge and skills in reading.

Keywords: critical reading ability, explicit instruction, literacy teachers, metacognitive awareness, reading strategies

Introduction

Self-regulated learning is essential for school and career success in our 21st-century society. Self-regulation is a thinking process considered an executive skill that operates at higher levels (Cartwright, 2017). One of the executive skills in the reading process is setting one's reading purpose or goal and achieving this through reading strategy use (Cartwright, 2017). Learners who self-regulate their thoughts as they read for comprehension are metacognitive readers. They purposefully select and apply appropriate strategies and monitor their understanding as they interact with the texts (Pressley, 2002).

The performance of Filipino secondary school children in the 2018 Program for International Student Assessment (PISA) and elementary school children in the 2019 South East Asia–Primary Learning Metrics (SEA-PLM) indicate weak reading comprehension skills (Organization for Economic Co-operation and Development [OECD], 2019; Schleicher, 2019; United Nations Children's Fund [UNICEF] & Southeast Asian Ministers of Education Organization [SEAMEO], 2020). The highest level on the PISA scale necessitates learners to have strong metacognitive knowledge of reading strategies (Soodla et al., 2017). The low reading proficiency level students attained in these assessments implies that they are far from being self-regulated and metacognitively skilled readers. Results from these assessments prompt urgent attention to examine the quality of literacy instruction in Philippine classrooms, including the depth of literacy teachers' reading knowledge and skills, among other factors that influence literacy performance.

Teachers are the prime agents to hone students' metacognitive awareness; however, they are not likely to teach metacognitive reading strategies to their students if they lack awareness and preparation about these strategies (Iwai, 2016a). Teachers must possess metacognitive reading strategy knowledge and skills to impart these to their students (Curwen et al., 2010, as cited in Iwai, 2016a; Keene & Zimmermann, 2013). Empirical studies have found a positive relationship between teachers' and students' metacognitive knowledge (e.g., Soodla et al., 2017), teachers' metacognitive knowledge and their reading strategies instruction (e.g., Hossu & Roman, 2019; Medina et al., 2021) and teachers' reading strategy instruction and students' reading performance (e.g., Medina et al., 2021). Teachers' level of awareness and use of different reading strategy types vary, ranging from a medium to a high level on problem-solving, global, and support reading strategies like those observed among in-service teachers (see Hossu & Roman, 2019; Koulianou & Samartzi, 2018) and pre-service teachers (see Aşıkcan & Saban, 2018; Iwai, 2016a). Reading strategy awareness of secondary pre-service teachers from the northern region of the Philippines range from average to favorable in their knowledge of different strategy types (see Batang, 2015). The authors of these studies highlighted the implications of teachers' awareness of reading strategies for improved strategy instruction and student reading performance.

Investigations undertaken on teachers' reading skills in the Philippines have been limited in terms of representation and scale. A study among public school content area teachers from a high-poverty rural region in the southern Philippines who participated in a reading program in 2015 and 2016 showed a score of below 50% in their reading comprehension (Cardno Emerging Markets [Philippines] Inc., 2017). In addition, their fluency assessments revealed that only 35.2% reached a proficient level. Another was a baseline survey in 2010 that involved the assessment of reading comprehension and oral reading fluency among Grades 1 to 6 teachers from different regions also in the southern part of the country. The assessment showed poor comprehension and reading fluency skills (Education Development Center Inc., 2011a, 2011b). Despite the absence of large-scale investigations on teachers' comprehension skills, the results from these two studies seem to align with the finding of the World Bank Group's nationwide assessment among elementary and secondary teachers in 2014. Teachers assessed were found to have weak content knowledge in the subjects they manage, directing the need for improvement in their subject knowledge and skills (Al-Samarrai, 2016).

The abovementioned Filipino teachers' and students' reading performance affirms the need to examine effective interventions to improve literacy teachers' metacognitive and critical reading skills. In this context, this research aimed to investigate how metacognitive reading strategies training (MRST), as an intervention, could improve elementary literacy teachers' critical reading ability. The findings have implications in designing professional development interventions for improved literacy instruction and student learning achievement.

Comprehension and Critical Reading Ability

In the schema-theoretic view of reading, comprehension occurs when readers access relevant schema and use it to construct an interpretation of a text (Anderson, 1984; Anderson & Pearson, 1984; Anderson et al., 1978). Schema, where prior knowledge is stored, is a mental organization of one's experiences and knowledge structured to represent the relationship among its components. Ideas presented in the text are interpreted when the reader picks up specific information from it and then matches it to its equivalent component in the schema. Passages become incomprehensible when a schema is not activated or when relationships among the ideas encountered in a text are not accounted for by the schema (Anderson, 1984; Anderson & Pearson, 1984). The transaction between the reader's schema and the text plays a significant role at all comprehension levels.

