



Reading with pictures for inferential understanding: Strategies for adolescent learners with dyslexia

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Abstract

Learners with dyslexia primarily struggle with decoding, that would lead to difficulties in reading comprehension. Interventions that address the primary decoding difficulties are established, common and useful in addressing the decoding and word recognition difficulties of dyslexic learners. Reading comprehension struggles however, are difficult to address since it requires learners to be competent in decoding on top of several other complex skills. Progressing in reading comprehension skills of a learner with dyslexia is typically dependent on the learner's ability to decode. Past researchers have looked into the possibility of teaching dyslexic learners reading comprehension strategies without being impeded by their decoding difficulties. These studies attempted to teach comprehension skills with the use of visualization or listening to compensate for a dyslexic learner's decoding difficulty. However it was revealed that learners still struggle with reading comprehension because these alternative intervention strategies were too cognitively demanding. A proposed alternative intervention curriculum was designed for the purpose of this study. This curriculum attempts to teach learners with dyslexia inferential reading comprehension skills without being impeded by their decoding difficulties. Stories presented in the curriculum were presented in the form of pictures and comic strips to ensure learners were able to minimize the need for decoding, and at the same time make reference to the stories thus managing their cognitive load. Results from this study revealed possibilities of providing learners with dyslexia opportunities to learn higher order reading comprehension strategies they did not have access to in the past.

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Introduction

There is a significant body of research that indicates that the adolescent years in school are perhaps the most challenging ones (Eccles, Wigfield, Midgley, Reuman, Maclver & Feldhauser, 1993; Moje & Sutherland, 2003). These challenges are magnified many fold in contexts where the learners present with a variety of disabilities. The inspiration for this study was motivated by a desire to help these learners – in particular the ones with dyslexia – cope with the many challenges that come with reading. The importance of comprehending text is undeniable and should not be hindered by age or by the inability to decode. This was emphasized in a short paragraph by the National Reading Panel (NRP)(2000):

When does comprehension instruction begin? Since the ultimate goal of reading is to interact with the text, comprehension should be emphasized from the very beginning, not only after a child has mastered decoding skills. For example, reading aloud provides an opportunity for children to hear a story and respond to the content – the characters, their feelings and motivations, and the setting, and to relate it to their own experiences. Children begin from an early point to understand that comprehension is the point of reading (NRP, 2000).

Classic Strategies

It is common knowledge that learners with dyslexia typically struggle with reading single words. This difficulty in turn affects

their ability to comprehend text. With the understanding that reading single words is a primary difficulty of dyslexia, established reading intervention programs targeted for dyslexic learners focus on addressing this need. Many studies in the past have involved teaching programmes targeting teaching young learners word recognition skills or phonological awareness tasks (Lovett & Steinbach, 1997; Schneider Roth, Ennemoser & Kuspert, 1999). Results of some of these studies include the discovery of the positive effect of facilitating phonological awareness on the reading abilities of beginning readers (Vellutino, Fletcher, Snowling & Scanlon, 2004) and success in Orton-Gillingham (OG) based instruction in Singapore (Chia & Houghton, 2011). These studies suggest that addressing word recognition skills or phonological awareness is important in addressing the decoding and spelling needs of learners with dyslexia. A recent meta-analysis conducted by Galuschaka et al., (2014) extracted the results of 49 intervention trials on learners with reading difficulties. Results of this study indeed suggests that phonics instruction is the most widely used intervention approach and is the only approach that statistically confirms the efficacy on reading and spelling performance of learners with reading difficulties.

Alternative strategies

These reading intervention strategies, however, may not directly address the need for learners with dyslexia to understand what they read since the ability to comprehend is dependent on how well a learner progresses in single

word reading. Some studies have looked into alternative approaches to teaching learners with dyslexia reading comprehension. One example was a study conducted by Rose, Cundick and Higbee (1983) in which teaching conditions of simple comprehension activities were altered to include instances where students were asked to talk aloud to themselves after every few sentences read, to simulate verbal processing; or to close their eyes every few seconds to make mental images of what they have read to simulate visual processing.

