A STUDY ON THE USE OF NOVAL TECHNOLOGIES TO IMPROVE READING SKILLS FOR STUDENTS

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Abstract

Despite significant initiatives to improve education globally, policy makers and researchers remain concerned about literacy outcomes in developing countries, as students lack basic literacy skills even after several years of schooling. Educational technology has been advocated as a potential solution to low-quality education in developing countries, yet little rigorous research exists on the topic. As COVID-19 has caused massive global disruption and teachers have been forced to adopt technology globally, research on the effectiveness of using technology to teach literacy in low-income contexts is important. An adequate level of reading skills is a prerequisite for successful learning. Many studies have shown that without a solid foundation, there can be serious difficulties in learning later and failure in the first years of schooling can determine attitudes towards learning. There are studies in the current literature that have examined the efficacy of Internet-based programs for reading skills for children with reading skills difficulties, but almost none have considered remote rehabilitation programs. The present paper reports data related to CLOSE, a distance program developed in India to improve language and reading skills.

Keywords: *Impact, Develop, Reading, Skills etc.*

Introduction

Reading skills is a fundamental cognitive ability for children, supporting school achievement and subsequent participation in most areas of adult life (Hulme & Snowling, 2011). Therefore, children with learning disabilities (LD) and special educational needs who show difficulty understanding text, sometimes in conjunction with other problems, may be at increased risk of life and school failure (Woolley, 2011). Reading skills, in fact, is a complex cognitive ability that involves not only linguistic (e.g., vocabulary, grammatical knowledge), but also cognitive (e.g. working memory, De Beni & Palladino, 2000), and metacognitive skills (aspects of both For) is also included. knowledge and control, Channa et al., 2015), and, more specifically, higher order skills skills such as generating inferences (Oakhill et al., 2003).

Recently, due to the spread of technology in many areas of daily life, text skills at school, at home during homework and at work depends on an increasing number of digital reading devices (computers and laptops, e-books and tablet devices). is based.) which can become a fundamental support to improve traditional reading skills and learning skills (e.g., inference generation). The training program consists of 15 different lessons, specifying 15 different development opportunities. On average, each set of tasks contains 13-16 tasks, so the total development program includes 200 basic tasks with additional support instructions and branches. The branch structure of the program allows the task to be tackled again with useful information in case of incorrect solution of a task. A task can be completed at 2-3 levels of difficulty. That is, after an unsuccessful answer, help is provided to the learner, and if this is still not enough to reach the correct solution, they can get further help information. The goal of acquiring various reading skills, from phonological awareness to vocabulary acquisition and fluency, is to be able to understand text effectively (Jamshidifarsani et al. 2019). Reading skills at an appropriate level involves a variety of skills, and a lack of one or more of these skills can impair skills (Nation 2005; Kendeau et al. 2014). Therefore, each individual with reading difficulties may have different levels of difficulty reading text, resulting in a different reading profile (Cain and Oakhill 2011). Therefore, the key to reading at a high level of proficiency is automatic, easy decoding (LaBerge and Samuels 1974). To reach this level of proficiency, learners have to go through a long learning process (Swart et al. 2017). This labor-intensive learning phase is not easy for all students and can be hindered by many factors. A school can only meet the expectations of public education if it can develop the skills and abilities of students with scientifically based tools. Computer-aided development programs provide a new way to solve this problem. These can be used to develop students' skills in a targeted way. Thus, a complex, multicomponent development program

