Teaching Year 8 students with Learning Difficulties to use paraphrasing strategies improves reading comprehension.

ABSTRACT

Many students within the secondary school level continue to encounter significant difficulties with reading comprehension. Paraphrasing, is one strategy that has been shown to improve reading comprehension ability in students with and without Learning Difficulties. Therefore, further investigation into the ability of students with Learning Difficulties to use the paraphrasing strategy, in the secondary school level was targeted in this study. Working Memory has also been raised as a possible sub-skill underlying poor comprehension ability and therefore this was also explored. The hypothesis was that teaching Year 8 students with Learning Difficulties to use paraphrasing strategies improves reading comprehension. However, lower Working Memory ability scores predict poorer paraphrasing and reading comprehension ability. Twenty four students with Learning Difficulties from two existing Year 8 classes were compared, with one class of 12 being exposed to ten paraphrasing strategy lessons, and each student's Working Memory measured. Results found the paraphrasing strategy to improve reading comprehension, however Low WM did not predict poorer paraphrasing or comprehension ability. Possible factors contributing to the varying results found with the relationship between working memory and paraphrasing and comprehension ability are raised. Implications for the classroom include the need for explicit teaching in the use of the paraphrasing strategy and other memory and executive functioning strategies to enhance reading and educational achievement.

INTRODUCTION

One of the many difficulties that individuals with Learning Difficulties face is with Reading Comprehension. As Oakhill, Hartt & Samols (2005) suggest there are children with specific comprehension problems whom are defined by their ability to develop good decoding skills but fail to understand what they have read. These authors refer you to Cain & Oakhill (2004) for a summary of the research. Seigneuric & Ehrlich (2005) note that research has focused far more on the development of decoding skills than the development of reading comprehension. However, the importance of understanding and facilitating reading comprehension is paramount, because after all, this ability to comprehend, is essentially seen as the ultimate goal or main purpose of reading, which is reinforced by Goff, Pratt & Ong (2005).

Unfortunately, there are many students whom continue to encounter significant reading comprehension problems throughout their secondary schooling. One of the many factors that may play a significant role is Working Memory (WM). As Seigneuric & Ehrlich (2005) discuss based on their findings, WM becomes an integral determinant of reading comprehension in the later years after word recognition becomes automated in the early grade levels. These authors note that WM is one of the main sub-skills, along with vocabulary knowledge that has been most explored as contributors to reading comprehension problems. Nevertheless, there is no general agreement as to which skills contribute most to reading comprehension (Goff, et al., 2005). Goff et al. (2005) explored decoding, language variables and working memory as underlying factors predicting reading comprehension. They found word reading and language variables to have a much stronger relationship with reading comprehension than memory, with orthographic processing being the strongest independent predictor. Bayliss, Jarrold, Baddeley & Leigh (2005) also found WM span was not closely related to sentence comprehension in the individuals with Learning Difficulties, but noted differences in the typically developing children. They discuss the possibility of different memory processes and means of approaching learning tasks, between students with and without Learning Difficulties.

Despite the findings from the above two studies, there are many studies that have found WM to be a direct predictor, or to be a related sub-skill, to Reading Comprehension (Seigneuric & Ehrlich, 2005; Gathercole, Alloway, Willis & Adams, 2006; Swanson, Saez & Gerber, 2006; Carretti Cornoldi, De Beni & Romano, 2005; Fedorenko, Gibson & Rohde, 2006; Alloway, 2007; Oakhill, Hartt & Samols, 2005).

The relevance of WM in reading is discussed by Carretti, et al.(2005). It is suggested that to maintain general understanding of a text the reader must update or change the content of memory from previous irrelevant information, with new information. Carretti, et al.(2005) explored whether a specific difficulty in the WM updating process (ie, controlling for information that's no longer relevant) resulted in deficiencies with poor comprehension. They found evidence to suggest that the relationship between reading comprehension and WM is mediated by the ability to control for irrelevant information. Fedorenko, et al. (2006) however concluded that it is difficulties at the retrieval stage of the memory process that interferes with sentence comprehension. They do however entertain the possibility that difficulties at the encoding and/or maintenance stage of memory may explain difficulties. Seigneuric & Ehrlich (2005) note that poor comprehenders have been found to perform more poorly

on WM tasks that require coordinating both storage and processing. Building integrated mental representations, which is crucial for text comprehension reportedly makes heavy demands on both the processing and storage functions of memory (Baddelely, 1986, cited by Seigneuric & Ehrlich (2005).

The underlying relationship between WM tasks and phonological ability is also emphasised in the research. Swanson, et al. (2006) discuss how memory measures (ie, Short-Term Memory) tap a phonological system which they note was identified by Baddeley (1986) as the phonological loop. This phonological loop is reported to involve a speech based phonological input store and a rehearsal process. Poor phonological memory is assumed to be related to a weak phonological store and those with difficulties with this phonological loop are reported to be unable to temporarily hold unfamiliar phonological forms of information to enable a more permanent memory representations. For a review of the link between the phonological memory component and discussions regarding how the phonological component of memory plays a major role in reading, Swanson et al. (2006) suggest Baddeley, Gathercole, & Papagno (1998).

Gathercole et al. (2006) discuss the distinction between WM scores simply reflecting contributions of phonological Short Term Memory (STM) abilities. They highlight that WM is related to but distinguishable from STM, and in their study provide support for the distinction by highlighting that phonological STM performance was not significantly impaired in children with reading disabilities yet WM skill independently predicted the children's attainment in reading. They concluded that phonological STM alone does not lead to substantial Learning Difficulties. Swanson, Saez, Gerber & Leafstedt (2004, cited by Swanson et al., 2006) also found a similar result highlighting the different contribution of STM and WM to reading. Seigneuric & Ehrlich (2005) also highlight other studies showing poor comprehenders performing more poorly on WM tasks involving the coordination of both storage and processing, but comparable STM scores between good and poor comprehenders. Therefore various WM processes, including encoding, storage, maintenance, updating, retrieval and phonological processes, have emerged as significant contributing sub-skills to reading comprehension in the research.

Munro, Chan, Huggins & Dalheim (2007) discuss several other reasons contributing to poor comprehension. These are typically more overt or readily observed and measured. These factors, which relate to the reader's linking of ideas, include vocabulary knowledge, word identification, fluency in reading, making predictions and building images of the text. Parker, Hasbrouck & Denton (2002) also support these as factors impacting on comprehension by noting the following as key determinants: failure to understand key words and key sentences, how sentences relate to one another and how the information fits together in a meaningful way, interest and concentration. Expository texts are believed to be more difficulty than narrative texts for students to comprehend (Kucan & Beck, 1997, cited by Munro, 2002), and this is particularly relevant to secondary school students given their need to read expository text to effectively learn in Key Learning Areas such as science, technology, economics and social science, as discussed by Lapp, Flood, & Ranck-Buhr (1995, cited by Munro, 2002). There is therefore an urgency within the secondary school level, for specific learning strategies to enhance students reading comprehension. As Fisk & Hurst (2003) suggest, Paraphrasing for comprehension can be used and be of

benefit not only in primary school but also at the secondary school level, given it offers students a reason to read and also encourages motivation to continue reading and learning. Munro (2002) used paraphrasing as part of a set of High Reliability Literacy Teaching Procedures within secondary schools, and found these strategies to enhance their learning and literacy knowledge. The use of these Teaching Procedures were further investigated at the secondary school level in later research by Munro (2003). This study found that all year levels made substantial improvement in reading comprehension, however paraphrasing and summarising were the best predictors of gains in comprehension for the younger secondary school students.

Paraphrasing as a learning strategy has been shown to significantly increase the reading comprehension skills of students with and without learning disabilities (Katims & Harris, 1997). In a study by Munro, et al.(2007), whom taught explicit comprehending strategies to students with Learning Difficulties in grades 3-6, paraphrasing was found to have the greatest benefit in improving the their reading comprehension. Schumaker, Denton & Deshler (1984, cited by Katims & Harris, 1997) conducted a study with high school students with learning disabilities in a special education classroom whereby students were taught to learn and use the paraphrasing strategy. They found paraphrasing resulted in increased comprehension ability, with the ability improving based upon greater exposure students had with utilising the paraphrasing strategy. Furthermore, Ellis & Graves (1990, cited by Katims & Harris, 1997) also conducted a study with students with learning disabilities and found instruction in the use of the paraphrasing strategy to greatly enhance reading comprehension.

