

The effectiveness of the methods of reciprocal teaching

As applied within the NSW primary subject *Human Society and its Environment*: An exploratory study

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Abstract

Reciprocal teaching (RT) is a process involving four distinct activities (questioning, clarifying, summarising and predicting) employed in a student-led, team approach to develop reading comprehension skills among primary students. In this study a series of readings were prepared for a topic taught within the NSW key learning area of Human Society and its Environment (HSIE). The readings were used in a study comparing the effects of RT with those of a more traditional approach to reading. A mixed-method procedure was employed with 25 Year Four students who were divided into two groups (control and experimental) balanced for age, sex and ability. Both groups were pre- and post-tested for their knowledge of information supplied within the readings. An analysis of variance of the results indicated no detriment to the use of the RT procedures in comparison to the effective traditional approach taken by the home-teacher. Further, exit interviews with, and journal entries of students from both groups suggested that while the students in the control group viewed reading as a decoding process, the students from the RT group had begun to internalise the questioning and clarifying strategies and viewed reading as a process of dealing with ideas (comprehension).

Introduction

The average worker of the future will need the ability to gather, organise and interpret information of all types (Rowe, 2005). In order to prepare students for their future roles in life, teachers need to ensure that cognitive and metacognitive reading skills are explicitly taught to their students (Rowe, 2005). Research indicates that poor readers evolve into poor thinkers who lack the strategies needed to think

and write well (Afassi, 2004). The ability to read with discernment and write with clarity contributes greatly to academic success and teachers who fail to teach effective literacy skills to their students are not preparing them for their future (Stefani, 1998).

This paper reviews the broad detail of the reading process and introduces reciprocal teaching (RT) as one means of developing sound literacy skills while at the same time developing students' ability to think critically (Biggs & Moore, 1993; Carr, 1990). The paper presents the results of a mixed-method pilot study with a Year Four class within the subject, Human Society and its Environment (HSIE), in which the RT strategies were compared with those of an effective but more traditional approach to reading text appropriate to the subject.

The reading process

Successful reading depends upon the simultaneous occurrence of two basic processes—text decoding and the comprehension of the resulting string of words (Kirby, 1988). Text is the collective name for the symbols that code elements of word-sounds (phonemes). Initial decoding involves the feature-identification of letters and their association with the essential phonemes that compose words (Grainger & Ziegler, 2008). By running these sounds together in their sequential order, the reader recreates the coded words. While early decoding requires concentrated effort and working memory involvement, practice permits skilled readers to automatically identify words from the sequential clustering of their constituent letters and ultimately from word shape itself (Seymour, 2008).

Comprehension is a function of working memory and begins at the word level (Just & Carpenter, 2002; Kirby, 1988). Strings of words create ideas that are given context and meaning through the involvement of structured knowledge (schemata) already coded

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into memory through prior experience. Thus, structured prior knowledge provides the guide as the basic ideas, gleaned from the text, are built into main ideas and themes. Because of the involvement of prior knowledge, comprehension is a top-down process and in order to ensure the efficiency of the comprehension process, the bottom-up decoding process needs to be made automatic so that working memory is free to throw its entire capacity into making sense of the text (Just & Carpenter, 2002).

Successful decoding alone is insufficient to ensure that readers understand text (Biggs & Moore, 1993). During early reading development many young readers can quickly learn to decode the appropriate word-sounds while understanding little of what they have read. Simply put, comprehension can fail even when decoding is successful. Teachers can compound this problem by focusing on decoding skills at the expense of comprehension.

One way of promoting early development of reading comprehension and critical thinking skills is to teach primary students a metacognitive approach to reading. Metacognitive practices combine three components of reading knowledge: a general knowledge of the reading process; awareness of personal strengths and weaknesses; and knowledge of the purpose for which the reading is being undertaken (Kirby, 1988). Metacognitive readers are aware that: focused attention is required in order to comprehend text; attention wanes over time; attention is greater if the reading material is interesting; and comprehension is greater if the material is familiar. Metacognitive readers are aware of their own proclivities and maximise their strengths and minimise their weaknesses. Metacognitive readers approach reading with a purpose and seek only the information that is relevant to this purpose. Finally, metacognitive readers create a record of the information necessary to their purpose. As a result, metacognitive readers plan for reading, monitor the process and judge the results of reading (Krause, Bochner & Duchesne, 2003). Metacognitive reading strategies can be taught at all levels (Center, 2005; Laverpool, 2008) and one way of teaching young readers to be metacognitive is to employ the procedures of RT (Biggs & Moore, 1993; Brown & Palincsar, 1985; Palincsar & Brown, 1983).