adapted to the curriculum can be used to facilitate the development of students' reading skills in the early stages of primary school, one of the methods of which could be technology-based development. The role of reading skills is indispensable in learning and proper understanding of instructions, and it is becoming increasingly important in modern societies. Any lack of reading can severely limit a person's ability to succeed (Viscone et al. 2017; Luo et al. 2017; Jamshidifarsani et al. 2019). A person who reads well makes a constant effort to find information from the text in order to interpret it. If proficiency is inadequate, the reader is unable to remember information, make connections, and integrate background knowledge with what has been read (National Reading Panel 2000). The integration of experience and background knowledge into what is read is a necessary condition for the development of intelligent and fluent reading (Nelson et al. 2012), and a lack of this skill puts students at risk of failing in school and dropping out. (Rabiner et al.) al. 2016).
Continued improvement in students' reading skills after the lower grades should be prioritized, as research shows that reading performance of low-income students declines after the third grade (Move and Jacobs 1983; Hirsch 2003; Stockard 2010; Campbell et al). 2019). Teachers need continuous feedback on how their students are developing in different areas of reading to support effective reading instruction (Sztajn et al. 2012). Thanks to technology, continuity of feedback can now be integrated into the process of modern teaching.

Literature Review

Some authors compared the effects of a technological interface on reading comprehension versus printed text in children with typical development (Kerr and Simons, 2006; Rideout et al., 2010; Mangen et al., 2013; Singer and Alexander, 2017; Delgado et al., 2018). The results were consistent and showed children demonstrated poorer comprehension in screen texts compared to printed texts (Mangen et al., 2013; Delgado et al., 2018) and adolescents still preferred digital texts compared to printed texts. Di (singer and vocalist) Alexander, 2017). With regard to children with learning problems, only a few studies considered the differences between printed text and digital devices (Chen, 2009; Gonzalez, 2014; Krieger, 2017), which found no significant differences, suggesting that That compensatory digital devices should be used for children with learning difficulties. Can be a valid alternative with respect to traditional written texts in facilitating their academic and work performance. This conclusion is also supported by the results of a meta-analysis (Moran et al., 2008) regarding the use of digital tools and learning environments to enhance literacy acquisition in middle school students, which shows that technology can improve reading comprehension can improve. The studies sourced included quantitative, qualitative, and mixed methods studies, so the methodological decision was made to use thematic synthesis (Snilstveit et al., 2012). This option is particularly appropriate for the research questions, as the aim of this review is to consider the wide range of research that exists, and not only which interventions were effective (for which meta-analysis may be more appropriate), but also which Why the interventions were effective. This approach to analysis was useful for representing qualitative data and information about the context of the intervention (Jimenez et al., 2018; Snilstveit, 2012; Snilstveit et al., 2012). This was important to Research Question 3, which explains why forms of educational technology are effective, and is suitable for qualitative analysis. Furthermore, this option was chosen for the relevance of the review to policy makers. As Mallet et al. (2012) argue, systematic reviews in the international development literature should help us understand the broader context of interventions, because 'the question of why things work is as policy relevant as whether they work in the first place or No' (page 453).

Methodology

Accessing the app required a connection to the Ridinet web site for more or less 15/20 minutes three or four times a week. The duration of use was 3 months for 6 children and 4 months for 22 children. After this period the children's understanding was assessed again. Additionally, parents and children were asked some questions about the usefulness and pleasantness of the app. Specifically, children were asked: “Do you think the program helped to improve your text comprehension skills?”, “Did you like doing this program instead of similar exercises on paper?”; And parents were asked: "Was it difficult to introduce cloze activities on the days when it had to be done?" "Compared to the beginning of treatment, how do you assess your child's ability to understand text currently?" , Except for the last question, all questions had to be answered on a 5-point scale, with 1 = not at all, 2 = a little, 3 = fairly, 4 = a lot, 5 = very much. Answers to the last question changed on a 4-point scale, with 1 = got worse, 2 = unchanged, 3 = improved a little, and 4 = improved a lot. The texts range in length from 226 to 455 words, and their length increases with school grade (the battery includes a different pair of texts for each grade, in order to have texts and questions matching the degree of expertise in different grades. Is). Students read the text silently at their own pace, then answer a variable number of multiple-choice questions by choosing one of four possible answers (depending on school grade). There is no time limit, and students can re-read the lesson whenever they want. The final score is calculated as the total number of correct answers for each lesson. As stated in the manual, alpha coefficients are between 0.61 and 0.83. The recommended age range for using