Explicit instruction with the use of Learning Strategies such as Paraphrasing, is particularly important, as it gives students an avenue and understanding of how to go about approaching a task, and acquiring knowledge that they may otherwise have significant difficulty acquiring or fail to acquire. Munro (2002) notes that it allows opportunities for linking new concepts, and talking about and retaining new ideas. As Fisk & Hurst (2003) highlight, paraphrasing is not intended to be a word for word translation but a restatement of the main ideas in the students own words. Skilful use of the Paraphrasing strategy, therefore requires knowing when and how to use it.

Katims & Harris (1997) used the RAP paraphrasing strategy in their study which involves three steps (*R*eading a Paragraph, *A*sking yourself Questions about the main idea and details, and *P*utting the main ideas and details into your own words using complete sentences). The use of the acronym RAP also served as a mnemonic strategy to trigger inner dialogues. Therefore metacognition and memory factors appeared to also be involved in this study. Katims & Harris (1997) conducted their study in the secondary school level with 7th grade students with and without Learning Disabilities (LD) within an inclusive classroom setting. These authors found that instruction in the use of the RAP paraphrasing strategy significantly improved student's reading comprehension. Whilst there was not a statistically significant improvement in the LD's reading comprehension, there was remarkably more improvement in the LD experiment group as opposed to control as a result of the strategy instruction.

The present study aims to add to the existing research by further exploring instruction in the use of the paraphrasing strategy to improve reading comprehension of

individuals with Learning Difficulties in a secondary school naturalistic setting. However, more specifically, it also aims to explore the role of Working Memory within reading comprehension. It is hypothesised that teaching Year 8 students with Learning Difficulties to use paraphrasing strategies improves reading comprehension. However, lower Working Memory ability scores predict poorer paraphrasing and reading comprehension ability.

METHOD

Design

This study consists of a OXO design whereby treatment group participants were pre-tested for their paraphrasing and comprehension abilities, then exposed to explicit teaching in the use of the paraphrasing strategy, and then post-tested for their paraphrasing and comprehension abilities. The control group consists of a OO design. Furthermore, both treatment and control group participants were tested once, prior to introduction of the paraphrasing lessons, to obtain a measure of their Working Memory abilities. School decoding data indicated students were capable of accurately identifying words to an adequate standard required for the purposes of this study. Spelling and Vocabulary testing scores from 2007 were obtained using the South Australian Spelling Test (SAST) and Progressive Achievement Tests in Reading – Third Edition (PAT-R): Vocabulary, to provide an indication of each child's spelling and word knowledge. See Table 1 for ability entry scores.

Participants

27 male students were initially selected for the study from two Year 8 specialist English Enhancement classes at a Catholic boys semi-private secondary school in the North Eastern Suburbs of Melbourne. All participants were identified by their school, based on testing conducted during Year 7 Orientation (prior to the commencement of Year 7 classes), as having significantly poor reading difficulties of sufficient severity to warrant specialised English classes and Corrective Reading in Year 7. The criteria was below stanine 3 on either the PAT-R Comprehension or Vocabulary test , and/or Writing/Spelling test, followed by significantly low scores on the Corrective Reading Program pre-test. Accordingly, in this study the term Learning Difficulties will be defined as difficulties in Reading, Writing or Spelling using the above criteria. All students participated in the Year 7 Corrective Reading, decoding course (excluding 1 student whom has an Intellectual Disability).

At the beginning of Year 8, the 27 students with Learning Difficulties were randomly divided into two classes by their school (13 students in one class and 14 students in the other) and currently participate in mainstream English lessons. These two classes remained intact for the study (therefore providing a naturalistic setting), with one class serving as the control group and one class serving as the treatment group. Two students from the class of 14 and one student from the class of 13 were omitted from the study as consent was not obtained from the parents of these individuals. The ages of the 24 students range from 12 years, 11 months to 13 years, 11 months (control group approximate mean age: 13 years, 5 months; treatment group: 13 years, 7 months). Refer to Table 1 for ages and entry reading ability scores.

Table 1 Age and Entry Reading Ability Scores

Student	**Age**	**Comprehension Pre Test Scores (PAT-R)**	**2007 Entry Spelling Age (SAST)**	**2007 Entry Vocabulary (PAT-R) Score**
Control Group	**(Yrs,Mnths)**	**Percentile Rank**		**Percentile Rank**
A	13yr2m	31	9.7	35
B	13y7m	57	10.2	22
C	13y7m	4	7.8	4
D	13y7m	60	12.2	8
E	13y7m	57	7.5	40
F	13y6m	17	11.7	13
G	13y4m	60	11.7	45
H	13y2m	8	11.4	26
I	13y7m	24	11.2	4
J	13y8m	24	13	8
K	13y4m	53	9.7	6
L	13y4m	46	10.9	19
Avge Score	13y5m	36.75		19.16
Intervention Group				
M	13y10m	35	11.4	10
N	13y11m	14	10.5	26
O	13y9m	24	10.0	2
P	13y10m	38	10.7	40
Q	13y7m	31	10.5	50
R	13y2m	24	9.0	13
S	12y11m	24	10.9	13
T	13y5m	50	10.5	19
U	13y11m	35	10.9	26
V	13y3m	63	13.8	15
W	13y11m	42	10.0	26
X	13y11m	57	10.7	15
Avge	13y7m	36.42		21.25

Materials

The Progressive Achievement Tests in Reading – Third Edition (PAT-R): Comprehension, Test Forms 3 and 4 (Australian Council for Educational Research, 2001) were used to assess reading comprehension ability. This task involves independently reading 9 prose passages and answering the comprehension questions (in multiple choice format) pertaining to each passage. This test measures literal and inferential comprehension and takes up to 40 minutes of permitted time to complete.

The Paraphrasing Task, Group Administration, developed by Munro (2005) was used as a measure of Paraphrasing ability. This task involves students being given 16

sentences that they read to themselves and then they write down another sentence (with as many words changed as possible) that conveys the same message.

To obtain a measure of Working Memory, the Letter-Number Sequencing (LNS) subtest and Digit Span (DS) subtest, both comprising the Working Memory Index from the Wechsler Intelligence Scale for Children – Fourth Edition (WISC-IV), were used (Wechsler, 2005). The DS subtest involves participants repeating a set of digits, that are verbally presented to them, in a Forward and Backward Sequence. The LNS subtest involves participants reordering and re-sequencing a set of numbers and letters that are verbally presented to them.

Five texts were used during the sessions (see Appendix 1 for texts). The texts were recommended as part of the Paraphrasing teaching lessons, "Teaching a paraphrasing strategy" developed by Munro (2006). The Fry Readability Procedure had been conducted on the texts which ensured they were at an appropriate level for the Year 8 boys with Learning Difficulties.

Procedure

All students were tested in a group format within the regular classroom by the classroom teacher/researcher. Pre-testing occurred on separate days for each test, first with the PAT-R Comprehension test Form 4 (the passages were read to the group to counteract any decoding problems, and then the students individually answered the comprehension questions), which was then followed by the paraphrasing test. Each of the 26 participants were then individually tested with the Working Memory subtests by a Psychologist (researcher of the present study).

Ten, 40 minute paraphrasing strategy lessons were then provided with the treatment group over 6 weeks. Lessons took place as part of the regular school timetable during scheduled English periods at the school. The control group continued to receive their regular English lessons. The same teacher taught both control and treatment groups, which provided consistency and regularity given the teacher is the regular classroom teacher for both classes. The teacher is also a researcher in literacy intervention and therefore is familiar with the paraphrasing strategy lesson plans.

The Paraphrasing Lesson script was followed by the teacher without amendments (refer to Appendix 1 for lesson plan script) using the same recommended texts. The students were introduced to the paraphrasing strategy in session 1. They practiced using the strategy interactively as a whole group and then in small groups by writing the paraphrase down. Afterwards, discussion was held regarding the steps used. Each session followed this similar procedure whereby the strategies action was discussed prior to applying it to the text, and then reviewed after it had been applied to see what they remembered about paraphrasing and how it helped them comprehend what they read. Different texts were used, beginning with the paraphrasing of sentences and then progressing to paragraphs as sessions continued. Also as sessions progressed texts moved from being read aloud to silently and from group to individually. In session 5, activities requiring identification of synonyms and meaningful phrases were introduced. Students then proceeded to suggest unfamiliar words and synonyms were taught for these.