The ability to read critically takes place at the evaluative level of the reading comprehension taxonomy (Hermosa, 2002). Comprehension at the evaluative level operates with the literal and inferential comprehension levels (Alonzo et al., 2009; Wolf et al., 1968) that serve as its foundations. Readers with critical reading skills are able to: comprehend at the literal and inferential levels (Basaraba et al., 2013); critically analyze, synthesize, and evaluate ideas (Vacca et al., 2009, as cited in Basaraba et al., 2013), compare and evaluate information in the text with prior knowledge (McCormick, 1992, as cited in Basaraba et al., 2013), and create a personal response, unique interpretation, or elaborate meaning that is beyond the scope of the text (Applegate et al., 2008; Rupley & Blair, 1983, as cited in Basaraba et al., 2013; Yun, 2018). Applegate et al. (2008) defined critical reading as the process of providing a personal response about the text that is logically supported by experiences, beliefs, values, and relevant information drawn from the text. Personal responses are readers' ideas that can take the form of an evaluative judgment about the story elements in narrative texts (characters, events) or story summary or main idea, and problems or solutions presented in informational texts. This definition recognizes the role of the reader's schema in the process of assessing textual information and prior knowledge (Lyman & Collins, 1990) that are both used to draw a personal response (Applegate et al., 2008). Critical reading ability, in this study, refers to the ability to provide an evaluative judgment that is supported by relevant textual evidence and prior knowledge. Evaluative judgments are formed when comprehension at the literal and inferential levels is made.

Critical reading is integral to the four literacy practices in Freebody and Luke's (1990) Four Resources Model. To successfully read different types and forms of texts used in academic and social settings, readers assume four practices when engaging with texts – *breaking the code*, *participating in understanding the text*, *using texts*, and *analyzing texts* (Freebody, 2007; Woolley, 2014). Each of these practices, also viewed as a resource, centers on specific competence readers can develop and draw from (Woolley, 2014). *Breaking the code* focuses on coding competence, which includes knowing and using print conventions, alphabetic, phonological, and phonemic awareness to decode written texts. *Participating in understanding the text* deals with semantic competence, which involves attending to the explicit and implied meaning by using prior knowledge, vocabulary and syntactic knowledge, and connecting ideas presented in different text parts. *Using texts* deals with pragmatic competence, which consists of knowing how different text forms and types serve different purposes to convey meaning. *Analyzing text* deals with critical competence, which includes recognizing biases, opinions, and points of view, and making an opinion or an alternative stand to what is

presented. The four resources are interrelated such that none of them, on their own, will make readers engage with texts effectively in whatever roles they assume in society (Freebody & Luke, 1990).

Metacognitive Awareness and Metacognitive Reading Strategies

Readers with high metacognitive awareness levels skillfully regulate their comprehension by applying metacognitive reading strategies. Metacognition is conventionally defined as the knowledge and the control of one's thinking processes (Baker & Brown, 1980; Israel, 2007; Jacobs & Paris, 1987). In reading, metacognition is the awareness and regulation of one's understanding of a text being read made possible through reading strategy application (Pressley, 2002).

Metacognitive reading strategies are cognitive techniques that readers apply to regulate text comprehension (Israel, 2007; Jacobs & Paris, 1987; Cervetti, 2011, as cited in Keene & Zimmermann, 2013; Shanahan, 2005; Sheorey & Mokhtari, 2001). Empirical evidence confirms that strategies such as clarifying, determining importance, generating and answering questions, inferring, predicting, summarizing, synthesizing, thinking-aloud, using prior knowledge, using text structure, and visualizing lead to improved comprehension achievement (Baker & Brown, 1980; Duke & Pearson, 2009; Keene & Zimmermann, 2007; Pressley, 2002; Shanahan, 2005). The National Reading Panel (2000, as cited in Paris & Flukes, 2005) recommends related strategies associated with the key strategies *Analyzing text features*, *Asking questions to clarify and monitor comprehension*, *Evaluating*, *Summarizing important ideas*, and *Using inferences and imagery* be taught together.

Metacognitive Reading Strategies Instruction

Metacognitive reading strategies instruction enables improvements in young and adult learners' metacognitive awareness, comprehension, and critical reading ability. Various literature recommends that reading strategies be taught through explicit instruction (see Pressley, 2002; Shanahan, 2005) following these four stages: a) presenting the strategy name, purpose, and steps in applying the strategy; b) modeling the application of the strategy; c) practicing the strategy with guidance from a more knowledgeable or skilled person; and d) practicing the strategy independently (Duke & Pearson, 2009; Pearson & Gallagher, 1983). It is through explicit instruction that teachers acquire subject-matter content (Moats & Foorman, 2003). Interventions that applied this instructional method improved learners' comprehension, metacognitive awareness, motivation, self-efficacy, self-perception, and vocabulary, such as those of Depatillo's (2015), Gatcho and Hajan's (2019), Habibian's (2015), Iwai's (2016b), Medina et al.'s (2021), and Tupe and Padilla's (2011).

