Measuring efficacy of the WriteReader-app

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Abstract

This study seeks to verify the hypothesis that teaching with the WriteReader-app enhances the ability for learning to write in first graders. The study is focused on the students' use of phonological strategies and on the development of quantity of characters in the texts as measured by the number of words and syllables.

The study was conducted using first graders from five schools in Odense municipality. Each school provided two classes, one for control and one for testing. The classes participating in the study worked with the WriteReader-app for 30-45 minutes every day as part of their daily language lesson for the duration of the project period. The control classes carried out their standard curriculum.

The results showed that the classes working with the WriteReader-app for six weeks performed significantly better than the control classes in the digital post-study test. Progress in the test classes was 11,8% higher than that of the control classes. This data addresses the first graders' use of phonetic strategies. The tested classes appeared to develop these strategies faster when using the digital platform.

All the students participating in the study that used the WriteReader-app showed a statistically significant progress in the use of phonetic strategies in writing.

Introduction

The WriteReader-app is a learning tool, which can be accessed through a tablet or computer. The tool makes it possible for the students to take photos, upload pictures and write their own texts. In this process, it is possible to write and experiment with letters, letter sounds and words. The app is a very popular teaching aid in many primary schools and for the development of writing and reading skills. The tool has been the subject of a qualitative case study, which resulted in a positive evaluation of the app on developing a constructive practice on writing for reading (Labutz et al 2012:4).

The aim of this project was to measure through quantitative analysis if this app could make a positive impact on first graders' ability to write with the use of phonological strategies . An underlying hypothesis for using this platform as a teaching aid is that writing promotes reading. This theory is supported by several studies (Brok et al 2015, Graham & Herbert 2010, Shanahan 2006).

The overall hypothesis for the study was: Working with the Writereader-app promotes first graders' ability in learning to write and in building phonological strategies.

Design

The project involved five schools in Odense municipality in the study (Bryman 2012). The five schools provided us with two classes: one test class (t) for the explorative study and one control class (c). Overall, the project involved 217 first grade students treated with 183 sets of data. The remaining 34 sets of data were removed from the study due to either missing pre-or after-tests.

Event / Schools	HCA		ROS		HPS		SAN		HUN	
	c	t	c	t	C	T	c	T	C	t
Pre-test	12	11	17	17	23	21	18	22	21	21
Intervention (6 weeks)										
After-test	12	11	17	17	23	21	18	22	21	21

The five classes that were selected for the explorative study worked with the WriteReader-app for 30 minutes or more every day in connection with their daily language lesson during the test period. This lasted from the 31st of August until the 13th of November 2015. The other five control classes were not allowed to use the app, but carried out their teaching programs as normal.

The five schools are placed in a socio-economical index based on the possibility of high grades on their final public school exams (Kora 2012). The lower the number, the lower the possibility of high grades:

School	Socio-economical group
HCA	1
ROS	2
HPS	4
SAN	4
HUN	5

The feedback from the participating teachers showed that the app was used 4 out of 5 days during the week during the project period.

All the classes were tested prior to the study period in August for their ability in writing texts (see appendix 1 and 2). Every student was asked to finish two tests: An analogue test using paper and pencil and a digital test, using a Google-docs document on their computer.

After finishing the testing period, the students were once again tested with the same test design. The data material was collected and scored by the student teachers.

Prior to the test, the student teachers were instructed and participated in the development of the testing tool. Possible challenges were addressed in the project group and the testing tool was optimized.

The tests were designed to measure the current level of the students writing skills. We designed two tests, to avoid any bias of the preferred writing platform of the class. The students were asked by the student

teachers to write small texts on simple subjects (i.e., my day at school, my favorite toy) and were given exactly ten minutes to perform each test (appendix 1 and 2).

The tests were scored using a tool developed by the project group. This tool is primarily constructed by reference to Hagtvet and Korsgaard (Hagtvet 2004, Korsgaard et al 2010). Thus what is measured was the student's ability to use phonological strategies in their writing, but also the development of length in words, the number of syllables in these words, and also the marking of spaces between the words were tested.