Group format Post-testing was then conducted using the same testing instruments (although Form 3 for PAT-R comprehension was used) in the same order as pre-testing.

RESULTS

The number of correct comprehension questions, memory items, and the number of fully correct, partially correct or incorrect paraphrasing questions was assessed. The comprehension and memory results are presented as percentile ranks whilst the paraphrasing results are presented as a raw score (with the total maximum score being 32). The means and standard deviations of the measures used in the study are shown in Appendix 2, Table 2.

A comparison of pre and post comprehension score averages of the control and treatment group demonstrates that although both groups showed similar comprehension abilities prior to the introduction of the paraphrasing strategy, the treatment group improved by a percentile rank average of 12.42, whilst the control group showed a decrease in scores of 3.5. Whilst this percentile rank improvement of 12.42 of the treatment group (and approximately15.92 improvement between the two groups) is not likely statistically significant (statistical analyses were not performed, although eyeballing the data tends to suggest that there is not a statistically significant difference at the .05 level, particularly given the large standard deviation of scores), the results still suggest a notable improvement in reading comprehension for the students with Learning Difficulties that were exposed to the paraphrasing strategy when compared with those that were not exposed to the paraphrasing strategy. The latter is reinforced by the actual decline in scores for those not taught to use the paraphrasing strategy. Analysing individual student comprehension data, 7 out of the 12 students in the control group showed a decline in scores (of those three showed a decline of between 18-24 percentile ranks), with 1 remaining the same. Nine of the 12 students in the treatment group showed an improvement in scores with only three showing a very slight decrease.

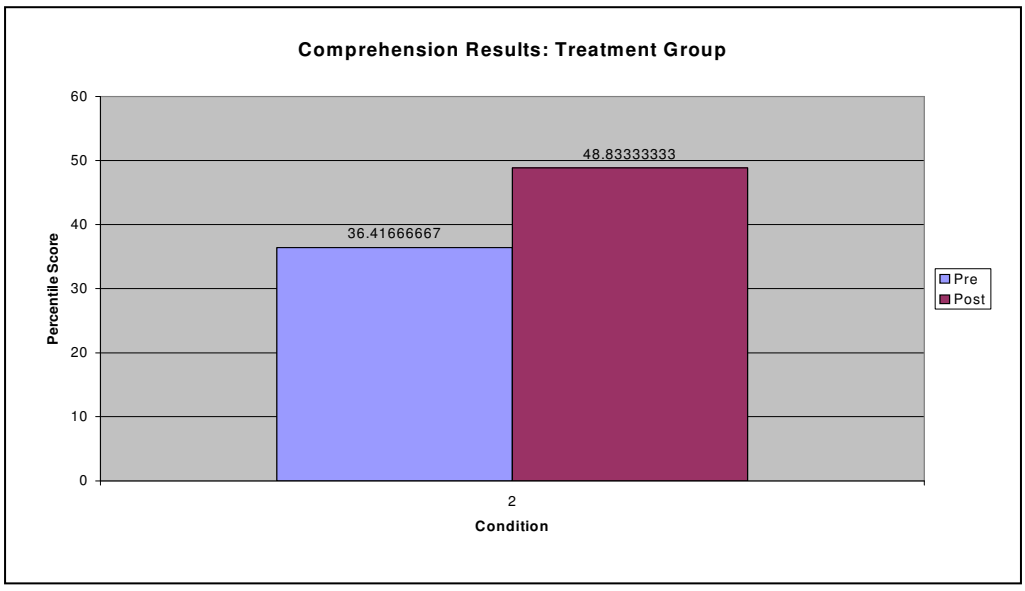

Figure 1: Comprehension Results: Paraphrasing Strategy Condition

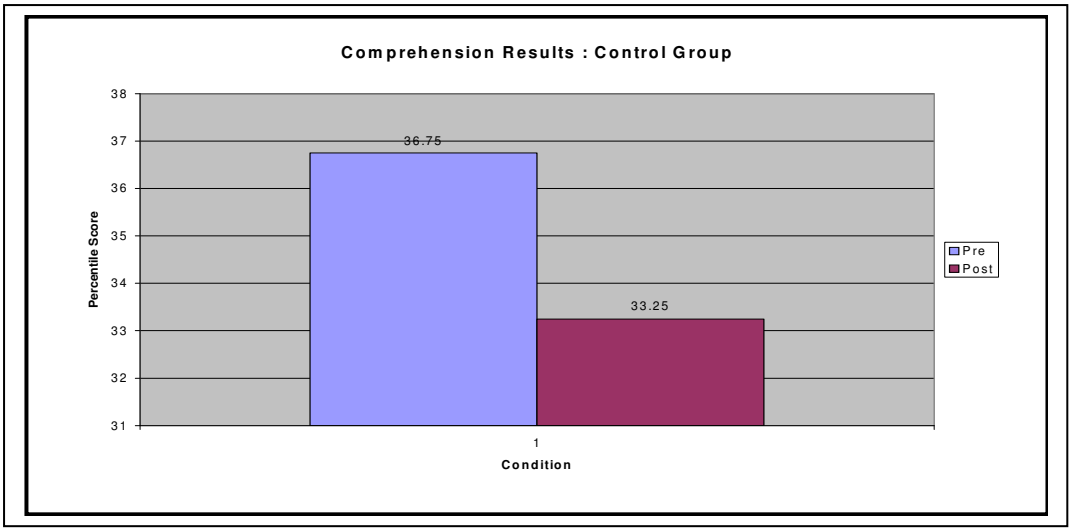

Figure 2: Comprehension Results: No Paraphrasing Strategy

Comparison of pre and post paraphrasing data was undertaken to ensure that the treatment groups paraphrasing ability actually improved as a result of the paraphrasing strategy rather than other factors. There was an improvement in the treatment group of 6 raw score points, yet the control group showed an improvement of only 2 raw score points. These results suggest that there is a good chance that the improvement in comprehension results was related to the introduction of the paraphrasing strategy.

To explore whether lower WM scores predict poorer paraphrasing and comprehension abilities, the two groups scores were divided based on Low and High Working Memory results. Low Working Memory scores were defined as below the 25th percentile (within the Below Average range or lower). This provided two even groups of 6 within the treatment group, and a group of 7 (Low WM) and five (High WM) within the control group. Refer to Appendix 2, Table 3 for means and standard deviations. Comparison of the paraphrasing scores between the High and Low WM treatment group, showed that there was no significant difference between the Low WM group and the High WM group (with only a 1.6 raw score difference between the Low WM and High WM group it would be safe to assume that at a statistical level, and also considering the SD, the scores are relatively similar). Nevertheless, the Low WM group post-test paraphrasing scores of the treatment group show a much better gain (double that of the High WM group) than the High WM treatment group, and also a 2.5 higher average score obtained by the Low WM group.

Being mindful of the greater standard deviation of the High WM group, and to seek to compare two groups with a much clearer difference between WM abilities, a further breakdown was conducted. Refer to Appendix 2, Table 4. The 3 lowest scores within the Low WM group (ie, students P, U, X with a percentile rank below the 10th percentile rather than 25th percentile) were compared with the 3 highest scores in the High WM group (ie, students M, S, T, at or above the 55th percentile). This does

lower the representative sample, however provides a greater differentiation between High and Low WM ability scores (with a new mean of 5.3 percentile of the Low WM group compared to 65.6 percentile of the High WM group). This comparison showed that the Low WM group had lower paraphrasing ability scores at the pre-test (8 raw score compared with 12.3) however at post-testing there was no difference (14.6 raw score of the Low WM compared with 14.3 of the High WM). The Low WM again made a bigger gain (6.6 gain compared with only 2 score gain).

To establish whether a similar pattern occurred with those not exposed to the paraphrasing strategy, those with Low WM and High WM scores in the control group were compared. There does not appear to be any significant difference between the two groups. Both groups had the same post-test score of 11 and relatively similar pre-test scores (there was a 1.8 raw score difference with the Low WM group actually obtaining the slightly higher score). Although the High WM group made slightly better gains between the pre and post test, despite not being exposed to the paraphrasing strategy, than the Low WM (ie, 1.14 mean gain versus 3.6 mean gain) this 2.46 difference between the two groups was not likely significant. Comparing the 3 lowest scores in control group (students F, I, L with a percentile below 5) and 3 highest scores (A, B, D with a percentile at or above the 34th percentile) revealed a slightly higher pre-test score with the Low WM group than High WM group and a slightly lower post-test score with the High WM as opposed to Low WM group. Although, the difference between the two was again minimal and not likely significant.

