Technology-Assisted Reading for Improving Reading Skills for young South African Learners

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Abstract: This paper addresses the controversial issues of improving the reading skills of young learners through technology-assisted reading programmes. On reporting the results of primary school learners from grade 2 to grade 7 who participated in a computer-based reading programme for seven months, we try to answer the critical questions of whether computer-assisted reading programmes should be embraced or avoided. We also have looked at the possible benefits of such an intervention apart from the improvement of reading skills.

The poorly developed reading skills of South African learners slowly became evident over the last couple of years as teachers, parents, employers and professionals were confronted with this ongoing crisis. The Department of Education (DoE) stated that the South African youth do not read as well as their foreign counterparts and actions were put in place to address the growing problem. However, despite this acknowledgement, decision makers are still indecisive in effectively addressing the problem. Many theories exist on why children are reading impaired and who should accept responsibility for it.

Data of the findings in this paper was collected over a period of seven months and reflects the reading results of learners who followed a combination of a computer-based reading programme, visual accuracy and visual memory computer exercises as well as the application of specific paper-based activities. Groups were small, with continuous personal intervention and communication from the facilitator with each learner. This paper also qualitatively reflects on the additional benefits or negative experiences of learners who participated in the electronic reading programme. The qualitative data was accumulated from interviews with learners and teachers involved.

The efficacy of the reading programme was evaluated through continuous assessment of learners' performance on different aspects of reading, including reading speed, reading comprehension, spelling and language. The reading results obtained were compared with the initial reading assessment before implementing the programme. The overall experience of learners who participated in this programme provided valuable information in evaluating the reading programme as a whole.

Results obtained from this study indicate that improvement in reading speed, comprehension and spelling was unique to every learner individually. The benefits beyond the improvement of reading skills obtained as a result of the programme encompass many areas of the learners' development, such as social learning, collaborative learning, finer perceptual motor skills, confidence and a general improvement in marks in other subjects.

This paper attempts to provide insights into the value and challenges of computer-assisted reading for primary school learners and into the importance of adapting teaching methods in response to a crisis.

Keywords: computer-assisted reading programmes, improvement of reading skills, evaluation, assessment, primary school learners, reading comprehension, mastering of reading skills

1. Introduction

The poorly developed reading skills of South African learners slowly became evident over the last couple of years as teachers, parents, employees and professionals were confronted with the ongoing crisis. The Department of Education (DoE) stated that the South African youth do not read as well as their foreign counterparts and that South African youth are of the poorest readers in the world (Howie 2007).

According to a report from Unesco, and the association for development of Education in Africa (ADEA), a learner should have at least six years teaching in the mother tongue and proper second language teaching to be at the same level as a learner who was taught in one exclusive international language. The minister of Education also stated in October 2006 that six years of mother-tongue education will be instituted at all schools (Rapport 2007). However, if it is true that six years teaching in the mother tongue is adequate as a foundation, the question arises why South African youth also count amongst the poorest readers in the world?

It was reported that businesses in South Africa first have to teach young recruits to read and write before the company can commence with their training programmes, indicating that basic skills are fundamental for

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efficiency in any working environment (Rapport 2007). Furthermore, UNISA found that students need reading skills to comprehend mathematical texts and to access, learn and apply mathematical concepts. (Bohlman and Pretorius 2002: 196-205; Dale and Cuevas 1987: 9-54)

Despite the acknowledgement of the DoE regarding the reading problem, decision makers are still indecisive in effectively addressing the problem, leaving Higher Educational Institutions with a rapidly growing intake of students who struggle to read and write, contributing to the failure and dropout rates. The DoE mentioned that they did not focus sufficiently on the core competencies of literacy and numeracy and that they had made serious mistakes in relation to the language of learning and teaching to try to teach first year learners in a language they do not understand (Sunday Times 2008:10).

Bakwin and Bakwin (1972: 409) reported that since 1952 the percentages of children in American schools who were unable to read at their proper school grade level remained unchanged at 10% for 20 years. The reason for this is believed to be that most of them had a developmental defect in understanding the written word, but their potential for reading was normal but not fully utilized as an effect of poor motivation, limited stimulation, anxiety, negativism and emotional blocking.

Therefore, this paper addresses the controversial issue of improving the reading skills of learners through technology-assisted reading programmes. Many different arguments are heard in favour of or against computer-based reading programmes of which many argue that reading on a screen will not improve reading on paper and that screen reading is not a “normal way” of reading. On reporting the results of a group of learners who participated in a computer-reading programme for seven months, we shed some light on the value of computer-aided reading programmes and try to answer the question of whether such programmes should be embraced or avoided in our educational system.