Hagtvet (2004) describes the development in writing as consistent with certain phases in the child's use of phonological strategies. Korsgaard name the phases as follows:

1. *Pre-communicative-writing*
2. *Semi-phonological-writing*
3. *Phonological writing*
4. *Interphase-writing*
5. *Conventional writing*

(Korsgaard et al 2010)

These phases were used to measure the quality of the students' use of phonological strategies. The quality equals a number (indicated by the numbers on the left side). Students were rated between phases with half a number. Phase 1-3 involved the use of phonological strategies, while phase 4-5 concerned the use of conventional spelling strategies. Our tests showed that the first grade students were in the area between phase 1-3. At the first test, we had many students writing by using logographic writing. We carefully tested a few phonological hypothesizes in their texts and thus had a test score of 1.5. At the second test, many more of the students reached the second phase. We observed many phonological strategies in their texts and thus gave them a score higher than 2.

Analysis

The analysis shows the correlation between the use of the WriteReader-app and the student performance in the post-test after the six-week study.

- Significant differences in general ($p < 0.05$) from pre-to post test and differences in tests were calculated with a single t-test with connected data.
- Significant differences between control-and test classes were calculated with a single t-test with independent data.
- Individual significant differences between schools and control-and test classes from the schools were calculated in a mixed model performed in the statistical program R.

A significant result means that the result has a very low chance of being coincidental. Hence, it should be possible to perform this study again and achieve the same results.

The Data set concerning the development in writing showed the most interesting results and the student average scores are shown in table 1. The student average scores from each school are shown in table 2-6.

All schools	Pre-test	After-test	Difference
Analogue (control)	1.67	2.04	0.37
Analogue (test)	1.87	2.22	0.35
Digital (control)	1.77	1.91	0.14
Digital (test)	1.84	2.20	0.36

The change in the student results from before the study and after the study is very significant. The p-value indicates how close the hypothesis is for being non-coincidental. Hence, the p-value must be less than 0.05 to indicate a highly significant result (the -0x number following the result indicates the number of zeroes in front of the comma, ex p = 1.48945E-07 = 0.000000148945).

Analogue test, control class, p < 0.001
Analogue test, test class, p < 0.001
Digital test, control class, p < 0.05
Digital test, test class, p < 0.001

All students, despite school, gender and type of test, showed a highly significant progress from before to after, *p < 0.001*

The test students have a highly significant better progress, despite school and gender, *p < 0.01 = 0,003839*

There is a highly significantly difference between the test-and control students when focusing on the digital test, *p < 0.01*

This difference is not significant when focusing on the analog test, *p = 0.4*

Table 2

HCA	Pre-test	After-test	Difference
Analog (control)	1.46	1.75	0.29
Analog (test)	1.70	1.66	-0.05
Digital (control)	1.65	1.67	0.02
Digital (test)	1.41	1.91	0.50

Tabel 3

ROS	Pre-test	After-test	Difference
Analog(control)	1.16	1.65	0.49
Analog (test)	1.38	1.85	0.47
Digital (control)	1.34	1.50	0.16
Digital (test)	1.34	1.90	0.56

Table 4

SAN	Pre-test	After-test	Difference
Analog (control)	1.28	1.81	0.53
Analog (test)	1.95	2.25	0.30
Digital (control)	1.54	1.67	0.13
Digital (test)	2.02	2.28	0.26

Table 5

HUN	Pre-test	After-test	Difference
Analog(control)	2.00	2.38	0.38
Analog (test)	1.96	2.45	0.49
Digital (control)	1.92	2.13	0.21
Digital (test)	2.00	2.27	0.27

Table 6

HPS	Pre-test	After-test	Difference
Analog (control)	2.17	2.36	0.18
Analog (test)	2.18	2.55	0.37
Digital (control)	2.21	2.34	0.13
Digital (test)	2.11	2.43	0.32

The progress of the different schools can be ranked as follows.