this program is between 7 and 14 years. This study included 21 children in the semantic mode (only content words could be missing and no syntactic cues could be used to decide between alternatives) and 7 children in the syntactic mode (where all words could be missing). Was proposed. The mode type selected for each child depends on the performance of pre-testing and diagnosis. The co-author of the current study (LB), a physician, monitored the child's results and activities with the app and periodically sent him some motivational messages. Motivational messages were usually sent once a week to congratulate children on the work they had accomplished and to learn about potential problems they might encounter. The training lasted for 3 to 4 months and consisted of 3 to 4 sessions of 15–20 minutes per week.

Result Analysis

In our first question, we examined changes in performance relative to students' native reading skill levels. Previous research has already examined the usefulness and effectiveness of technology-based learning at the school level (including Sivin-Cachla and Bialo 2000; Barley et al. 2002; van Scotter and Bos 2004; James 2014) and the potential for technology-based development. comprehension beyond normal school teaching (e.g., Jenkins et al. 2017; Klus et al. 2019; Campbell et al. 2022). Their results highlight the success of technology-based reading development. Our research results confirmed that the application of the training program in the sample is suitable for improving comprehension performance. We found that the text comprehension of the students involved in the development improved by half a standard deviation (d = .51) after completion of the development program, while there was no change in the skill level of the control group members (d = .51). .03). In the three months between the pretest and the follow-up test, students received only schooling, where we experienced positive changes in the skill levels of both groups. That is, this period is sensitive towards the development of understanding. Since the students started at the same skill level before starting the experiment, we can conclude that extracurricular development accelerated the development of the intervention group, because the students included in the development maintained their marked development.

As for the second research question, which aimed to gain more knowledge about the efficacy of the intervention program, we examined the effect size according to the students' skill level. Based on the results, we concluded that the intervention program was able to accelerate the growth of students in the intervention group and that students from both low skill groups were most affected by the training. The worst performing students (skill group 1) showed the greatest improvement, the effect rate of the intervention was large (d = 1.81) and the medium performing students (skill group 2) was medium (d = .92). Strongly performing students (skill group 3) showed the least improvement (d = .23). Overall, after completion of the training program, there was a positive change in understanding among members of all three skill groups compared to members of the control group; That means their development accelerated. As a result of measurements three months later, it could be concluded that their performance gains were maintained by the low- and high-skilled intervention groups; However, this advantage waned. Those with good skills were able to maintain their significant gains, with their understanding improving by more than two-tenths of a standard deviation (d = .24), and students in the first skill group improving by an additional one-tenth of a standard deviation (d = .24). happened. Standard deviation (d = .12). Our results are partially consistent with those of Campbell et al. (2022), who also found that their development was effective for students at the highest and lowest levels of study. We consider these results particularly important, as students lacked in-person schooling for two school years, resulting in a significant gap in learning (Engel et al. 2021; Tomasik et al. 2021; Molnar and Harman 2022). The positive change in performance of the intervention group suggests that the development program is also suitable for overcoming these disadvantages.

Our fourth question involved evaluating the impact of the intervention program in a latent curve modeling framework. The developmental strength of the intervention program was confirmed by structural equation modeling analysis. Three different combinations of no-change and latent change models were used in both the intervention and control groups. The best-fit trajectory (latent change model) and the significant positive latent slope factor of the intervention group confirmed the results obtained at the manifest level regarding the positive impact of training in both dimensions, while the students of the control group did not demonstrate any significant positive latent slope factor. Changes at the latent level. Importantly, our results also demonstrated that there were significant differences in students' response to the training program, as indicated by the interaction between treatment and baseline.