Medina et al. (2021) implemented a mixed-method approach to examine the effect of a school-based reading strategies professional development intervention on primary teachers' reading strategy knowledge and instruction. They also studied the perceived influence of participants' strategy instruction on their students' reading strategy knowledge and behavior. Grades 1 to 3 teachers (n = 8) from an urban school in the USA participated in the study for one academic year. They received instruction and demonstration on the explicit teaching approach and the use of a lesson framework for planning and implementing six strategy lessons. Participants planned and implemented six strategies from a range of strategies that included activating prior knowledge, asking questions, evaluating, inferring, making connections, monitoring and clarifying, predicting, retelling, and summarizing. Participants were coached, observed, and provided feedback in the delivery of the six lessons using measures to ensure consistency and accuracy in the implementation of the lesson framework. The scores of the researcher-developed questionnaire that assessed participants' declarative, procedural, and conditional knowledge showed an increase after the intervention. Classroom observation results showed that the intervention influenced participants' classroom practices in strategy instruction. Interview results from randomly selected

students who came from participants' classes showed that students learned about a third of conditional, declarative, and procedural knowledge of the six strategies taught to them. Participants reported an increase in their students' reading interest, social interaction with other readers, and an improvement in their reading competence. The researchers concluded that the intervention was beneficial for teachers and students. They noted that proficiency in teacher strategy knowledge might take more than a year to develop.

Iwai (2016b) examined the effects of explicit strategies instruction on metacognitive awareness and perception of reading strategies among students (n = 18) from a university in the USA taking a teacher education program's literacy methods course. Participants received explicit instruction on think-aloud, anticipation guide, and open-mind portrait strategies for 20 minutes every week for one semester. Participants' quick-writing notes about their reflections on the strategies and literacy lesson plans developed, and their reflection papers about the implemented literacy lessons in schools, were analyzed to determine their perceptions about the reading strategies. Results revealed a significant increase in overall metacognitive awareness. The increase in global reading and support reading strategy scores was significant, but the increase in problem-solving strategy scores was not significant due to a high level of awareness of this type of strategy before the intervention. The results also revealed that participants viewed the reading strategies to be helpful for children's comprehension. Iwai (2016b) concluded that explicit instruction was an effective approach to significantly increase metacognitive awareness and develop a positive attitude towards learning the strategies and teaching the strategies to learners.

In Habibian's (2015) study, explicit instruction of metacognitive reading strategies improved the comprehension and metacognitive awareness of ESL Malaysian college students. Participants in the experimental group (n = 24) received 1-hour lessons on metacognitive reading strategies thrice a week for 12 weeks. They received reading strategy lessons on adjusting the reading pace, identifying keywords, monitoring reading, paraphrasing, problem-solving, rereading, self-testing, underlining the main point and specific information, using diagrams, and using prior knowledge. Participants in the control group (n = 24) received reading comprehension instruction without strategy instruction. The result of the standardized comprehension test revealed a significant increase in the mean comprehension score of participants in the experimental group. The results of the researcher-developed, pilot-tested survey questionnaire that measured the frequency of reading strategy use revealed an increase in strategy use. The end-of-training semi-structured interview revealed that a positive view of the strategies was shared among experimental group participants. They found the strategies effective in facilitating comprehension. In contrast, those in the control group were unaware of the reading strategies. Habibian (2015) concluded that reading ability improves with explicit teaching of metacognitive strategies.

Similarly, Depatillo (2015) found improvements in learners' comprehension, metacognitive awareness, and reader self-perception as a result of explicit instruction. Depatillo (2015) examined the effects of explicit reading strategies and basic and critical reading skills instruction among undergraduate students in a suburban region in northern Philippines. Using a quasi-experimental, counterbalanced design, Group 1 (n = 74) received reading strategies instruction first before basic and critical reading, while Group 2 (n = 70) received explicit basic and critical reading skills instruction first before reading strategies. Participants in both groups attended a 90-minute class thrice a week for 12 weeks, where they received metacognitive reading strategy lessons using expository texts as material. They received strategy lessons on activating prior knowledge, adjusting reading speed, paying close attention to reading, previewing, reciprocal teaching (summarizing, questioning, clarifying, and predicting), rereading, setting a reading purpose, and visualizing. Results revealed that learners improve their comprehension, metacognitive awareness, and reader self-perception with explicit metacognitive strategies and basic and critical reading skills instruction.