Rose et al.'s (1983) study attempted to help learners with difficulties work on comprehension skills without being impeded in their difficulties in reading. However, they later realized that producing mental images required a substantial amount of cognitive effort that could explain some undesirable results. Success with this intervention depended to a large extent on the learner's ability to retain information without a visual copy of the text, thus requiring the heavy use of cognitive processes such as working memory, that are known to be weak in dyslexia.

An alternative approach was a study conducted by Elkind, Cohen and Murray (1993), who experimented with the use of computer-based readers to aid learners when reading texts. Elkind et al., (1993) had similar concerns about dyslexic learners not receiving enough comprehension related remediation at an early enough age. They believed that it was possible to enhance the students' comprehension by eliminating their limited ability to decode using computer-based

readers so that the learners would not need to decode in order to listen to the text. Results of this study suggested that computer-based readers could be useful tools for dyslexic learners since the majority of learners who were in the study improved on their abilities to comprehend. The study by Elkind, Cohen and Murray (1993) tackles listening comprehension and similarly is heavily reliant on working memory.

The studies presented suggest limitations i.e., a heavy reliance on working memory and a lack of reading material presented in the form of a physical text. This would be problematic for learners with dyslexia since traditional forms of physical texts require dyslexic learners to decode.

The pedagogical gap is real as classic intervention strategies and the alternative strategies mentioned above do not seem to have an effect on learners in the adolescent years – some of whom may still have problems with decoding but must move on to higher order comprehension skills to keep up with the rest. The challenge then was to help these learners work on higher order comprehension skills without the impediment of decoding difficulties and without overloading their cognitive processes.

With these in mind, an intervention program was designed to teach adolescents with dyslexia comprehension skills by using stories in the form of pictures. To evaluate the use of this designed intervention program, the following research question was formulated:

Are there positive impacts of teaching inferential comprehension skills with the use of pictures on adolescent dyslexic learners?

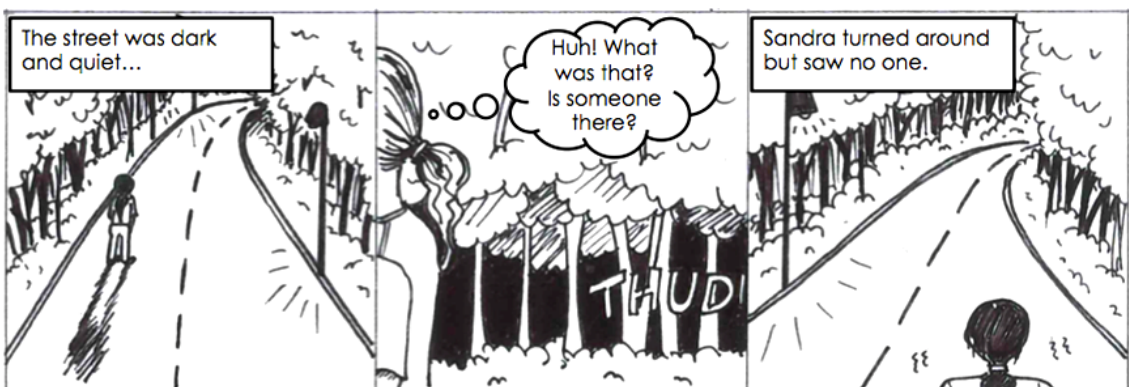
The designed picture based intervention programme

The intervention was designed bearing in mind the need to address the pedagogical gap to cater to a specific group of dyslexic learners who are required to develop their inferential comprehension skills without being impeded by their difficulties in decoding words in a text. Intervention activities planned aimed to provide students with opportunities to experience understand and appreciate stories in the form of comic strips and, in doing so, draw inferences from the stories presented.

Short comic strips and page-long comic stories were used to provide students' exposure to different text types. They contain incidents that require students to think and infer using strategies that will be taught in the curriculum. Some of these strategies include teaching students to look for clues in the pictures, teaching

students to predict what happens between comic strip frames, teaching them to think about the perspectives of characters in the stories and the problems and solutions in stories presented. These comic strips selected were meant to represent what adolescents would usually read, understand and enjoy. The stories chosen were age appropriate so that these dyslexic learners can read stories that are suitable for their cognitive abilities and maturity. The picture below is a sample of short comic strips presented in the intervention programme.