Various processes and abilities have been targeted in the international literature related to computerized training programs for reading comprehension. Specifically, various studies have included activities promoting cognitive (e.g., vocabulary, guessing) and metacognitive (e.g., use of strategies, monitoring of comprehension, and identification of relevant parts in the text) components of reading comprehension. Table 1 reports the list of papers proposing computerized training programs along with a summary of the findings that emerged. The participants included varied ages and school grades, with the majority belonging to middle school and high school. The general outcome of the study is positive due to significant improvement in comprehension skills after the training program, the effects of which last long even during follow-up; In fact, most participants in the

training programs outperformed their peers assigned to comparison groups and maintained their improvements. Specifically, several studies (O'Reilly et al., 2004; Magliano et al., 2005; McNamara et al., 2006) used the iSTART program with adolescents and young adults. This program promotes self-explanation, prior knowledge, and reading strategies to increase comprehension of expository scientific texts. The results showed that students who followed the iSTART program made greater gains than their peers, improving self-explanation and summarization. Additionally, strategic knowledge was a relevant factor for results in comprehension tasks including multiple-choice questions: students who already had good strategic knowledge improved their accuracy when answering guessing questions, while those with less strategic knowledge Students became more accurate with text-based questions. , Another program, ITSS, was used with young students (Mayer et al., 2011; Wijekumar et al., 2012, 2013, 2017), with the aim of identifying key parts and key words in text and retaining information. The activities were to be supported on the basis of classification. In a hierarchical order. Thus, computerized programs generally appear to improve reading comprehension skills. However, it should be noted that, in most cases, students were trained at school, without the personal support of a therapist, taking into account the cognitive and psychological needs of the child. In particular, to our knowledge, no program has examined the effects of an Internet-based remote reading comprehension program that allows the child to be trained at home in an individualized manner. A useful aspect of Internet-based distance training is that the psychologist can monitor the child's results and activities and write him some motivational messages, thereby reducing the attenuation present in programs carried out at home only with supervision. The literature related to remote training is still scarce, however, some evidence suggests that these programs may represent a good integration to other types of intervention, which are usually carried out in school, in a rehabilitation center or at home (For example, Meech et al., 2013). The present study tested the effectiveness of this training program on a clinical population who, for various reasons, demonstrated difficulties in reading comprehension. The participants were 28 children (16 males and 12 females) attending a private practice for learning difficulties in the city of La Spezia in the north-west of Italy, from the third to the sixth school grades (5 of the third, 5 of the fourth 9, 11 of 11) 5th and 6th grade 3), the mean age of M's children = 9.79 years (SD = 1.03). Seventeen children had a current or former speech disorder: 10 of these children also had LD (learning disability) and one was bilingual (speech problems not due to bilingualism). The other 11 children had LD or significant learning difficulties, and one of them also had ADHD (attention deficit/hyperactivity disorder). For the goals of the study, all of these children were considered together because they all presented severe reading comprehension difficulties, as reported by parents and teachers and confirmed by initial assessment.

All analyzes were conducted with SPSS 25 (IBM Corp., 2017). A preliminary analysis found that all examined variables met assumptions of normality (K-s between 0.106 and 0.143, $p > 0.05$). Then, we compared children's reading comprehension performance with cloze before and after computerized training. For this analysis, a repeated measures analysis of variance (ANOVA) was conducted on the comprehension scores to examine differences across the entire group of children between scores obtained before and after training. A significant difference was found for both comprehension texts [$F(1,27) = 22.37$, $p < 0.001$, $\eta 2p = 0.453$ and $F(1,27) = 38.90$, $p < 0.001$, $\eta 2p = 0.599$, respectively]. Then possible differences between the two training modalities (semantic vs. syntactic) and different training periods (3 months vs. 4 months) were analyzed; In both cases no significant differences emerged between the groups [$F(1,27) < 1$]. Results related to parents' and children's answers about the app's usefulness, pleasantness, and self-perceived efficacy were also analyzed. In the first question, addressing perceived improvements in children's comprehension skills, more than half of the sample chose the option “very” or “very much” (15 “very” and 5 “very much”), with only 1 child answering Gave “a little bit” and others chose “enough”. On the second question, about the pleasure of doing this kind of activity instead of pen and paper activities, all the children answered "a lot" or "a lot." With regard to parental questions, on the first question about difficulty initiating cloze activity, only one parent answered "enough", a quarter of the sample chose "a little" (seven families) and all the others 20 families chose the option. Not at all." On the last question about perceived training efficacy on their child's performance, most families chose "a little improvement" or "a lot of improvement" and only three parents thought that their children's ability remained unchanged. However, no relationship was found between parent and child perceived improvements in STG and reading comprehension.