2. Reading and computers in education

Bad readers avoid engagement with the written word, resulting in negative attitudes towards school and education. Most of the schools’ and teachers’ problems are rooted in the fact that learners cannot read. The lack of reading skills manifests in behaviour patterns that are not correctly interpreted by teachers as not being able to read but rather as misbehaving, being ill-mannered or even stupid (Wilsenach 2003: 96).

Many higher education institutions in South Africa progressed to technology-supported learning as many students who enter tertiary education are under-skilled and lacking basic academic and other related skills (Van Schalkwyk 2002:183-188). Should we not be more innovative in our school programmes in the face of a crisis and intervene quickly to learn from the experience?

Many educationalists still doubt the benefits of technology in fostering literacy skills and accordingly the lack of literacy skills and technological skills pose a higher risk for learners and students who enter the educational system of not achieving educational goals (Weikle and Hadadian 2003:181). However, according to the literature, assistive technology does not cure or eliminate learning difficulties but it helps a learner reaching his/her full potential as it utilises their strengths and allows them to bypass areas of difficulty (Stanberry and Raskind 2007:2). In this regard research has shown that assistive technology serves to improve certain skills deficits such as reading and spelling (Higgins and Raskind 1997:2). Moreover, the large storage and calculating capacities of the computer offer great potential for its use in the classroom. It can give instructions to the learner, call for responses, feed back the results and modify his further learning accordingly. The computer also can be used to measure each student's attainments and compare them with past performances.

In addressing reading difficulties, the choice of a suitable computer programme is one of the most important aspects. In search of the programme to be used, a set of criteria should be listed as minimum requirements to provide readers with the best chance for success. Such a programme should encompass all important aspects of reading but should also be able to assist the teacher in record keeping and administration.

Three basic levels of comprehension at least should be included in a reading programme for primary school learners as a minimum requirement, although comprehension of reading material requires much more than only three levels of comprehension.

- Comprehension of the factual content, which is important for studying. The learner must be able to recall important information and discriminate between important and less important information.

- Comprehension on an interpretive level enables the learner to interpret the content. The learner needs to identify the main idea, make assumptions based on the content, provide possible information of future actions and draw conclusions regarding the moral or lessons to be learnt from the content.
- Comprehension to analyse and apply the content. The reader needs to identify, from the content, similarities and differences, causes and effect and be able to reason and make decisions for application in general life scenarios. Readers also need to be confronted with the views of the writer that may be different from them to enable them to understand that you as a reader need not have to agree with what you read but can be stimulated to think in different ways.

A suitable programme should enlarge vocabulary and improve word recognition. This is important to enable the reader to recognise words quicker and to improve the reader's ability to express himself verbally and in writing.

Different reading techniques should be introduced to improve reading speed, fluency of eye movements and to reduce the duration of fixation and to improve recognition span. Spelling is an integral part of written communication and an aspect of great concern at schools and tertiary education level and should, therefore, be part of such a computer programme.

3. Methodology

The study took place at an Afrikaans medium primary school in middle to lower income socio- economic environment. Letters were sent to all parents informing them of the proposed reading programme for grade two to seven learners. Learners could be assessed voluntarily at the school over a period of three days. In addition, teachers identified learners with reading barriers and specifically referred those learners for voluntarily assessment. A comprehensive report was compiled for every learner after the assessments were completed.

3.1 Subjects

The group consisted of 31 learners from grade 2 to grade 7. The number of respondents per grade is shown in table 1.

Table 1: Grades of participants

rade	N
Grade 2	4
Grade 3	5
Grade 4	4
Grade 5	8
Grade 6	7
Grade 7	3
Total	31

3.2 The assessment

A standardised scholastic reading test was utilised that provided information on reading speed, comprehension, vocabulary and typical reading mistakes. An additional standardised spelling test was used in order to also assess the spelling skills of the learners. The tracking of eye movements by means of moving a pencil horizontically and vertically and towards learners' eyes, formed part of the assessment. Any irregular eye movements, discomfort or pain were noted, duly reported and recommendations for an appointment with an optometrist were made when necessary.

The electronic assessment was used as an introduction to the reading programme and to assess the learners' mouse-skills. This was done to ensure that the lack of computer literacy of the learners would not impact negatively on their performance in the assessment (Foxcroft and Roodt 2005:183).

There are, however, many aspects that influence reading capabilities which are not always detectable in assessing reading through standardised reading tests. A reader who is inhibited if required to read aloud could be assessed through silent reading, which then does not allow for an assessment of fluency and accuracy (Lewkowics (n.d.):4). Furthermore, standardised reading assessments do not measure growth over a short period of time nor will it measure mastery of the reading task.