Gatcho and Hajan (2019) found improvements in eleventh-grade students' comprehension and vocabulary performance after receiving explicit instruction on metacognitive reading strategies. Participants in their quasi-experimental study were from a private school in a highly urbanized city in the Philippines. Experimental group participants (n = 20) completed four 1-hour training sessions that covered strategies for comprehension development (i.e., getting the main idea, making inferences, noting details, summarizing, self-questioning, and monitoring) and vocabulary development (i.e., semantic webbing, context clues, and word formation), which were explicitly taught. The researcher-developed and validated reading comprehension and vocabulary tests showed that experimental group participants outscored the control group participants (n = 20). In addition, the experimental group showed a significant increase in comprehension and vocabulary scores after the intervention. The researchers concluded that explicit metacognitive strategies instruction results in comprehension and vocabulary performance improvement. They also recommended that language teachers receive training on metacognitive strategies.

Tupe and Padilla (2011) also found explicit strategy instruction of reading comprehension to affect high school students' reading comprehension in English and Filipino, awareness of the use of metacognitive strategies in reading English and Filipino, and scholastic performance in English, Filipino, and world history subjects. Third-year high school students (n = 17) from a private school in the Philippines completed 25 1-hour lessons on KWL (Know, Want, Learned), SQ4R (Survey, Question, Read, Recite, Record, Review), and conversing with the author through text annotation. Results revealed a significant improvement in participants' comprehension in Filipino, metacognitive awareness in Filipino, and academic performance in English and world history. There was no significant improvement in their comprehension in English, metacognitive awareness in reading English, and academic performance in Filipino. Participants' learning portfolios and self-reports revealed that the direct teaching of strategies made students aware of the reading strategies. The researchers concluded that strategy use brought about the comprehension of expository texts in English and Filipino and that effectiveness in the use of the strategies could be influenced by students' language proficiency in the first and second languages.

Purpose of the Study

This research directly responds to study findings among teachers in the Philippines that point to the need for reading skill improvement and recommendations from the literature that teachers need metacognitive and critical reading skills for effective literacy instruction, assessment, and intervention. Teachers need to be metacognitively skilled themselves first; without these skills, they would not be able to deliver effective strategy instruction nor influence their students' reading performance. Teachers who are more knowledgeable in content and pedagogical content knowledge in reading are more likely to employ instructional strategies in reading (Jordan & Bratsch-Hines, 2020; Piasta et al., 2009). Conversely, teachers with poor knowledge and abilities in teaching reading cannot provide adequate instruction on reading (see Pedroza & Talili, 2015). In reading, the notion that one cannot be expected to give what one does not have is referred to as the *Peter Effect* (Applegate et al., 2014).

This study specifically aimed to determine whether explicit metacognitive reading strategies instruction, implemented through the metacognitive reading strategies training (MRST), would affect elementary literacy teachers' critical reading ability. The study proposal was carried out after the approval of a research committee, which was the responsible body designated by the university to oversee the proposal's design, methodology, and ethical integrity.

Methodology

Research Design and Participants

This quasi-experimental study implemented a one-group pretest-posttest design. Eleven public elementary school teachers (all female) from a

high-poverty rural region in the southern Philippines participated. They were kindergarten to grade 6 teachers handling English, Filipino, science, math, and social studies. On average, they have served in public schools for 15 years. A school without an established school-based professional learning community was given priority to provide teachers with an opportunity to engage in a training activity for their professional improvement. Additionally, the school was chosen because it had a larger teacher population (greater reach). Access and security going to the school were also considered.

Preliminary Activities

Teachers of the selected school were informed of the MRST and their participation in the intervention, including all assessment activities before and after the intervention, through consultation and orientation meetings where the school head and the researcher explained an option to discontinue their participation at any point of the intervention. Participants gave their verbal consent to participate in the intervention.

Prior to the administration of the test instrument and implementation of the MRST, participants' baseline oral reading and comprehension ability was assessed to identify their membership in the ability groups formed during the MRST sessions and to select the approximate text difficulty level of the passages used by each ability group. Fluency assessment benchmark passages developed by Scholastic, Inc., were used to assess their oral reading fluency, and the same passages were used to assess reading comprehension. The same instrument had been used in teacher development programs to assess teachers' fluency and comprehension (i.e., Cardno Emerging Markets [Philippines] Inc., 2017).

Instrument and Material

Critical Reading Inventory

Critical Reading Inventory (CRI), developed by Applegate et al. (2008), was administered to measure changes in critical reading ability. Its comprehension test has a total of 10 questions that assess literal (40% of the items), inferential (40% of the test items), and evaluative (20% of the test items) skills. Inferential and evaluative test items employ open-ended questions. Inferential questions require readers to use text information and prior knowledge to generate conclusions and predictions, explain implied ideas, and offer other possible solutions to a problem presented in the passage. In contrast, evaluative questions require readers to give a judgment to an underlying theme or an important idea related to the passage and support it. A correct response was scored one point and an incorrect response zero points. A response with correct and incorrect ideas was considered partially correct and marked with .5 points. Interrater reliability for scoring comprehension items is expressed in the percentage of agreement between expert and novice test enumerators. The total interrater agreement was 95.2%. Interrater agreement for informative passages was higher (96.1%) than for narrative passages (94.8%). CRI authors stated that literal, inferential, and evaluative questions are highly interrelated; thus, the validity of different item types was not computed. Informational passages were used at the pretest and posttest. The passage difficulty level selected approximated participants' reading skills reported from studies among teachers' comprehension skills conducted in the southern part of the country of which participants of this research were representative.