Reciprocal teaching (RT)

From a review of the literature in relation to reading comprehension, Palincsar and Brown (1984), concluded that effective reading comprehension was related to the following six key points:

- understanding both explicit and implicit meanings within text;

- activating appropriate and related background knowledge;
- focusing on prime content and excluding trivia;
- critically evaluating the content for internal consistency and comparing the content with existing knowledge;
- using periodic reviews as a part of ongoing monitoring of comprehension;
- drawing inferences to test predictions, interpretations and conclusions.

From this foundation, Palincsar and Brown (1986, p. 772) developed the RT process that, in their design, occurs within a social setting in which students work in teams numbering four or five students. Members of these teams are to take turns in reading the text aloud while other team-members follow the passage. Reciprocation occurs as each team-member successively assumes the responsibility of the instructor / coordinator for the team. The role of the instructor / coordinator is to lead out and ensure that the four strategies of RT, as listed below, are appropriately implemented. Firstly, these strategies are taught and modelled by the teacher who progressively passes responsibility for their implementation to the teams while monitoring and scaffolding the function of each successive instructor / coordinator within each of the teams. The four strategies are:

Questioning: The text is read and questions are posed about the content. When questioning the text, students are to concentrate on the main ideas and check their immediate level of understanding.

Clarifying: While the text is being read, students are to critically evaluate the meaning of unfamiliar words and phrases and to draw upon the collective knowledge of the team members. In addition, they are to seek the essence of ideas, main ideas and themes contained in the text.

Summarising: When summarising, students are to re-state the main ideas and themes in their own words to ensure that they have fully understood them.

Predicting: At critical points in the reading of the text students are to pause to draw and test inferences from the text about future content.

Initially, teachers closely monitor the implementation of the four strategies, stepping in to correct and scaffold student-efforts. Over time, the student-run teams are to take increasing responsibility for the process, permitting the teacher to progressively remove him- or herself from team mechanics and to concentrate on facilitating and managing the process (Brown, 1986; Palincsar & Brown, 1986). Even so, teachers continue to provide feedback to student-teams about their implementation of the process.

“Reciprocation occurs as each team-member successively assumes the responsibility of the instructor / coordinator for the team”

A number of authors have commented on the strengths of RT (Biggs & Moore, 1993; Carter, 1997; Emms, 1988; Hart & Speece, 1998; Hattie, 2009; Moore, 1988). Firstly, it is an open process. The skills of effective reading comprehension are usually covert and poor readers can be unaware of strategies employed by the successful readers among their peers. RT makes the basic skills of effective reading comprehension visible to all. Since the process is open the teacher is able to evaluate each student's development of the strategies and provide specific feedback. Secondly, devolving team-leadership upon the students themselves increases the likelihood that basic reading skills will be internalised. Rotation of the leadership means all team-members will have the opportunity to internalise these skills. Thirdly, the social nature of the process makes it enjoyable and age-appropriate. In addition this social aspect reinforces the internalisation of skills. Fourthly, the RT process can be adapted and taught to almost any age-cohort and can even improve the reading skills of learning disabled students. Fifthly, the RT process operates within the Vygotskian Zone of Proximal Development of each student. Here, both the teacher and peers are available to scaffold individual student-efforts. Thus each student is permitted to develop reading skills at their own rate. Finally, there is strong evidence that RT is an effective teaching method that produces notable improvements in reading comprehension (Hattie, 2009).