3.3 The electronic reading programme as intervention

The study spanned a period of seven months and the programme did not run during school holidays. All learners were placed on the programme with compulsory attendance for at least 16 sessions of 45 minutes each, after which a decision would be made for continuing on the programme. Learners started at different times during the seven month period.

A standard reading session throughout the seven month period contained the following elements:

- A spelling test, where the specific word is flashed and the learner is also able to hear the word through earphones. Flashing speed gradually increased with every session;
- Testing of reading speed;
    - A contained reading exercise to improve fluency and speed. The contained speed is initially determined by the comprehension achievement in the assessment of the first session. Should the reader attain 70% or above, the contained reading speed will increase at default of 10 words per minute in every subsequent study-unit. Should the reader attain below 70% for the comprehension test, the contained speed will be decreased for the start of the programme. Any achievement of below 70% on the comprehension test in the following sessions will result in the reading speed being contained. The contained reading exercises promoted the following aspects:
        - reduce the duration of fixation on a word;
        - improve the recognition span to eleven characters and train the eye to transgress into the margins rather than regress;
    - improve the fluency of the eye in moving from left to right.
- Comprehension test.
- Test of language skills.
- Paper-based activities to reinforce new vocabulary and the application of new knowledge in general language (learning through repetition).
- Five to seven minutes of engagement in electronic exercises for eye movement, visual accuracy and visual memory.

The following additional features were accommodated:

- Readers were encouraged to make use of the dictionary function of the computer programme for unfamiliar words.
- Readers were encouraged to listen to the reading material as read by mother tongue speakers.
- Readers could record themselves to enable them to assess their own progress.

3.4 Personal interventions as part of the programme

Health is regarded as a state of total physical, psychological and social well-being and not just as the absence of illness. Healthy perceptions of oneself and confidence in one's own abilities form part of the total state of health. Literature informs us that achievement or failure is not only determined by ability, but also by a person's perception of his or her ability (Ochse 2003: 67-73). Many children perform poorly in school because of their low expectancies and feelings of hopelessness and not because they lack the intellectual capabilities (Graham 1989:40). Negative experiences in the classroom such as being teased by others, insensitive remarks from teachers and parents and learners compared against each other, contribute to the learner's perceptions of their reading abilities. These perceptions cause poor readers' dislike of reading and unwillingness to engage in reading activities. The poor reader feels exposed and humiliated when asked to read aloud, contributing to anxiety and poor confidence.

Competition in the classroom creates anxiety, while the lack of competition and being threatened by others motivates competition in itself As every learner engages with the reading material on a computer and receives immediate feedback electronically, the competition between readers is eliminated but competing with oneself is encouraged.

Learners were encouraged to read softly with minimum movement of the head. They were also encouraged to read to their younger siblings, pets and dolls at home and to use their newly acquired vocabulary in their daily conversations. The facilitator provides techniques for the memory of the spelling of difficult words and provides continuous information on spelling rules. Help from the facilitator regarding unknown words not

provided by the dictionary function would be in the form of providing information about the word to enable the reader to think.

The atmosphere in the venue was kept informal, caring and non-threatening. Recognition formed an important part of the programme. The facilitator made an effort to recognise every reader at every session for something positive. News about the readers' achievements was published monthly in the school's newsletter and parents were provided with regular progress updates. Achievements to be recognised were not limited to reading achievements, but also behavioral achievements such as punctuality, neatness, friendliness etc.

Parents and teachers formed part of the reading team providing the support, encouragement and time the learners needed.

3.5 Evaluation

Continuous evaluation took place. The reader was offered immediate feedback on every response by means of an animated character. A report and graph is also presented at the end of an exercise and a full report at the end of every session provided readers with the results obtained during the session.

4. Results

The results of the assessment indicated major difficulties in the following areas:

- Poor reading speed
- Poor comprehension
- Fixation on specific words
- Rereading of words and phrases
- Poor vocabulary
- Difficulties in pronunciation
- Incorrect eye movements

In the following table the results of the learners after the completion of 15 reading sessions (study units) are reflected next to the results learners obtained in the initial assessment. The column *Expected reading speed* indicates the expected reading speed for every grade (Taylor, Frackenpohl and Pettee 1960). Reading speed is indicated as words per minute while comprehension and spelling are reflected as percentages obtained.

Table 2: Comparison of the results of the initial assessment and after completing 15 reading sessions.