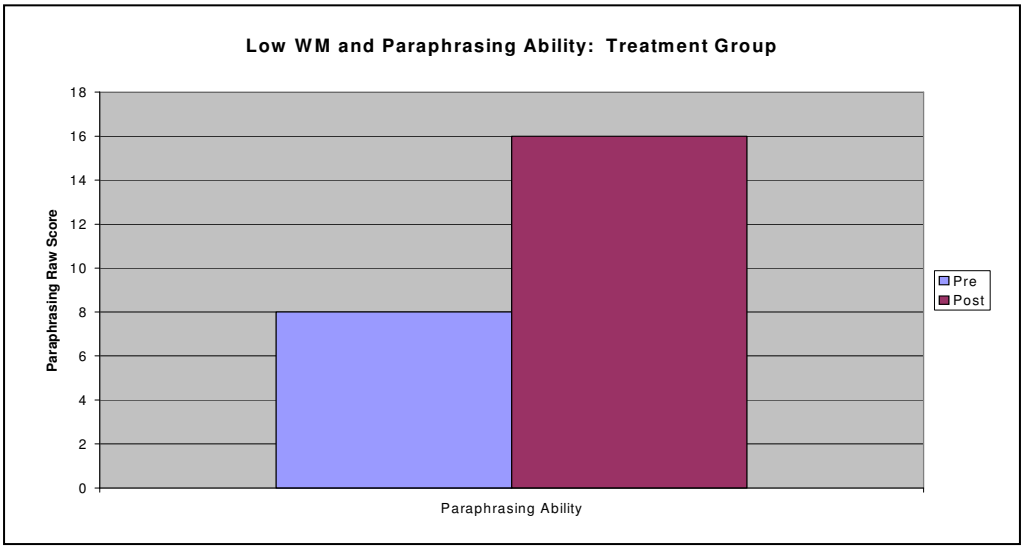

Figure 3: Paraphrasing Results: Low WM group, Treatment Condition

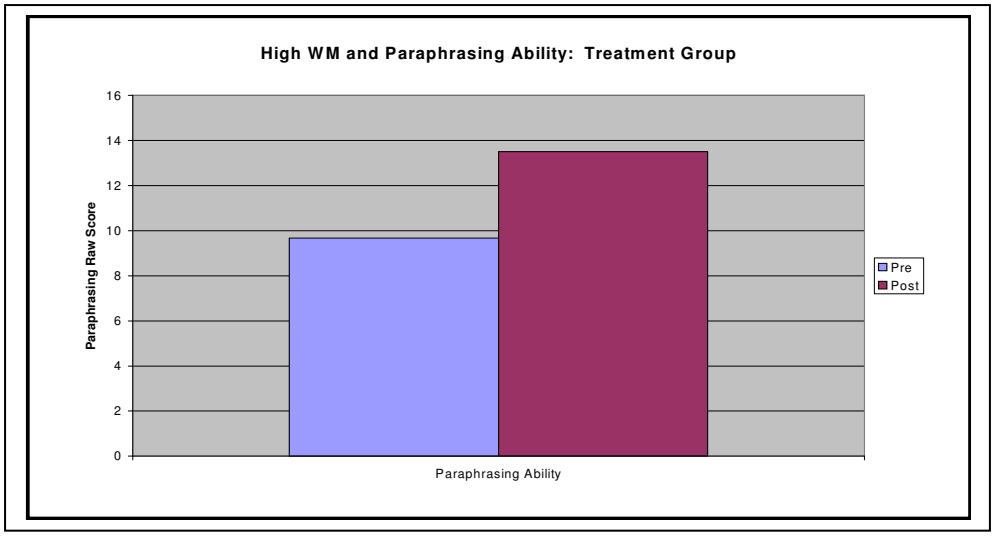

Figure 4: Paraphrasing Results: High WM group, Treatment Condition

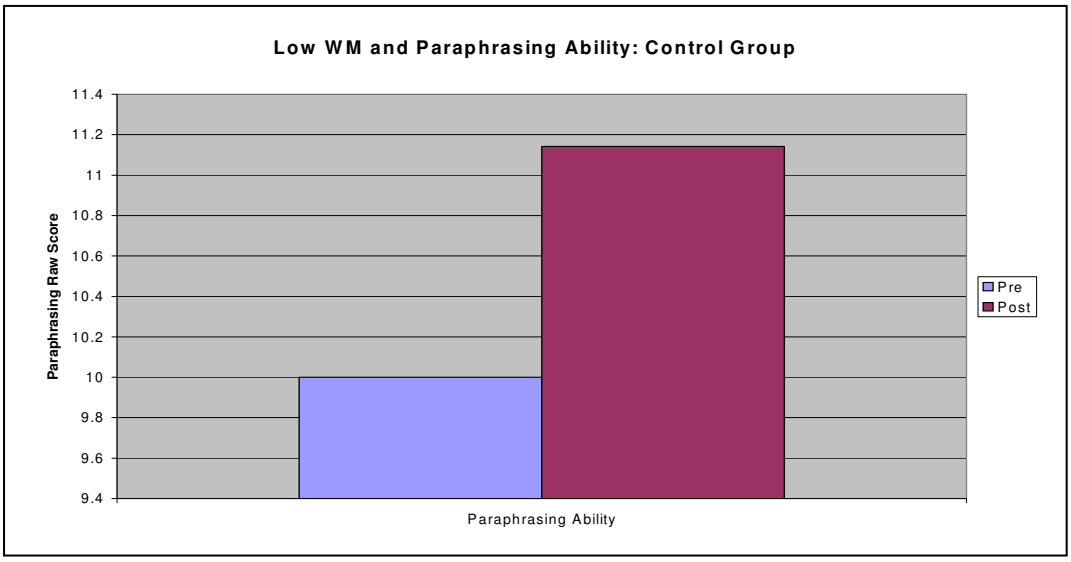

Figure 5: Paraphrasing Results: Low WM group, Control Condition

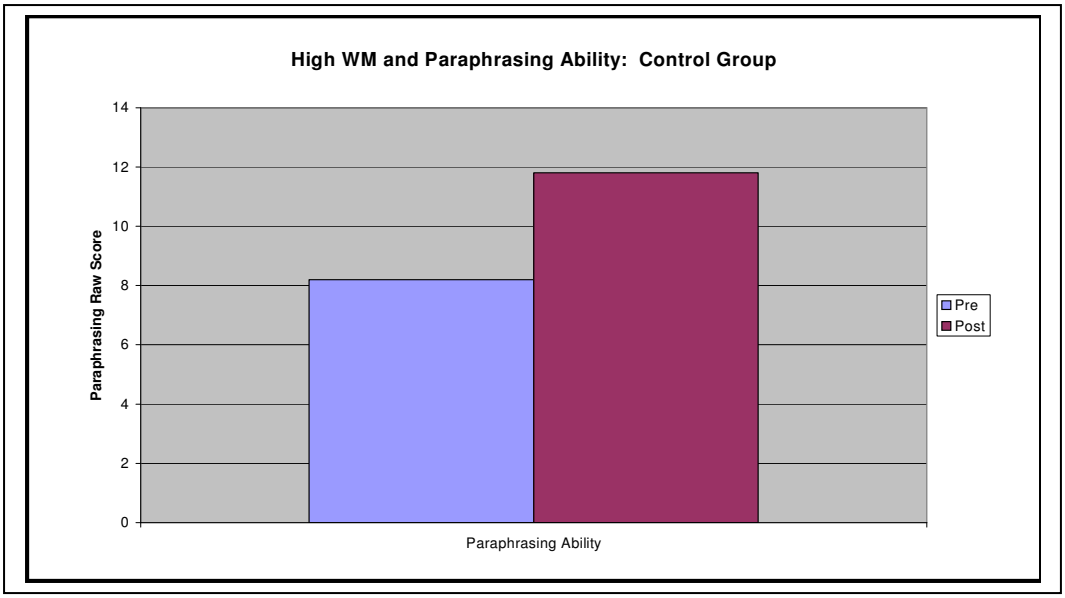

Figure 6: Paraphrasing Results: High WM group, Control Condition

Analysis of the memory and comprehension scores was also conducted to ascertain whether High and Low WM scores predicted better comprehension scores. Analysis of pre-test comprehension scores between high and low WM would provide a more valid indicator given post-comprehension scores of the treatment group can be influenced by the paraphrasing strategy introduction, therefore not providing a direct link or comparison. Table 3 (Appendix 2) shows that the Low WM pre-test average scores of the treatment group were higher (ie, 6.5 percentile greater) than the High WM group. However there was greater variation with scores in the Low WM group (standard deviation = 16 for Low WM and 10 for High WM) so this result should be considered with caution (eyeballing the data indicates there is not likely a statistically significant difference between the two groups). By further breaking down the two treatment groups to yield a much greater differentiation between High and Low WM as referred to above and shown in Table 4, Appendix 2 (ie, the 3 individuals WM scores below 10th percentile, and 3 individuals WM scores above 55th percentile), again shows higher pre-test comprehension scores (7 percentile greater) for the Low WM group (43.3 percentile) than the High WM group (36.3 percentile). The SD was similar between both High and Low WM groups but was more reflective for the Low WM group in this analysis.