The CRI test was administered one-on-one, observing silent reading. The passage was not made available to the participants when the comprehension questions were asked; however, text look-backs were allowed in cases when responses like "I don't know" or "I don't remember" were given or when a request was made. Questions were read aloud, and responses were recorded verbatim. Answers in Filipino were accepted. Follow-up clarification questions were asked when there were vague responses to inferential and evaluative questions.

MRST Lessons

A total of 12 MRST lessons were developed that focused on four key strategies. The key strategy *Making Inferences* included lessons on making connections,

making inferences (explaining implied meaning of events and ideas, generating and validating predictions, inferring causes and effects, and inferring the main idea), and drawing conclusions (from textual evidence, and from textual evidence and prior knowledge). The key strategy *Evaluating* covered the lesson on making judgements. The key strategy *Clarifying and Monitoring* consisted of lessons on asking and answering literal, inferential, and evaluative questions. Finally, the lesson on the key strategy *Summarizing Important Information* focused on summarizing, with three sub-lessons: identifying text structure, identifying main and supporting ideas, and writing summaries. These strategies promote skills for text comprehension (Paris & Flukes, 2005) and making critical judgments (Israel, 2007) and are relevant for adult literacy (Hock & Mellard, 2005). The first lesson in each of the four key strategies went through expert validation and pilot testing. The other eight lessons were produced adhering to the guidelines set by reviewers and considering the observations from the pilot experience.

The lessons followed the stages in explicit instruction: presentation, modeling, guided practice, and independent practice. Each lesson provided participants with two guided and two independent practices using informational passages. Multiple practices enable learners to become independent strategy users (Clark & Graves, 2005) and informational texts develop readers' strategic reading (Marinak & Gambrell, 2007). The passages were differentiated in terms of text complexity in that participants with higher reading scores, as determined by their baseline oral reading fluency and comprehension scores, read more complex texts than those with lower scores. Text complexity increased after every four completed lessons to introduce some challenges, develop motivation, and improve reading stamina (see Dougherty Stahl, 2012; Shanahan et al., 2012; Strong et al., 2018; Wray & Janan, 2013). The selected passages were in English and related to events, innovations, or issues affecting different aspects of one's life (e.g., family, profession, religion, and social life). Texts of interest scaffold learners' reading of challenging texts (Halladay, 2012).

Intervention

A total of 63 sessions (96 hours) were conducted to complete the 12 lessons in four months. On average, sessions were held three to four times a week, with each session lasting 1.5 hours. They were conducted within the school's Learning Action Cell (LAC), the recognized professional learning community in Philippine public schools (Republic of the Philippines, Department of Education, 2016). LAC is a school-, district-, or division-based venue where teachers collaborate to learn and share expertise with the end goal of improving their instructional practices and their students' academic performance. Intervention for teachers on reading strategy knowledge and classroom instruction in a school-based professional development setting was found to improve their reading strategy knowledge and strategy instruction (Medina et al., 2021). Although the MRST lessons and the passages used in the practices were in English, the sessions were conducted in English and Filipino. English was used in the presentation and modeling stages. Participants used Filipino during peer interaction and feedback discussion in the guided and independent practice stages, and their written tasks were completed mostly in English.

Participants were grouped according to their reading ability determined by their fluency and comprehension baseline performance. Based on individual scores, participants were assigned to one of the ability groups: *basic, average,* and *advanced*. Flexibility in group membership was observed by moving participants who completed the tasks with ease and speed to a higher ability group. In addition, participants were supported with different types of scaffolds (i.e., prompts, peer discussion, feedback) to facilitate task completion. However, these were gradually withdrawn or reduced as they progressed through the practices.

Data Analysis Procedure

The Wilcoxon signed-rank test was applied to determine any significant difference in CRI overall and subscale mean scores at .05 level of significance.

The effect size was computed to determine the strength of the intervention on participants' critical reading ability. Additional analysis was carried out to identify the types and causes of comprehension difficulties before and after the intervention to supplement statistical results. Responses to incorrect items (0 points) and partially correct items (0.5 points) in the CRI were analyzed. Consistency in scoring diverse answers to inferential and evaluative questions was observed by annotating textual evidence for rationalizing a correct response or marking answers with unsupported textual evidence in the case of incorrect and partially correct responses. Correct answers to each question were then consolidated and compared against each other to countercheck logic in reasoning. The same process was observed for incorrect and partially correct answers to assess consistency in scores. Incorrect and partially correct answers that exhibited multiple comprehension difficulty types were added to the tally of observed cases. Joint relative frequency and marginal relative frequency were used to compare the most and least frequently occurring comprehension difficulty types overall and before and after the intervention.