Extending RT processes beyond literacy classes in English

For the most part, the exploration of the effectiveness of the RT process has been limited to literacy skills in the subject of English. Despite this, there have been occasional extensions into other subject areas. For example, Palincsar and Brown (1986) demonstrated that RT could be successfully employed with text arising from the disciplines of Science and Social Studies. In view of this, Hashey and Connors (2003) argued that the processes of RT should be regarded as a means of supporting curriculum implementation of literacy skills in subjects other than English.

This study examines the use of RT methods with a class of Year Four students using text prepared for the NSW subject of HSIE.

Research questions

- Can RT be applied to reading passages used with a Year Four class in the NSW subject of HSIE without impeding the learning that should take place?

- Is there evidence to suggest that, when the RT strategies are applied to reading passages employed in the subject of HSIE, students internalise and benefit from the skills involved?

Research method

This study was conducted with a regular Year Four class during the first author's practicum internship in the fourth year of his degree program. The study had the approval of a Human Research Ethics Committee and permission to conduct the study was sought and received from the respective authorities, including the parents of the Year Four students. Data were collected by a combination of quasi-experimental and qualitative methods.

Quasi-experimental approach

The initial plan involved the use of Raven's progressive matrices to provide a measure that would permit the students to be divided into two groups (an experimental group and a control group) that were balanced for sex, age and ability. However, the class teacher employed her prerogative to choose the two groups based on her knowledge of their backgrounds, abilities and social interactions. Her objective was not only to have two groups of roughly equivalent spreads of age, sex and ability, but two groups that were socially cohesive and easy to manage.

Both groups were exposed to the same set of prepared readings in the topic, 'Notable Events and Places in Australian History', within the HSIE Key Learning Area. The control group was taught by the class teacher who used her normal mode of instruction. Her reading strategies involved: directing the students to read aloud; using silent reading; teacher-led questioning; requesting re-reading of elements of text where she deemed this to be necessary; requiring the students to highlight elements of the text; and completing written exercises related to the readings. The experimental group was taught by the first author who employed RT procedures in handling the same readings. The RT method was explained and modelled. The students in the experimental group were divided into three teams of four students who initially employed the questioning and clarifying strategies and later added the summarising and predicting strategies.

Both the experimental and control groups were pre- and post-tested for their knowledge of the information contained in the readings. The objective was to compare the learning that took place in the experimental group with that of the control group.

The pre-test and post-test included a common core of questions in which a rubric was used for the purpose of marking. The quantitative data arising

“RT makes the basic skills of effective reading comprehension visible to all”

Table 1: Group membership by sex and age in years and months

	Control group	Experimental group	Total
Sex in each group			
Female	8	9	17
Male	5	3	8
Subtotal	13	12	25
Age in years and months			
8y 0m – 8y 5m	0	1	1
8y 6m – 8y 11m	3	2	5
9y 0m – 9y 5m	6	7	13
9y 6m – 9y 11m	4	2	6
Subtotal	13	12	25

Table 2: Descriptive statistics for the ages of students and for their scores on the Ravens Matrices test as set against their group membership

Grouping	N	Mean	Standard deviation	Variance	Standard error mean
Age in months					
Control group	13	111.38	4.33	18.75	1.20
Experimental group	12	110.42	5.25	27.56	1.52
Ravens Matrices					
Control group	13	37.85	4.02	16.14	1.11
Experimental group	12	37.50	9.23	85.17	2.66

from this component of the research was subjected to descriptive analysis and the pre-test and post-test was subjected to statistical analysis.

Qualitative approach

The qualitative data was generated from student interviews, classroom observations and individual journal entries. Four representatives of varied abilities (as determined by their score on the Ravens Matrices test) were chosen from the control group and from the experimental group to participate in the semi-structured interviews. These were conducted following the completion of the unit and the post-test. Questions were neutral in nature and designed to avoid leading the participants. The key questions included:

- What did you enjoy?
- What did you learn?
- What was important to you?
- Has this unit helped improve your reading skills?
- How were you able to answer the questions?

Data was recorded in field notes by the first author.

In addition, all students were given four opportunities to make journal entries about their respective experiences. Three of these came during

the teaching of the unit and the fourth was made at the completion of the unit but prior to the post-test. These were based on a set of stimulus statements and were followed by a free response section. The stimulus statements included:

- Things I found interesting;
- Activities I enjoyed;
- Things I want to know about;
- My comments.