The pre and post test comprehension scores of the treatment group were compared for interest (despite not providing a direct analysis due to the paraphrasing strategy), and showed similar gains between the High WM (13.66 percentile gain) and Low WM (11.16 percentile gain) groups. The Low WM groups post-test scores remained higher (by a percentile of 4 or 7.3 if comparing the 3 lowest with the 3 highest WM), however there was a significantly large standard deviation with the Low WM group therefore likely suggesting no significant difference between the two groups comprehension abilities. Breaking down the analysis further to compare the 3 lowest and 3 highest WM scores showed a similar pattern to above.

The control groups pre-test comprehension scores of the High and Low WM groups revealed a very similar standard deviation allowing a more accurate comparison (although the SD of 19 is rather high and therefore does not offer the most valid overall indication of comprehension abilities). The Low WM group obtained poorer comprehension scores (8.65 percentile lower) than the High WM group. The Low WM groups post-test comprehension scores remained lower, although there was only a 1.5 percentile drop of the Low WM group compared with a 6.2 percentile drop with the High WM group. Nevertheless, there was a large standard deviation with the Low WM group's post test scores when compared with the High WM groups post test scores. Comparing the 3 lowest and highest scores (Table 4, Appendix 2) showed a similar pattern to above, however the pre-post test drop was more significant for the High WM group (12.6 percentile drop versus 3.6 percentile drop for Low WM) but the SD remained large for Low WM group.

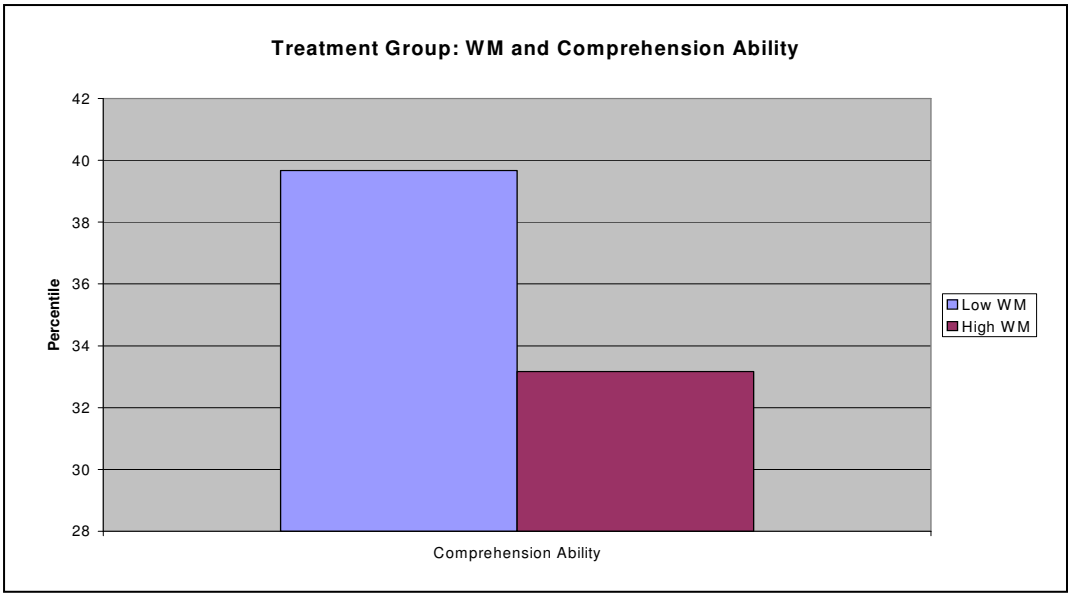

Figure 7: Comprehension Results: Low Vs High WM Group, Control Condition

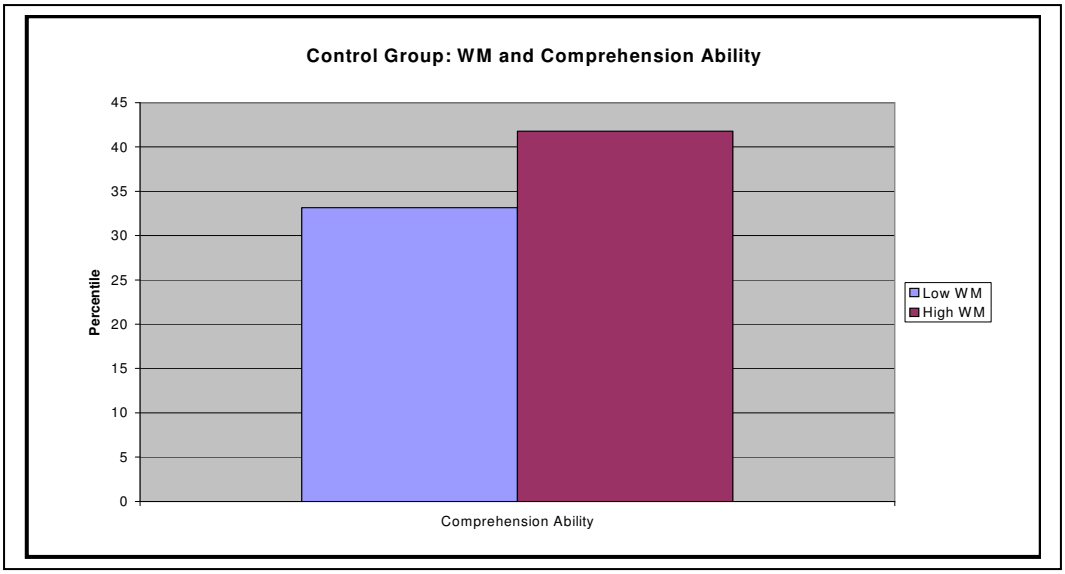

Figure 8: Comprehension Results: Low Vs High WM Group, Treatment Condition

DISCUSSION

This study sought to investigate whether teaching Year 8 students with Learning Difficulties to use paraphrasing strategies improves reading comprehension, and whether lower Working Memory ability scores predict poorer paraphrasing and reading comprehension ability. There was support for and against this hypothesis.

There was an improvement in reading comprehension ability for the students exposed to the paraphrasing strategy. Although the improvement may not be statistically significant, it is still substantial to suggest that paraphrasing is an effective strategy which can result in improved comprehension abilities in secondary school students with Learning Difficulties. Nine of the 12 students appeared to benefit from being taught the paraphrasing strategy. It was interesting however to find that there was an actual decline in comprehension ability for those not exposed to the paraphrasing strategy. This result provides support for the effectiveness of the paraphrasing strategy, and may indicate that for those not exposed to the paraphrasing strategy that other, less useful strategies were utilised by this group. Alternatively, it may suggest that the students did not have any clear strategy to assist them to make sense of the text. The need for an explicit strategy is highlighted by Katims & Harris (1997) whom outline empirically based example approaches and support for teaching students specific strategies, including how and when to strategically and actively process information, to improve comprehension. By providing the students with teaching in the use of the paraphrasing strategy within the present study, it sought to engage them as active learners in the reading process (ie, they were required to think about how and when to use the strategy and to reflect on how it helped them comprehend what they read), and it seems that the students in the present study were able to benefit from such an approach. The students demonstrated that they were able to learn and apply the paraphrasing strategy, given an improvement in pre and post paraphrasing test results was obtained with the treatment group. The students in this

study were secondary students with Learning Difficulties, which further highlights that the paraphrasing strategy can be taught at any stage of schooling and applied with individuals whom typically take longer to learn or acquire information. In fact Yuill & Oakhill (1988, cited by Oakhill et al, 2005) note that even fairly brief training in comprehension skills effectively enhance the reading comprehension of poor comprehenders. These results therefore support the results of previous studies such as Munro et al. (2007), Katims & Harris (1997), Ellis & Graves (1990, cited by Katims & Harris, 1997) and Schumaker, et al. (1984, cited by Katims & Harris, 1997), whom also investigated students with Learning Difficulties, and found their comprehension ability to improve with instruction in the use of the paraphrasing strategy.