Results and Discussion

Critical Reading Performance

The result of the Wilcoxon signed-rank test showed that the overall posttest comprehension score (Mdn = 7.5) was significantly higher than the pretest score (Mdn = 4.5), z = -2.805, p < .05, r = -.59 (Table 1). The test also showed that scores of literal and evaluative questions were significantly higher in the posttest but not for inferential questions. The posttest score of literal questions (Mdn = 3) was significantly higher than the pretest score (Mdn = 1), z = -2.683, p < .05, r = -.57. The posttest score of evaluative questions (Mdn = 2) was significantly higher than the pretest score (Mdn = 1), z = -2.636, p < .05, r = -.56. The overall comprehension and literal and evaluative comprehension effect size value indicate a large effect. The posttest score of inferential questions (Mdn = 3) was higher than the pretest score (Mdn = 2), but the gain was not significant, z = -1.491, p = .136, r = -.31. Insignificant mean score gain at posttest could be due to greater difficulty in answering inference questions. The inferential comprehension effect size value indicates a moderate effect.

Table 1

Summary of Wilcoxon Signed-rank Test for CRI Scores

CRI Measures of Comprehension	Median Score (Pre)	Median Score (Post)	Negative Mean Rank	Positive Mean Rank	z-value	Significance (2-tailed)	Effect Size (r)
Literal	1	3	1.50	7.00	-2.683	.007*	-.57
Inferential	2	3	2.50	5.70	-1.491	.136	-.31
Evaluative	1	2	0.00	4.50	-2.636	.008*	-.56
Overall	4.5	7.5	1.50	6.45	-2.805	.005*	-.59

Note. n = 11. *Significant at α = .05

Comprehension Difficulties

Seven comprehension difficulty types were deduced from 80 pretest and posttest answers to the CRI marked as incorrect or partially correct. The types of comprehension difficulties were: *Accurate-inaccurate ideas, Accurate-relevant-irrelevant ideas, Illogical conclusion, Imprecise concept, Incomplete enumeration, Question miscomprehension*, and *No idea* (Table 2). With some responses exhibiting multiple difficulty types, a total of 92 observed cases were recorded (67 cases at pretest and 25 at posttest). There were 35 observed cases from literal items (29 at pretest and six at posttest), 40 observed cases from inference items (24 at pretest and 16 at posttest), and 17 cases from evaluative items (14 at pretest and three at posttest).

Overall, *Imprecise concept* was the most observed comprehension difficulty type, with *Illogical conclusion* and *Accurate-inaccurate ideas* as the second and third types for all comprehension question types. These three were the main causes of difficulty at pretest and at posttest (Figure 1). The other four types were the least encountered comprehension difficulties, comprising less than 11% of incorrect and partially correct answers. The occurrences of comprehension difficulties for all comprehension difficulty types decreased at posttest, except for *Incomplete enumeration*. *Imprecise concept* was the leading comprehension difficulty identified in literal items (Figure 2). *Imprecise concept* and *Illogical conclusion* primarily characterized responses to inference items (Figure 3). *Accurate-inaccurate ideas* was the main cause of difficulty found in evaluative items (Figure 4).

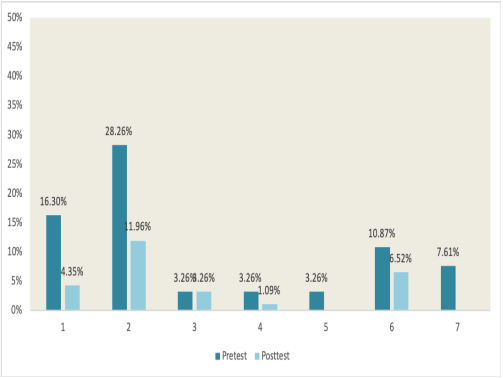
Table 2

Comprehension Difficulty Types

Types	Description
Accurate-Inaccurate ideas	A response that includes a) a combination of accurate and misinterpreted text information or b) a combination of accurate text information and ideas from prior knowledge but are unsupported by the text.
Accurate-Relevant-Irrelevant ideas	A response that includes a combination of accurate and relevant text information with accurate but irrelevant text information.
Illogical conclusion	A response that a) does not answer the question, b) mentions irrelevant text information, or c) is not supported with text information.
Imprecise concept	A response that exhibits misinterpreted ideas or distorted meaning of text ideas.
Incomplete enumeration	A response that fails to enumerate all the facts mentioned in the text.
Question miscomprehension	A word or phrase in a question is misinterpreted to mean something else, or the question is not understood.
No idea	A response such as "*I don't know"* or *"It didn't say in the passage."*