Lessons were carefully planned and designed, taking into account the needs of the dyslexic learners. The lesson pedagogy, structure, plan and materials were planned to be dyslexia friendly. The intervention consisted of 8 weeks of content that focused on introducing various skills and strategies that students could use to make inferences and evaluate comic strips and stories. The series of lessons begin by familiarizing students with reading stories with the use of pictures before progressively guiding students into inferential understanding of these picture stories.



Performance and observation

Sixteen students aged 11 to 14 participated in this study, 8 of whom were in an experimental group and the other 8 in a control group. Students in the experimental group were given a pre-test requiring them to complete inferential comprehension questions after reading different types of picture stories before eight hours of the intervention programme spread across eight weeks. They were given a similar post-test after the programme. Students in the control group did the same pre-tests and post-test eight weeks apart. Both the pre-tests and post-tests of all students were marked by a single teacher to account for inter-rater reliability.

Two paired samples t-tests and two independent samples t-tests were conducted to evaluate any positive impact

the curriculum had on the learners. Descriptive statistics and the results of the t-tests are presented in the following tables.

The first t-test conducted was an independent samples t-test comparing the pre-tests of the experimental group with the pre-tests of the control group. Results of this t-test suggest that there is no significant difference between pre-test scores of the experimental group and the control group as shown in Table 1.1.

The second t-test conducted was a paired samples t-test comparing pre-test and post-test scores of the experimental group. The results of the t-test ($p < .05$) suggest that there is a significant difference between the pre-test and post-test scores of the experimental group as shown in Table 1.2.

Table 1.1. Results of Independent Samples t-test comparing pre-test of experimental group and control group

Group	n	Mean	SD	df	p
Experimental Pre-test	8	5.13	2.23	14	.457
Control Pre-test	8	5.88	1.64		

Table 1.2. Results of Paired Samples t-test comparing pre-test and post-test of experimental group

Group	n	Mean	SD	df	p
Experimental Pre-test	8	5.13	2.23	7	.021*
Experimental Post-test	8	7.75	2.60		

* $p < .05$

Table 1.3. Results of Paired Samples t-test comparing pre-test and post-test of control group

Group	n	Mean	SD	df	p
Control Pre-test	8	5.88	1.64	7	.470
Control Post-test	8	5.38	2.56		

Table 1.4. Results of Independent Samples t-test comparing post-test of experimental group and control group

Group	n	Mean	SD	df	p
Experimental Post-test	8	7.75	2.60	14	.087
Control Post-test	8	5.38	2.56		

The third t-test conducted was a paired samples t-test comparing pre-test and post-test scores of the control group. Results of the t-test suggest that there is no significant difference between the pre-test and post-test scores of the control group as shown in Table 1.3

The last t-test conducted was an independent samples t-test comparing the post-tests of the experimental group with the post-test of the control group. Results of this t-test suggest that there is a trend towards a significant difference comparing post-test scores of the experimental group and the control group as shown in Table 1.4.

The insignificant difference between the experimental group and the control group in their pre-test scores confirms that both

groups of students were of very similar performance prior to the programme. This similarity was reduced, showing a trend towards significance after the programme. The significant difference in the experimental group and insignificant difference of the control group seem to indicate that students were able to perform better after the intervention.

The lack of improvement of the control group confirms that no other variables, such as the occurrence of practice effects were present and improvements of the experimental group were solely based on the curriculum. It was also observed that the control group showed a slight deterioration in performance over time. The consolidation and evaluation of all 4 t-tests provided data that indicates that the introduced curriculum could have a

positive impact on these adolescent learners with dyslexia.

An effect size analysis (Cohen, 1988) was also conducted as an alternative method in measuring the strengths of the above observed improvements for the experimental group. Cohen's effect size value ($d=4.47$) suggests a very large effect size confirming the excellent progress of the experimental group.