The present study also investigated the relationship between Working Memory and paraphrasing and comprehension ability. The present studies hypothesis pertaining to this relationship was not supported. Lower Working Memory ability scores did not predict poorer paraphrasing or reading comprehension ability. There was little difference (which is not likely significant at a statistical level) between the High and Low WM groups paraphrasing ability scores. In fact the Low WM group had a higher average post test score and showed a much bigger gain from pre to post testing, which was double the gain of the High WM group. This pattern was similar when a further breakdown of the High and Low WM group was conducted. The further breakdown enabled a greater differentiation between High and Low WM groups (ie, students within the Low WM group were further divided based on WM scores below the 10^{th} percentile and students within the High WM group were divided based on WM scores above the 55^{th} percentile). Again there was no difference between the High and Low WM group, and the Low WM group made a bigger gain pre to post testing.
A similar pattern was also found with the control group with no significant difference between High and Low WM groups. Therefore these results do not support the hypothesis that Low WM ability scores predict poorer paraphrasing ability.

These results were quite surprising. When thinking about paraphrasing, it would appear to draw on WM as you are required to temporarily hold the sentence in memory long enough to make sense of it, integrate it with existing networks/knowledge and then reword and retell. As Munro (2002) suggests paraphrasing allows for new topic ideas and concepts to be discussed, linked (ie, with what they already know) and retained in short-term memory. Furthermore, Swanson and Beebe-Frankenberger (2004, cited by Gathercole, et al, 2006) propose that WM allows for the integration of information retrieved from long-term memory with current inputs and argue that poor WM capacity compromises one's ability to undertake such cognitive tasks. Therefore one might assume that for those with poorer WM processes, paraphrasing may be more difficult for them. However, in the present study, given the Low WM produced much bigger gains it would seem that they may have been able to better grasp and use the paraphrasing strategy to produce bigger gains than the High WM group. There was little difference between the pre-test scores between the Low and High WM group so the bigger gain cannot be attributed to a significantly lower pre-test score. Factors such as Metacognitive (ie, self-talk and rehearsal) or motivation may explain the results. Seigneuric & Ehrlich (2005) mention in their discussion about the possible reciprocal causal relationship between WM and reading comprehension, that metacognition and motivation are two factors that may have explained individual variance in their study. They suggest that WM tasks involve both storage and attentional control processing and the

requirements of the WM task may explain low reliabilities. Swanson, et al. (2006) also highlight that WM as an attentional mechanism versus storage mechanism could explain ability group differences in reading performance. Bayliss, et al. (2005) suggest in their study that the Learning Disabled group (as opposed to Typically Developing group) found short-term storage tasks more demanding, and they propose that the Learning Disabled group may have required controlled attention resources to maintain the information in an active state. It is therefore possible that the lower the WM, the more applied attention is needed to compensate for such difficulties. Therefore greater effort may be made by the Low WM to concentrate and/or apply self-talk and rehearsal strategies possibly impacting on their ability to use the paraphrasing strategy to make greater gains in paraphrasing ability.

The present study also investigated the relationship between WM and comprehension and found that the Low WM group achieved better comprehension scores than the High WM group in the treatment condition only. The opposite was true for the control condition whereby the Low WM group obtained poorer results. There was however large variance within the Low WM group. When the groups were further divided into the lowest WM scores (below the 10^{th} percentile) and highest WM scores (above 55^{th} percentile), the variance reduced (offering a more reliable comparison) and the Low WM group in the treatment condition continued to achieve better comprehension scores than the High WM group.

The pre-test scores in the treatment group are seen as the most valid indicator, given post-test comprehension scores of the treatment group can be influenced by the paraphrasing strategy introduction, therefore not providing a direct comparison. The pre and post test scores of the control group can both be compared without the interfering aspect of the paraphrasing variable. Within the control group, the High WM group achieved a greater drop in comprehension ability than the Low WM group (although greater variance in the Low WM group may explain to some extent why the Low WM group's drop in scores was not as great). Therefore given the differing pattern of results between treatment and control conditions, and the variance between scores, there is no conclusive support for the hypothesis that lower WM ability scores predict poorer comprehension ability.

The present studies result, may be more consistent with the findings of Goff, et al. (2005) whom found that the contribution of Working Memory to reading comprehension was not significant, and also the findings by Bayliss, et al. (2005) whom found WM span was not closely related to sentence comprehension in individuals with Learning Difficulties. The present studies results are however surprising given the findings of a large number of other studies which found WM to be a direct predictor, or correlated with reading comprehension (Seigneuric & Ehrlich, 2005; Gathercole, et al., 2006; Swanson, et al., 2006; Carretti, et al., 2005; Fedorenko, et al., 2006; Alloway, 2007; Oakhill, et al., 2005).

Possible factors that may explain the lack of support for the hypothesis may include the type of memory measure and reading comprehension measure used. This factor was raised by Goff, et al. (2005). These authors suggested that the lack of a strong relationship between reading comprehension and WM may be related to the fact that many WM assessment tasks used, predominantly tap into STM processes (ie, temporarily storing and manipulating meaningless novel information) and fail to

reflect the interplay between short and long term memory (ie, in which new information is combined with existing stored information within the long term memory, as is required when comprehending text). They suggest when reading stories, long-term representations of the text must be involved given the average story far exceeds the storage capacity of STM. Swanson and Berninger (1995, cited by Goff, et al., 2005) suggested the processing of digits (as used in this study) is verbally mediated and therefore specific difficulties with verbal WM may be the problem rather than a generalised WM difficulty. These authors also raised the possibility that the type of comprehension measure used may explain a lack of independent contributions of WM to comprehension. That is, they suggest the Progressive Achievement Test, as was used in the present study, is a multiple choice format that allows plenty of time to re-read sections of the text to address any uncertainty. This may have benefited the Low WM treatment group participants in the present study. Future research may seek to use different memory and comprehension test measures.

Some other factors that have been raised in the research as possible factors underlying individual differences on WM tests and comprehension ability, that may offer insight into the present varying results between the control and treatment group have included storage deficits in complex memory span being counteracted by increased Processing Speed ability (Bayliss, et al, 2005); Verbal Ability (Nation, Adams, Bowyer-Crane & Snowling, 1992, cited by Gathercole, et al., and Stothard and Hulme, 1992, cited by Gathercole, et al., 2006); Executive skills to support complex memory span which Baddeley (1996, cited by Bayliss, et al., 2005) propose that the Learning Disabled individuals may be more dependent on. Therefore, those with and without executive functioning difficulties, and differences in Processing Speed, Verbal IQ and language abilities in the current study may have produced differing results. The participants of this study demonstrated poor vocabulary skills (as can be seen by the entry PAT-R Vocabulary scores). Although measures were taken to account for any decoding issues during testing (by reading the passages to the group), students comprehension ability could be explained by deficits in word knowledge. Future research could compare pre and post vocabulary scores to explore it's relationship with the variables in this study. Alternatively, students with reading comprehension problems and average decoding skills could be selected in future studies to counteract for the impact of this variable. A limitation of this study was that statistical analyses were not performed on the results from this study to provide a clearer indication of statistical significance.

Other limitations of this study include the sample size and variance (standard deviation). With a greater sample size, it may have allowed greater division of memory groupings (ie, into Low , Medium and High WM ability scores) and differing patterns may be revealed, which may offer greater support for the relationship between WM and paraphrasing and comprehension ability. Further research may seek to perform post-testing of memory ability to see if paraphrasing ability improves WM. Other suggestions for future research include conducting a longitudinal study of memory and comprehension ability whereby students receive memory intervention and strategies aimed at improving memory (eg, encoding, self-talk and rehearsal strategies).