Results

It can be seen from Table 1 that there were twice as many girls as boys in the Year Four class and that the control group contained two more boys than the experimental group. The table also indicates a fairly even distribution of participants by age. Table 2 provides the mean ages and the variances for age for the two groups and the means in measures of ability of the two groups (using Ravens Matrices). T-tests indicated no significance in the means for age ($t = 0.51$; $p = 0.65$) and in the means for ability ($t = 0.12$; $p = 0.91$).

These results permit the assumption that, for the purposes of the study, the control group and the experimental group were alike in terms of their ages, sex and ability. There is another implication here as

“All students were given four opportunities to make journal entries about their respective experiences”

Figure 1: Representation of the pre-test and post-test scores for the control and experimental groups

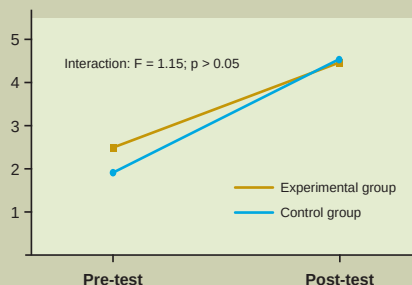


Table 3: Mean scores for the control and experimental groups as measured by the core-items included in the pre-test and post-test of knowledge gained from the set readings

Grouping	N	Mean	Standard deviation	Variance
Core items—pre-test				
Control group	13	1.92	0.760	0.578
Experimental group	8	2.50	1.195	1.428
Mean / Total	21	2.14	0.964	1.00
Core items—post-test				
Control group	13	4.54	1.330	1.77
Experimental group	8	4.50	1.195	1.43
Mean / Total	21	4.52	1.250	1.60

Table 4: Tests of significance in the differences in mean scores for the control and experimental groups as measured by the pre-test and post-test of knowledge arising from the set readings

	Sum of squares	df	Mean squares	F	Sig.
Pre-test					
Between groups	1.881	1	1.881	1.343	0.260
Within groups	29.423	21	1.401		
Total	31.304	22			
Post-test					
Between groups	0.108	1	0.108	0.068	0.797
Within groups	33.631	21	1.601		
Total	33.737	22			

well. The class teacher chose the members of the two groups based on her knowledge of her students. These results also indicate that this knowledge was both intimate and accurate.

Implications of the quantitative data

Table 3 indicates that the average of pre-test scores for all students was 2.14, while the mean scores on the pre-test for the control and experimental groups were 1.92 and 2.50 respectively. Analysis of variance (see Table 4) indicated that the mean scores for the control and experimental groups on the pre-test can be regarded as equivalent ($F = 1.34$; $p = 0.26$).

The intervention involved the use of the readings by both the control and experimental groups. In the control group, the class teacher employed her traditional approach to reading. In the experimental group, the first author employed the procedures of RT. In each team, the role of leader rotated as each new reading was introduced.

The post-test was administered at the conclusion of the intervention period. The mean score for all

students in the class was 4.52 while the mean scores for the control and experimental groups on the post-test were 4.54 and 4.50 respectively (see Table 4). Again the ANOVA (see Table 4) indicated no difference between the post-test mean scores for the control and experimental groups ($F = 0.68$; $p = 0.80$). These results are represented in Figure 1.

In relation to the pre- and post-tests, the questions to be answered are:

- Did learning take place in both the control and experimental groups?
- How did the learning in the experimental group compare with the learning in the control group?

A 'mixed between—within subjects' MANOVA was used to test these questions using the SPSS General Linear Model with repeated measures (Kinnear & Gray, 2008). The main effect (see Table 5) indicated that the post-test scores were significantly greater than the pre-test scores for both groups ($F = 64.5$; $p < 0.00$) suggesting that learning took place in both groups. The measure of effect size (partial eta squared = 0.77) suggests that these

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learning gains were meaningful. However, there was no interaction between group membership and the pre-test and post-test scores ($F = 1.15$; $p = 0.30$) suggesting that group membership had no effect on the learning that occurred.