Further qualitative evidence suggests that these students have improved in their understanding of inferences after the intervention. This was recorded by comparing their answers in their pre-tests to the post-tests. One such example can be observed in one of the test questions requiring a student to infer the feelings of a man after a boy took a plank of wood from the man's house and used them as skis. When asked how the man felt, one learner answered "Sadness" in his pre-test. This did not show an understanding of any inference, but rather just revealed how the learner interpreted how the man felt. In his post-test, the same learner answered, "Because the boy took the wood from the house." (He most likely meant "Because the boy took the wood from the house.") In this case, he was able to infer that the boy took the plank from the man's house even though it was not shown in the picture. This also showed that the learner was able to understand the feelings of the man and inferred that the man was upset because the boy had tampered with his house.

A second example was when learners were asked how a boy in a story solved his problem of not having a gun in a

dangerous situation depicted in the picture in the following page. One of the learners' pre-test answers was "The boy asked the crooks to throw their guns to him." Although this was indeed what the boy did, the learner's answer in his pre-test did not reveal understanding of the story since he was just lifting the answer from the speech bubble. In the post-test, however, he answered, "The boy tricked them by thinking that he has a gun." This revealed that in the post-test, the learner was able to perceive what the crooks were thinking, understanding that in their perspective, they would think that the boy had a gun. This also showed that he understood the boy's plot of tricking the crooks into thinking that he had a gun to solve his problem of being unarmed.

The differences observed between how these adolescent learners with dyslexia answered questions in their pre-test and post-test revealed that there was a positive impact in using pictures to teach inferential comprehension.

Referencing the same two stories mentioned earlier, examples of answers provided by students in the control group include the following.

When a student in the control group was asked how the man felt after wooden planks were removed from his home, a student answered "The man felt angry" in his pre-test, which would actually be an accurate answer. In his post-test however, he answered that "He felt cold." This indicates that this student was describing the feelings of the man based on how the man looks like in the picture rather than based on the situation in the story.



When a student in the control group was asked how the boy in second story solved his problem of not having a gun, his answer in his pre-test was "The boy shouted loudly, when the robber was looking at the stuff." His post-test answer was "He shouted loudly, they were scare because of the shout and never think properly." Both answers were similar and were describing what the picture story exactly presents. This student was only able to describe the picture and is not able to show an inferential understanding of the reason behind the action of the boy in the story.

A comparison of the answers between students in the experimental group and students in the control group clearly shows a distinct difference in their ability to comprehend inferentially.

Conclusion

Results and observations from the pre-tests and post-tests answers suggests that there was a positive impact of teaching dyslexic learners in their adolescent years inferential comprehension using pictures. Adolescent learners were able to understand the picture-based stories

better. They were also better able to answer inferential questions after the intervention programme. These were not possible when reading text-based stories since these would require too much effort on the part of the learners to decode text. Picture stories also provide readers with a physical reference to the story unlike the alternative strategies mentioned earlier that could be too cognitively demanding.

While this study was successful in establishing the possibilities of using pictures in the form of comic strips in comprehension interventions for dyslexic learners, it is important to understand its limitations. One of the limitations to this study is its small sample size. While measures were taken to confirm that the participants were normally distributed and to ensure the findings were also supported by the qualitative data collected, future research with a larger sample size would be better placed to justify the findings of this study

This study was also conducted and evaluated within a short duration. The actual implementation of the programme was only conducted for 8 weeks before data collection. Future research could include longitudinal studies which would explore the long term impact of using pictures in comprehension intervention programmes.

There are several other possibilities for future research in line with the interests of this study. For example, future research could look into how students can progress long-term with a designed curriculum that moves progressively from a curriculum that is predominately picture-based to one that

is text-based. It would also be useful to look into the reasons behind the improved quality of activity answers in learners when they are exposed to learning with pictures.

The knowledge and discovery of the possibilities learners with dyslexia have when exploring comprehension with pictures provides them with outstanding opportunities to assess and learn skills that they may not have had opportunities to acquire in the past. It is difficult to explain how frustrating it must be for a learner not being able to access knowledge, information and skills because of decoding difficulties. This study opens doors and opportunities for learners with dyslexia to learn and progress cognitively and intellectually. Educators will also be able to explore several possible directions in teaching these learners skills they had so much difficulty accessing in the past.

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