Nevertheless, this study has been valuable to confirm the effectiveness of the paraphrasing strategy in enhancing comprehension ability in a secondary school,

naturalistic setting with those with Learning Difficulties. Classroom teaching should therefore incorporate paraphrasing as an explicit teaching strategy in everyday lessons across the Key Learning Areas, particularly for those identified at-risk during the secondary school orientation entry phase. Metacognitive training methods could also be used to assist those with poor comprehension abilities to better monitor and control for irrelevant information when reading in the classroom. Furthermore, teacher awareness of WM limitations of students may also seek to improve the achievement of these students, particularly if they are given visual compensatory aides and strategies including mnemonic strategies, instruction in the use of mind mapping, and visualising as they read which can help convert knowledge that is stored in different forms (refer to Munro, 2002, for an outline of how knowledge can be stored in different forms such as verbal, imagery or action, and the strategies for it to be recoded) and act as coat hangers for better encoding and retrieval. Nevertheless, such cognitive and behavioural instructional methods as mentioned above would benefit students in regular classrooms and would seek to enhance the reading comprehension and educational outcomes for all students.

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APPENDIX 1

Texts Used:

1. The Jaguar: A great Cat

2. It's not a rat, it's not a cat, it's a…

3. Our Forests have gone to keep us warm.

4. The animals that live in the Earth's coldest areas

5. The energy we use: Fossil fuels or renewable energy

Paraphrasing Teaching Strategy Lesson Plan Script:

Teaching a paraphrasing strategy

No amendments were made to this script, although one of the nine sessions below ran over two sessions to make ten, 40 minute sessions in total:

Paraphrasing Session 1
Recommended teacher dialogue is shown in italics.
Give each student a copy of The Jaguar: A great cat

Introduce the strategy: *I am going to teach you something that you can do that will help you to remember what you read. It is called paraphrasing. This is what you do. After you have read each sentence, you say it in your own words.*
We will begin doing this with sentences and then with paragraphs.
The first text we will read is about some of the big cats, like lions and tigers, that live around the world. Let us read the first paragraph aloud. I will read it aloud first and then I will ask individual students to take turns to read it.

When the first paragraph has been read twice, read each sentence in the first paragraph again. After you (the teacher) have read a sentence, paraphrase it by saying it by changing as many words as possible but still keeping the meaning the same. Then ask individual students to paraphrase it by changing more than one word in it. If possible record their attempts on a white board.

I will read it and I want you to read it to yourself with me. Then I will try saying it another way. Then I will ask you to try. I will write down what I say and what you say.
Sentence read:
This text is about some of the big cats, like lions and tigers that live around the world.
Teacher paraphrases: This is a story about some of the big cats that inhabit the Earth. Student then paraphrases.
Sentence read: When you hear the word cat you probably think of the pets you have at home.

Teacher Paraphrases: Hearing the word cat might cause you to see in your mind the animals that live with us. Student then paraphrases.
Sentence read: The warm, cuddly kittens, that play with balls and enjoy being patted.
Teacher reviews the action: *Let us look at what we did here. We read each sentence and then said it in other ways. See how it helped you to understand what the text said. Do you have any questions*? (If Yes , a teacher gives the answers).
Repeat this for the rest of the paragraphs, sentence by sentence. The teacher models the paraphrase first and children then take turns. Remind them regularly of what they are doing.
What do you tell yourself to do when you paraphrase?

Once the text has been paraphrased as a group interactive activity, students in small groups can have a go at writing their own paraphrase of each sentence.
Correct the students responses.

After students have paraphrased several of the paragraphs: *Now let s discuss what steps you used to paraphrase.* Several students say the processes they used to arrive at their paraphrasing.
Tell me what you know about paraphrasing and what steps you should follow to paraphrase a text.

Have students write down what they do when they paraphrase, as follows:
1. The first step in paraphrasing is to read a sentence.
2. The second step is to change as many words as you can while keeping the meaning the same.
3. The third step is to say the sentence again in your own words.

Session 2
During this session, the students again apply the paraphrasing strategy sentence by sentence. The students review the steps involved in producing paraphrasing and the teacher gives additional practice in paraphrasing single sentences first interactively and then in small groups. The teacher actively monitors the students work, giving appropriate feedback both individually and through class discussion. Pupils transfer the strategy to new texts by being shown a text and saying what they will do.

Teacher reviews what students remember about paraphrasing from the Session 1.
What do you do when you paraphrase a sentence?
How does paraphrasing help you?
Have students again paraphrase some of the sentences in: The Jaguar: A great cat.
Introduce them to the text: It s not a rat, it s not a cat, it s a **.** Discuss its topic and repeat the set of teaching procedures used for Session 1. Regularly remind students of the nature of the task and have them review the action.

Session 3
On the last two sessions we were practicing paraphrasing sentence by sentence. Now we are going to read two sentences at a time and then paraphrase them.
Let s revise what actions we do when we paraphrase. Students say what they do.

Introduce them to the text: Our forests have gone to keep us warm. Discuss its topic.

Repeat the set of teaching procedures used for Session 1. Regularly remind students of the nature of the task and have them review the action.

When you have finished it as an interactive activity, have students in small groups work on writing their own paraphrase of it.
Have them discuss how paraphrasing helps them to comprehend what they read.

Session 4
Teacher reviews what students remember about paraphrasing from Session 1.
What do you do when you paraphrase two sentences at a time?
How does paraphrasing help you?

Have students again paraphrase some of the pairs of sentences in Our forests have gone to keep us warm.

Introduce them to the text: The animals that live in the Earth s coldest areas. **Discuss** its topic and repeat the set of teaching procedures used for session 3. Regularly remind students of the nature of the task and have them review the action.

Session 5
Read aloud each paragraph.
Paraphrase sentence by sentence in whole group activity.
In small groups write a paraphrase of each sentence.
Recommended teacher dialogue is shown in italics.

Give each student a copy of The energy we use: Fossil fuels or renewable energy
Work on the first section in this session (down to ***Energy from fossil fuels).***
Remind students of the strategy: *You have been learning to do something that will help you to remember what you read. We called it paraphrasing. What you do is this. After you have read a sentence or a group of sentences, you say it in your own words. So far we have been doing this with sentences. Now we will do it with paragraphs. This text is about the energy we use in our lives every day.*
Let us read the first paragraph aloud. I will read it aloud first and then I will ask individual students to take turns to read it.

Have students take turns to read aloud the first paragraph twice. Then, in small groups, have students read each sentence, paraphrase it and write their paraphrase. Then ask groups to read out their paraphrases of each sentence.

Teacher reviews the action: *Let us look at what we did here. We read each sentence and then said it in other ways. See how it helped you to understand what the text said. Do you have any questions*? (If Yes , the teacher gives the answers).
Repeat this for the rest of the paragraphs, one at a time.
Correct the students responses.

After students have paraphrased the paragraphs, have students identify unfamiliar words and suggest synonyms or meaningful phrases for them. Record these on the whiteboard and have students say each word and its meaningful substitutes. These may include the following:
Text word: Energy.

Students suggest synonym or meaningful phrase: power, strength, 'zing'
Text word: Fuel
Student suggest synonym or meaningful phrase: Something to give you energy, such as …
Text word: Fossil Fuel
Students suggest synonym or meaningful phrase: a fuel made from animal or plant remains that died long ago

Session 6
Read aloud each paragraph.
Paraphrase sentence by sentence in whole group activity.
Each student writes a paraphrase of each sentence.

Use the section ***Energy from fossil fuels.***
Review the key words and synonym list assembled in Session 5. Write each of the key words on the white board and ask students to suggest synonyms or matching meaningful phrases. Have students say again the links between each pair.

During this session, the students read aloud a paragraph, paraphrase sentence by sentence in the whole group activity and then each student individually writes a paraphrase of each sentence.
Work through each paragraph in turn.
After reading this section, ask students to suggest new unfamiliar words and teach synonyms for these. List these on the white board, teach these and the synonyms and add them to the earlier list, for example;
Text word: pollutants, dirty fuel, protects
Students suggest synonym or meaningful phrase for each word.
Teacher reviews what students remember about paraphrasing:
What do you do when you paraphrase a sentence?
How does paraphrasing help you?