			Reading speed, wpm		Comprehension, %		Spelling, %	
Grade	N	Expected Reading speed	Assessment	After 15 units	Assessment	After 15 units	Assessment	After 15 units
Grade 2	4	115 w.p.m.	29	44	66	88	100	100
			34	75	20	74	70	70
			24	41	25	73	71	100
			11	45	45	88	25	73
Grade 3	5	138 w.p.m.	32	77	60	78	60	90
			30	97	60	82	0	84
			40	144	60	94	50	100
			45	68	63	66	30	75
			52	90	60	84	20	88
Grade 4	4	158 w.p.m.	16	84	0	70	0	73
			52	90	50	83	10	89
			33	101	13	92	10	92
			52	108	13	91	70	96
Grade 5	8	173 w.p.m.	49	105	60	59	20	61
			100	455	80	79	10	85
			103	115	50	63	40	79
			99	120	60	91	80	96
			89	164	50	79	70	85
			70	193	60	76	70	76
			46	165	13	88	6	85
			51	135	50	72	30	74
Grade 6	7	185 w.p.m.	132	262	90	91	90	100
			59	134	40	79	60	88
			49	83	50	84	33	68
			91	102	30	55	50	79
			66	82	40	87	70	93
			72	175	65	77	30	80
			66	189	60	81	30	71
Grade 7	3	195 w.p.m.	167	330	38	76	54	84
			62	93	50	77	44	90
			98	149	50	70	70	80

Assessment results indicated that none of the learners met the expected level for their grades.

In the table below, the improved results of learners are reflected as per individual learner and as per average for every grade.

Table 3: Improved results per individual learner and per average for every grade

	Improved Reading Speed, w.p.m.	Average w.p.m.	Improved Comprehension, %	Average %	Improved Spelling %	Average%
Gr. 2	15	26	22	41,75	-	19,25
	41		54		-	
	17		48		29	
	34		43		48	
Gr. 3	45	55	18	18,2	30	55,4
	67		22		84	
	104		34		50	
	23		3		45	
	38		14		68	
Gr. 4	68	57	70	65	73	65
	38		33		79	
	68		79		82	
	56		78		26	
Gr. 5	56	105 (70) * not included	-1	23	41	35,12
	355*		-1		41	
	12		13		39	
	21		31		16	
	75		29		15	
	123		16		6	
	119		75		79	
	84		22		44	
Gr. 6	130	70	1	25,57	10	30,86
	75		39		28	
	34		34		35	
	11		25		29	
	16		47		23	
	103		12		50	
	123		21		41	
Gr. 7	163*	81 (41) * not included	38	28,33	30	28,67
	31		27		46	
	51		20		10	

5. Discussion of results

5.1 Reading speed and comprehension

According to the results, it is evident that the reading speed of all readers increased without exception. The improvement in reading speed and comprehension was unique to every learner. It seems that reading speed improved more rapidly in the grade 5 to grade 7 groups and that comprehension improved best in the grade 2 and 4 groups. Improvement in individual reading speed varies from as little as 11 words per minute to as much as 355 words per minute. The grade 5 average increase in reading speed is influenced by one learner's exceptional improvement. This specific learner was extremely focused, dedicated and motivated by his own success and achievement. In order to gain a more realistic picture of the general increase in reading speed in the grade 5 group, the particular learner's speed was omitted in the calculation – indicated within brackets. Two different results are also indicated in brackets in the grade 7 group where learners achieved exceptionally well.

Comprehension was maintained or improved despite an increase in reading speed. Only two learners in grade 5 showed an insignificant decline of 1% in comprehension. It can be assumed that the individual engagement with reading material allows every learner to improve according to his or her own pace, level of motivation, cognitive abilities and dedication to the reading programme.

5.2 Spelling

The spelling results in table 3 reflect the average mark every learner obtained for the 15 sessions attended. This average was compared against the mark obtained in the initial assessment. The spelling results were included as a matter of interest as the results indicate that spelling of the learners improved drastically after attending 15 reading sessions. Possible reasons could include the frequent exposure to new words, improved vocabulary, spelling exercises, paper-based repetitions and repetition of basic spelling rules and ways of remembering them. Improvement of spelling as part of a reading programme could be investigated.

5.3 Contributing factors

The individual attention to each learner, support from the teachers and parents are seen as contributing factors to the success of the learners in the group.

One group of learners, who was referred to an optometrist after the initial assessment, commenced on the programme with correctional glasses.