These results indicate that there was no disadvantage in terms of the acquisition of content knowledge from the readings to the students placed in the experimental group where they undertook instructional activities involving RT as compared to the control group where students received teacher-focused reading instruction. This parity is doubly significant, given that the class teacher was experienced and had an intimate knowledge of her students while the first author was an internist who was new to the school. Further, the class teacher employed an array of effective teacher-focused direct teaching strategies. Thus, it can be argued that RT strategies in the hands of a teacher still gaining experience were comparable to a more traditional approach under the direction of an able and experienced teacher.

- A further question now needs to be asked:
- Is there evidence to suggest that Year Four students in the experimental group internalised and benefited from the processes of RT?

The answer to this question lies in the qualitative data collected in the study.

The qualitative data

Research data was gathered from teacher-observations, student comments during the interviews and statements written in the student journals. The data suggests the following in relation to reciprocal teaching:

- Students from the experimental group appeared to engage enthusiastically with the RT process and reported enjoyment of it.
- The RT strategies provided a structured place for the expression of curiosity.
- Interviews and the students' journal entries gave evidence that the strategies of questioning and clarifying were generally internalised by the students in the experimental group.

- Through questioning and clarifying, students in the experimental group engaged with ideas arising from the text.
- The strategies of predicting and summarising appeared to be more difficult to master and the evidence suggests that the internalisation of these latter skills takes more time than for questioning and clarifying.
- The RT strategies changed the way students of the experimental group perceived the reading process.

Each of these six points will be addressed in turn.

Once the reading teams in the experimental group caught the intention of the questioning and clarifying strategies, they appeared to assume ownership of the process and were observed to enter into the activities with considerable enthusiasm. They scoured the text in a purposeful manner in order to create questions, locate points to be clarified or find answers to questions and explanations for obscure points. To the intern teacher, the nature of student involvement had a different feel to it than did their involvement in those sessions in which they responded to teacher-initiated activities and questions.

The RT framework provided a structured means of helping the students interrogate the text. Students gave evidence of mastering the questioning and clarifying strategies and used them to involve each other in the information included within the text. For example, the ancient roots of Aboriginal culture and the long occupancy of the Australian continent by Aboriginal peoples captured the attention of all the reading teams and there was prolonged discussion with conjectures of amazement. Six students from the experimental group commented on this fact in their journals. In comparison, only one student from the control group made reference to the ancient roots of Aboriginal culture. A second example of the value of the structured place for student-initiated questions within the RT strategies comes from an interview with a student from the control group. During this interview Student 8 asked the question, “Why did Charles deGroot cut the ribbon for the

Table 5: ‘Mixed between-within groups’ MANOVA providing main effects and the interaction for the pre-test and post-test

	Type III sum of squares	df	Mean square	Partial eta squared	F	Sig.
	448.72	1	448.72	0.93	261.34	0.00
Group	0.72	1	0.72	0.02	0.42	0.53
Pre-test / post-test (main effect)	52.75	1	52.75	0.77	64.50	0.00
Pre-test / post-test* group (interaction)	0.94			0.05	1.15	0.30
Error (pre-test / post-test)	15.54	19	0.82			
Error	32.62	19	1.72			

opening of the Harbour Bridge?" Later during the same interview, supplementary questions led to a discussion of Aboriginal culture and she made the statement, "I would like to hear one of their stories and see one of their dances." Her query and statement indicate the kind of curiosity that leads to in-depth understandings. From the nature of the exchange within the interview, it appeared that neither the question nor comment was made in the control group class session. However, both question and comment would have had a legitimate place within the RT strategies, and Student 8 would have benefited from the discussions that her questions and comments would have provoked within an RT reading team.

During the end-of-activity interviews the students from the experimental group either directly referred to or implied benefit from the RT strategies. For example, Student 23 stated that through clarification she "had learned different words and how to pronounce them." Student 24 said that questioning and clarification had "helped my concentration" and Student 6 indicated that questioning and clarification had improved her reading skills because "we were reading and spelled out [and talked about] the words we didn't know."