Session 7
Read silently each paragraph.
Paraphrase paragraph in whole group activity.
In small groups they write a paraphrase of each paragraph.

Use the section ***Other types of fuel and Energy from the sun*** (down to **Wind power*)***
Review the key words and synonym list assembled in Sessions 5 and 6. Write each of the key words on the white board and ask students to suggest synonyms or matching meaningful phrases.
Have students say again the links between each pair.

During this session, the students read silently each paragraph. Once they have done this at least once, students in the whole group activity and then each small group writes a paraphrase of each paragraph. To do this, they can combine two or more sentences into a paraphrase at once. Work through each paragraph in turn.

After reading this section, ask students to suggest new unfamiliar words and teach synonyms for these. List these on the white board, teach these and the synonyms and add them to the earlier list.

Students say what they do when they paraphrase a paragraph.
Teacher reviews what students remember about paraphrasing:
What do you do when you paraphrase a paragraph?
How does paraphrasing a paragraph help you?

Session 8

Read silently each paragraph.
Paraphrase sentence by sentence in whole group activity.
Each student writes a paraphrase of each sentence.
Read silently each paragraph. Students paraphrase sentence by sentence in whole group activity and each student writes a paraphrase of each sentence.

Use the section **Wind power.**
Review the key words and synonym list assembled in Sessions 5 -7. Write each of the key words on the white board and ask students to suggest synonyms or matching meaningful phrases. Have students say again the links between each pair.
Ask students: What do you do to paraphrase a paragraph?

During this session, the students read silently each paragraph. Once they have done this at least once, students in the whole group activity and then individually write a paraphrase of each paragraph. To do this, they can combine two or more sentences into a paraphrase at once. Work through each paragraph in turn.

After reading this section, ask students to suggest new unfamiliar words and teach synonyms for these. List these on the white board, teach these and the synonyms and add them to the earlier list.
Teacher reviews what students remember about paraphrasing:
What do you do when you paraphrase a paragraph?
How does paraphrasing a paragraph help you?

Session 9

Read silently each paragraph.
Each student paraphrases each paragraph silently.
Each student writes their paraphrase and then shares it with the group.

Use the section **Biomass energy**
Review the key words and synonym list assembled in Sessions 5 -8. Write each of the key words on the white board and ask students to suggest synonyms or matching meaningful phrases. Have students say again the links between each pair.
Ask students: What do you do to paraphrase a paragraph?

During this session, the students read silently each paragraph. Once they have done this at least once, students individually write a paraphrase of each paragraph. Then each student shares this with the group.
After reading this section, ask students to suggest new unfamiliar words and teach synonyms for these. List these on the white board, teach these and the synonyms and add them to the earlier list.
Teacher reviews what students remember about paraphrasing:
What do you do when you paraphrase a paragraph?
How does paraphrasing a paragraph help you?

APPENDIX 2

Table 2: Memory, Paraphrasing and Comprehension Results for Control and Treatment Groups

Student Control	Age	Memory	ParaPre	ParaPost	CompPre	CompPost
A	158	47	2	10	31	32
B	163	55	11	14	57	39
C	163	18	6	7	4	4
D	163	34	10	8	60	39
E	163	18	12	17	57	51
F	162	0.3	9	9	17	15
G	160	9	16	14	60	67
H	158	27	7	12	8	39
I	163	4	8	9	24	26
J	164	13	7	12	24	23
K	160	27	11	15	53	29
L	160	4	12	10	46	35
Avge		21.35833	9.25	11.41667	36.75	33.25
SD		16.59304	3.442988	2.956866	20.203651	15.60515

Treatment	Age	Memory	ParaPre	ParaPost	CompPre	CompPost
M	166	81	10	15	35	54
N	167	18	5	16	14	13
O	165	34	5	12	24	51
P	166	9	7	18	38	91
Q	163	21	4	13	31	47
R	158	42	7	16	24	32
S	155	61	12	11	24	39
T	161	55	15	17	50	59
U	167	4	9	13	35	32
V	159	18	15	23	63	71
W	167	47	9	10	42	46
X	167	3	8	13	57	51
Avge		32.75	8.833333	14.75	36.416667	48.83333
SD		23.73508	3.507928	3.418699	13.152198	19.07806

Memory = Working Memory Index Percentile Score
ParaPre = Paraphrasing Pre Test Raw Score
ParaPost = Paraphrasing Post Test Raw Score
CompPre = Comprehension Pre Test Percentile Score
CompPost = Comprehension Post Test Percentile Score
Age = Age in months
Control = Control Group
Treatment = Treatment Group
Avge = Mean Score
SD = Standard Deviation

Table 3: Low and High WM group results for Paraphrasing and Comprehension

Treatment	Low WM	ParaPre	ParaPost	CompPre	CompPost
N	18	5	16	14	13
P	9	7	18	38	91
Q	21	4	13	31	47
U	4	9	13	35	32
V	18	15	23	63	71
X	3	8	13	57	51
Avge	12.16667	8	16	39.66667	50.83333
SD	7.151146	3.559026	3.651484	16.34693	25.23501

Treatment	High WM	ParaPre	ParaPost	CompPre	CompPost
M	81	10	15	35	54
O	34	5	12	24	51
R	42	7	16	24	32
S	61	12	11	24	39
T	55	15	17	50	59
W	47	9	10	42	46
Avge	53.33333	9.666667	13.5	33.16667	46.83333
SD	15.10703	3.248931	2.629956	10.13931	9.118053

Control	Low WM	ParaPre	ParaPost	CompPre	CompPost
C	18	6	7	4	4
E	18	12	17	57	51
F	0.3	9	9	17	15
G	9	16	14	60	67
I	4	8	9	24	26
J	13	7	12	24	23
L	4	12	10	46	35
Avge	9.471429	10	11.14286	33.14286	31.57143
SD	6.569782	3.251373	3.18158	19.75875	19.94175

Control	High WM	ParaPre	ParaPost	CompPre	CompPost
A	47	2	10	31	32
B	55	11	14	57	39
D	34	10	8	60	39
H	27	7	12	8	39
K	27	11	15	53	29
Avge	38	8.2	11.8	41.8	35.6
SD	11.20714	3.429286	2.56125	19.73221	4.270831

LowWM = Low Working Memory Group (below 25th percentile) Percentile Score
HighWM = High Working Memory Group (above 25th percentile) Percentile Score
ParaPre = Paraphrasing Pre Test Raw Score
ParaPost = Paraphrasing Post Test Raw Score
CompPre = Comprehension Pre Test Percentile Score
CompPost = Comprehension Post Test Percentile Score

Table 4: **3 Lowest and 3 Highest WM Group Results for Paraphrasing and Comprehension**

Treatment	Low WM	ParaPre	ParaPost	CompPre	CompPost
P	9	7	18	38	91
U	4	9	13	35	32
X	3	8	13	57	51
Avge	5.333333	8	14.66667	43.33333	58
SD	2.624669	0.816497	2.357023	9.741093	24.58997

Treatment	High WM	ParaPre	ParaPost	CompPre	CompPost
M	81	10	15	35	54
S	61	12	11	24	39
T	55	15	17	50	59
Avge	65.66667	12.33333	14.33333	36.33333	50.66667
SD	11.11555	2.054805	2.494438	10.65624	8.498366

Control	Low WM	ParaPre	ParaPost	CompPre	CompPost
F	0.3	9	9	17	15
I	4	8	9	24	26
L	4	12	10	46	35
Avge	2.766667	9.666667	9.333333	29	25.33333
SD	1.744197	1.699673	0.471405	12.35584	8.178563

Control	High WM	ParaPre	ParaPost	CompPre	CompPost
A	47	2	10	31	32
B	55	11	14	57	39
D	34	10	8	60	39
Avge	45.33333	7.666667	10.66667	49.33333	36.66667
SD	8.653837	4.027682	2.494438	13.02135	3.299832

LowWM = 3 Lowest Individual Scores within Low WM Group (percentile below 5 or 10)
HighWM = 3 Highest Individual Scores within High WM Group (percentile above 34 or 55)
ParaPre = Paraphrasing Pre Test Raw Score
ParaPost = Paraphrasing Post Test Raw Score
CompPre = Comprehension Pre Test Percentile Score
CompPost = Comprehension Post Test Percentile Score

*Note: This analysis is not as representative given a smaller sample, however it provides a greater differentiation between Low and High WM ability scores