5.4 Benefits beyond reading improvement

5.4.1 Feedback from teachers and parents

The following feedback was received from parents

- Learners use newly learned words at home during conversations
- Learners asked for books from the library for the first time
- Learners reading for the first time during school holidays
- A general increase in school marks
- A change in attitude towards reading and excitement about the reading programme
- An improvement in reading speed and reading fluency
- Learners having fun reading to their pets

Teachers reported a general improvement in confidence especially from the shy learner and a general improvement in learners' marks in unrelated subjects. The improvement in reading speed and fluency also was reported. Teachers felt confident enough of the benefits of the reading programme as they started referring learners and their parents to enroll in the programme. Thus, the motivation level is increased.

5.4.2 Facilitators' experiences

Demotion of learners by the computer programme to a level where they are comfortable is an especially positive attribute. The moment the learner copes with the reading material and is able to achieve 70% or more for comprehension, their attitude towards reading changes. Learners become excited about their marks. They want to share their newly achieved success with their peers and parents and want to continue with the reading programme. The learners were motivated by their success and started asking for additional reading material on the computer. This phenomenon depicts collaborative learning.

Learners become helpful towards younger learners or learners in need of support. They started to refer their friends, whom they perceive as struggling with reading, to enroll in the programme. Social learning is enhanced in this regard.

Poor reading skills in the class lable the learner as a member of the *slow or dumb* group. Being part of the reading programme now places them in an exclusive group who are privileged to read on the computer. This was very helpful for the poor readers in regaining their self-confidence and enabled them to use their disadvantage as an advantage in coping with the negative remarks from other learners.

The mouse skills of learners improved drastically, especially those of the grade two learners. The additional computer exercises not only improved visual memory and visual accuracy, but also improved hand-eye coordination. A dramatic improvement was noted within the third week of attendance, indicating a noticeable improvement in finer perceptual motor skills.

Confidence of readers grew rapidly as they proceed through the programme. The immediate feedback is a good motivator. The computer kept visible score of the learners progress during the programme which

motivated readers to seriously consider different options before answering a question and so consciously try to improve their mark. The graph that is visually presented after completing the speed reading exercise was a favourite with all readers as they requested it to be printed and taken home.

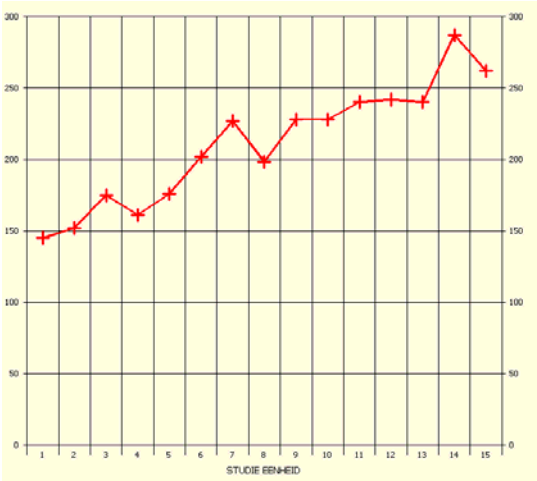

Figure 1: Example of a graph of one of the learners.

The exercise on visual memory spontaneously developed into a competition for the readers. The readers took the initiative to type a list of all the group members and excitedly entered new readers. This competition served as a major tool in developing perseverance and goal setting as learners were unwilling to leave the room until they had achieved their goal for the day.

The visibility of the computers at the school resulted in many learners requesting to be part of the programme.

Negative experiences were limited to two aspects. Firstly, limitations in the design of the programme in that the facilitator has no access to the framework to rectify spelling mistakes and grammar related mistakes. Secondly, the limitation of the programme in allowing more than one correct response from the learner as the programme was not always able to confirm the accuracy of synonyms or antonyms. This resulted in correct and more creative responses from learners marked as incorrect by the programme.

6. Conclusion

The results of this study indicate the importance of adapting our teaching methods in order to address the reading crisis in the country. Computer-based reading programmes are effective and fairly quick in addressing the reading problems of young learners. The educationalists who still believe that reading on a computer screen is not the answer to addressing reading difficulties, should ask the question if we are in a position at all to waste time on debating the advantages of computer-assisted reading in South Africa. If our children are among the worst readers in the world, why not use computer-aided technology as the medium which young learners can identify with to cultivate and re-establish a love for reading?

This tool opens doors to interact with the world. Reading creates the opportunity to learn and therefore learners should be offered the opportunity to improve their reading skills. Computer- assisted reading programmes offer learners the opportunity that we as educationalists should embrace.

This paper is the first in a series of papers in addressing reading difficulties through computer-assistive programmes. Further research in the efficacy of specific programmes and the criteria such a programme should have as minimum requirements for the improvement of reading skills and to provide readers the best chance for success, is envisaged.

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