Figure 1

Distribution of Comprehension Difficulty Types at Pretest and Posttests for All Types of Comprehension Questions

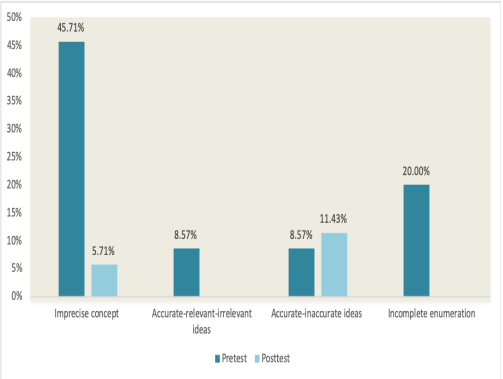


1 – Illogical conclusion; 2 – Imprecise concept; 3 – Question miscomprehension; 4 – No idea; 5 – Accurate-relevant ideas; 6 – Accurate-inaccurate ideas; 7 – Incomplete enumeration*

Notes: There were no questions requiring enumeration of facts at the posttest. 67 cases at pretest. 25 cases at posttest.

Figure 2

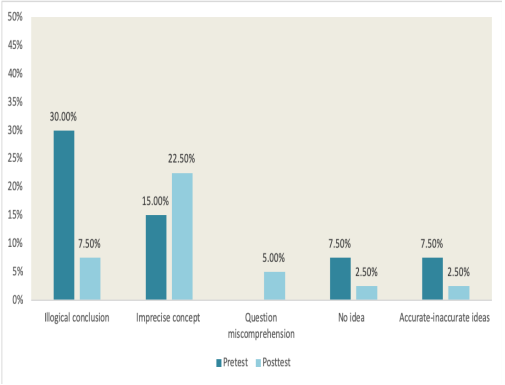
Distribution of Comprehension Difficulty Types at Pretest and Posttests for Literal Items



Note: 29 cases at pretest. 6 cases at posttest.

Figure 3

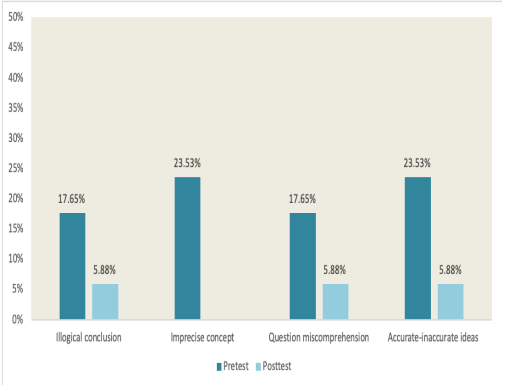
Distribution of Comprehension Difficulty Types at Pretest and Posttests for Inference Items



Note: 24 cases at pretest. 16 cases at posttest.

Figure 4

Distribution of Comprehension Difficulty Types at Pretest and Posttests for Evaluative Items



Note: 14 cases at pretest. 3 cases at posttest.

The significant gain in participants' overall CRI mean score suggests that the MRST improved participants' ability to answer literal, inferential, and evaluative questions. A large effect size means that the intervention was strongly effective in improving their critical reading ability. The results are consistent with the study findings of Depatillo (2015), Gatcho and Hajan (2019), Habibian (2015), Tupe and Padilla (2011), and what the literature generally says about explicit instruction and ways to improve reading skills. Significant mean score gains for literal items and evaluative items and an insignificant mean score gain for inferential items suggest that the intervention was effective in providing a strong improvement in participants' ability to use the strategies to construct literal meaning and evaluative judgment and in providing a modest improvement in their ability to draw inferences. The greater challenge in responding to inference items than evaluative items suggests inferential comprehension is not the easiest skill to acquire among the three comprehension levels. The result is similar to the finding of Bilbao et al. (2016), where elementary and secondary education students demonstrated higher mean scores in evaluative comprehension than in literal and interpretative levels. Participants in their study scored the highest on the creative level and lowest on the interpretative level. Learners can find higher-level comprehension items easier than other lower-level comprehension items, as shown in Basaraba et al. (2013) and Yun's (2018) studies among younger students.