In summary, the results show that the development of this online training program can be considered successful. It develops students from 3rd to 4th grade in a playful environment. The findings show that reading skills can be developed significantly and effectively not only in the traditional in-person setting, but also in a computer environment. The development program has achieved its goal because it really focuses on capturing low-skilled and/or disadvantaged groups. However, surprisingly, it also significantly facilitated the growth of students in the high-skilled group. Therefore, this development program can be used as a supplement to school education at the grade level to accelerate the development of understanding.

Conclusion

The online development program accelerated growth and helped students in the program make significant developmental gains over their control group peers. The results of the program also showed that development of

understanding can also occur in an online environment, providing an objective form of measurement and development for teachers and students. The uniqueness of our program lies primarily in the fact that its content has been developed in line with the national curriculum and recommended textbooks used in Hungary and can therefore be used in classroom and extracurricular activities. Second, it is suited to the needs and abilities of students as its branch structure guides students to the right solution with useful information, explanations and highlights. Therefore it is also suitable for differentiated education.

Regarding the efficacy of computer-assisted training programs, the literature highlights that many training programs are designed for an educational context. The results are generally encouraging with positive effects on reading comprehension, measured with materials different from those practiced during training. However, few studies analyzed efficacy in children with specific reading comprehension problems, and no studies considered the possibility of conducting training at home under remote monitoring of an expert. The latter characteristics are what make Close unique compared to the existing literature. Close is actually based on a rehabilitation online platform that allows the child to complete individual training activities several times a week without leaving their home, and at the same time allows the therapist to monitor the child's progress or monitor the characteristics of the activities. Enables to manage. The advantage of this procedure is twofold: on the one hand it increases the possible number of training sessions per week, on the other hand it allows saving the time required to reach the center for rehabilitation and reducing the costs of the intervention. Such results have clinical and pedagogical implications, inviting professionals and teachers to consider early resources for children and, if necessary, activities organized through remote rehabilitation programs with individual intervention sessions. that can teach strategies and promote a metacognitive approach to reading comprehension.

However, some limitations of the present study should be acknowledged. First, the study did not include a control group, so the findings should be taken with caution, although standard data and previous results obtained with the same test provide support for the robustness of our results and the use of standard data. Provides a control measure of the way comprehension skills are acquired in typically developing children without specific training, so it serves as a kind of passive control group. Second, the treated group, although characterized by a general reading comprehension difficulty, was partly heterogeneous, as children read in different grades and may have had different diagnoses. Unfortunately, the limited number of subjects, as a result of which it was not possible to create groups defined by both grade and diagnosis, did not allow analyzes taking into account grade and diagnosis as between subjects factors. Future studies should examine more homogeneous populations or consider a larger sample of children, allowing more information about the efficacy of training in different child populations. Additionally, the fact that the treatment was concluded with a post-training assessment did not allow the opportunity to further examine procedure and maintenance effects with follow-up. Limitations of the study affected the sample and methodology sections. Convenience sampling was used, as schools and classes were able to join the sample on a voluntary basis, so representativeness did not appear. Students who completed the pretest dropped out significantly during the development process, which requires further research to explore. Although pairs of learners were fitted according to certain criteria, no background variables were considered, nor was the effect of the teaching method of reading on development considered.

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