There is evidence that the strategies of questioning and clarification stimulated the students of the experimental group to engage with the ideas within the text. For example, in response to the journal stimulus statement, 'Things I found interesting', all members of the experimental group listed a minimum of two items covered in the unit. In contrast, five students from the control group offered no response at all. Further, in response to the stimulus statement, 'Things I found interesting', eight participants from the experimental group listed items of information and three of these eight listed two or more items of interest. In contrast four students from the control group listed one item of interest each. Observation indicated that the students in the experimental group reading teams actively processed information gleaned from the text as they questioned and clarified points of information. It can be argued that the use of these two RT strategies by the students encouraged them to engage with the ideas described in the text. Further, there is the suggestion that placing the responsibility for the employment of these two strategies upon the students themselves increased the depth and quality of the processing of the information.

The descriptions above indicate that the two strategies of questioning and clarifying were more fully utilised than were the strategies of predicting and summarising. For example, questioning and clarifying were mentioned or inferred by all students of the experimental group in either the journal or the interviews. In particular, Students 3, 7 and 16 stated

that the clarifying strategy had helped them learn new words. Student 3 said, "Yes, [through clarifying] I have learned different words and how to pronounce them." In contrast, only one student, Student 23, described the usefulness of all four strategies. It appeared that she was the first student to gain a real understanding of the process of summarisation when she stated that "Predicting was helpful. Summarisation means going through the paragraph and remembering what happened."

There is evidence that the RT process broadened the perception that students of the experimental group had of the reading process. For example, during the interviews three students from the control group responded to the question, "Has this unit helped improve your reading skills?" with a simple "No." Of these, Student 8 (who scored highly on the Ravens Matrices test) asserted that she was already "a good reader". Of the experimental group, three students indicated that their reading comprehension had improved and indicated that the clarifying strategy helped them most. As indicated above, Students 3, 7 and 16 indicated that the process of clarification had helped improve their vocabulary. The implication here is that the students of the experimental group began to link reading with the process of understanding, where as, it is likely that Student 8 perceived the reading process as one of decoding.

The foregoing paragraphs described the beneficial effects of implementing the four RT strategies. While they do not describe the teaching procedures of the home teacher, evidence suggests that she was highly competent and experienced. From her knowledge of her students, she was able to divide them into two groups that were balanced by age, sex and ability and in addition, the two groups were socially cohesive. In response to the specific question about enjoyment of the unit, all students indicated that they had enjoyed the unit content, the activities and the assignments.

Conclusion

This pilot study was undertaken to explore the benefit that the use of the four strategies of RT might bestow upon a class taught by a preservice teacher. In answer to the first research question, the results indicate that, in terms of the knowledge of content of the prepared readings, the students in the experimental group performed as well as the students from the control group. Hence, the students exposed to the RT strategies were not disadvantaged in relation to the knowledge of content. In other words, it can be argued that the RT strategies provided a structure that permitted an inexperienced preservice teacher to function in the manner of an experienced and knowledgeable teacher.

“Placing the responsibility for the employment of these two strategies upon the students themselves increased the depth and quality of the processing of the information”

“**Students’ involvement with the RT strategies changed the way they viewed the reading process**”

In response to the second research question, there is evidence that the students of the experimental group benefited from the use of the RT strategies in ways other than knowledge of the content of the readings. They gave evidence of finding the process interesting and were enthusiastic in their involvement. The RT process provoked curiosity and caused them to engage with the ideas within the readings. They also gave evidence of internalising particularly the strategies of questioning and clarifying. Finally, students’ involvement with the RT strategies changed the way they viewed the reading process. They appeared to implicitly see the process of reading as more than the decoding of text; it had become a way of deciphering the meaning implied by the readings.

Finally, the study indicates that RT strategies, which are intended to develop the skills of reading comprehension, can be extended to readings in subjects such as HSIE. As such, the RT process can be extended to all other subject areas that include subject-specific text, such as Science, Technology, History and so on. It must be remembered that RT is not a short-term process, but one that can be and should be continued throughout the years of primary and secondary education. Its use over time will also permit students to master the skills of summarisation and prediction. Most importantly, the RT process becomes a means of making literacy skills a major focus of education. **TEACH[®]**

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