An overall score increase in the CRI also suggests that participants were able to sustain the use of the reading strategies to understand and analyze texts making them more successful readers. Improvement in their critical competence indicates that they can apply the practices of analyzing texts, with the use of the strategies, which allowed them to draw logical opinions or alternative stands to ideas presented in texts (Freebody, 2007; Freebody & Luke, 1990). Participants can provide logical justifications to their point of view on a theme or an underlying meaning of the passage based on their schema, as what evaluative questions in the CRI require. Improvement in participants' semantic competence suggests that they can maintain the practices of understanding texts, with the use of the strategies, which made them more skilled in attending to the explicit and implied meaning by drawing from prior knowledge and inferring the connection of ideas found in different parts of the text (Freebody, 2007; Freebody & Luke, 1990). Despite improvements in critical and semantic competence, participants experienced different kinds of comprehension difficulties. Five comprehension difficulty types — *Accurate-inaccurate ideas, Accurate-relevant-irrelevant ideas, Illogical conclusion, Imprecise concept,* and *Question miscomprehension,* indicate inadequacy in participants' relevant and correct prior knowledge that impaired the identification of text clues, and that led to misconstrued text ideas. The schema that could not account for the things and events presented in a text means a deficit in one's schema (Anderson, 1984; Anderson & Pearson, 1984). This deficit has significantly affected participants' performance in answering inference items in the CRI.

Inference items in the CRI should be answered logically with relevant textual information and prior knowledge to earn a full point (Applegate et al., 2008). *Imprecise concept* was the primary comprehension difficulty type in answering inferential questions even after the intervention, suggesting that participants have inadequate schema to interpret the meaning of concepts in the text accurately and synthesize information found in different parts of the text correctly, leading to text misinterpretation. Imprecision in understanding concepts presented could be caused by incomplete or faulty schema (Cromley & Azevedo, 2007; Dochy, 1992, as cited in Hailikari, 2009). Precision in concept is necessary to satisfactorily answer inference items in the CRI (Applegate et al., 2008).

Unskillful text integration or weak text-connecting inference skills also lead to distorted text interpretation. The construction of accurate text representation is facilitated by the reader's text-connecting skills (Basaraba et al., 2013; Perfetti et al., 2005). Participants' answers categorized as *Imprecise concept* could also contain distorted ideas due to their inability to establish connections between and among ideas found in different parts of the texts (local and global coherence)

to construe a coherent representation of the text, which is needed for inference making. An incomplete schema prevents readers from recognizing relevant text information (Anderson, 1984; Anderson & Pearson, 1984). A deficit in text-integration skill or text-connecting inference skill led participants to answer inference questions incorrectly.

Comprehension difficulties were caused by one or a combination of factors that include inadequate schema, unskillful text integration, inability to respond logically to questions with implied answers, and weak memory recall. Most of the comprehension difficulties were reduced due to the improved quality of critical responses formed brought about by participants' effective use of the strategies. Imprecise concepts remained the main source of miscomprehension at posttest, particularly for inference items. This comprehension difficulty is not easy to overcome because it deals with one's depth of conceptual understanding.

Conclusions and Recommendations

This study investigated the effects of MRST intervention on critical reading ability among elementary literacy teachers. The overall CRI mean score significantly increased after the intervention, indicating improved critical reading ability brought about by their participation in the MRST. There was a significant mean score increase for literal items and evaluative items but none for inference items. Participants' lack of conceptual mastery or their inability to grasp the meaning of concepts with precision mainly caused the difficulty in answering inferential questions.

The findings imply that metacognitive reading strategies taught explicitly effectively improve the ability to form critical responses drawn from relevant prior knowledge and textual evidence. The intervention was effective in providing a strong improvement in participants' ability to use the strategies for literal and evaluative comprehension and in providing a modest improvement in their ability for inferential comprehension. Future studies should investigate how teachers' metacognitive awareness and critical reading ability affect or relate to literacy instruction. Further investigations can also examine the impact of teachers' metacognitive awareness, critical reading ability, and strategy instruction on their students' metacognitive awareness and critical reading ability.

Findings also imply that inference skills can be harder to learn than evaluative skills, but evaluative comprehension is not always easy to master. Readers' poor schema and weak integration skills mainly bring about difficulties in making inferences and creating critical responses. Professional development interventions for in-service teachers should then be designed to cover topics that would enhance their metacognitive awareness, critical reading skills, and subject-matter knowledge. Assessment of pre-service teachers' knowledge and abilities in these aspects is recommended to address any learning gaps early on in their teacher education preparation.

This study and earlier studies revealed a non-linear relationship between inferential and evaluative comprehension. Questions about why and how this occurs remain unexplained. To this end, further investigation to explore the factors or reasons that make evaluative skills easier to develop than inferential skills is warranted.

The context in which the intervention took place indicates that continuous school-based professional development interventions for teachers can be a potential resource for improving teachers' knowledge and skills, provided that conditions for a supportive learning environment are present. A supportive learning environment includes 1) providing sufficient scaffolds for task completion, ample time for skill practice, and timely feedback; 2) iterative learning to allow mastery of the targeted skill; and 3) engaging participants in peer interactions.

The study's sample size was small; thus, any future investigation should use a larger sample size to increase statistical strength and generalizability. In addition, it is recommended that a third party implement the administration and analysis of constructed-response tests to strengthen reliability and reduce bias.

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