High-performing schools:

HUN has a highly significant better progress than HCA despite type of test and gender, p = 0.000805

HPS has highly significant better progress than HCA despite type of test and gender, p = 0.000935

Middle-performing schools:

SAN has borderline significantly better than HCA despite type of test and gender, p = 0.074248
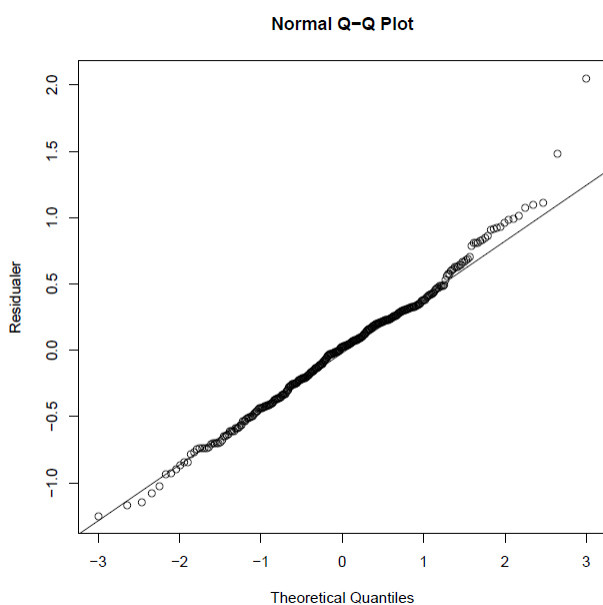
Low-performing schools

ROS performs on a level with HCA despite type of test and gender

All students have a borderline-significant progress in the digital test despite school and gender, *p = 0.06422*

Issues of validity

The data model was tested with a QQ-plot and proves to be probability distributed.

This study was constructed so that the teachers themselves could carry out the research. This was without randomization in the selection of test-and control classes. The teacher-factor presents a challenge in evaluating the validity of the study because it brings into question what is really being measured: Is it the effect of the WriteReader-app or is it the teacher's expectancies? Thus the study has not been randomized and we cannot be sure whether the tested participants can be compared. However, the essential validity of the study could be said to be quite high: Working with the WriteReader-app as a teaching aid is quite close to the daily life conditions in which the teachers find themselves (Bryman 2012). Therefore, this study can present a valid indication of what the teaching app can do.

Another challenge concerning validity was the student teachers' scoring of the collected data material. An issue of validity from this point could be that the testing tool required a great amount of interpretation. The results could be greatly influenced by the person scoring the test. This concern was controlled by letting the student teachers double-score the tests. Meaning each student test was scored two times by two different student teachers. Also, the tested pupil remained anonymous for the teachers. They did not know which student test from which school was being scored. This was done primarily to avoid any bias by the student teachers in regards to the specific first grade student, but also concerning the specific school.

Results

- All students perform significantly better in the post-test despite type of student and test.
- The test classes show significantly better progress than the control classes in the digital test.
- The test classes' progress is 11,8% better than the control classes in the digital test.
- The HUN and HPS-schools show the greatest progress due to the study.
- All test students seemed to improve from the study despite school and gender.

The results show that all the students involved in the study benefited from working with WriteReader-app. The students from the schools with the highest socio-economical factor showed the most significant progress in the tests, but the students from the schools with middle and low socio-economic factors also seemed to significantly benefit from the study.

The test group performed significantly better than the control group in the digital test. This may be attributed to digital as a platform. Throughout the study, the test group worked with the WriteReader digital platform and thus, was trained in the use of a keyboard and writing and reading on screen. The students exposed to the study seem to develop their use of phonological strategies faster than the control group. On an average level, they are moved into the semi-phonological phase as a primary writing phase.

Bundsgaard suggests that this could be a result of the digital app as a platform (Bundsgaard 2005). Motor skills in writing letters can be a challenge for first graders, but the digital platform provides a more direct way in working with the sounds and not the shapes of the letters and thus the development of content in the text.

Hagtvet (2004) defines writing as a result of three components:

Writing = message x in-coding (x motivation)

In-coding is a technical component, which addresses the process of recreating the phoneme to a grapheme (cf. Frost 2001). This process is very demanding for a seven year old child and requires motivation. The app supports this process by connecting the phoneme to the grapheme with an electronic voice and creates a framework for the students (jf. Wood et al 1976). This could be an explanation for the test classes higher test score in the digital test. The study has increased the students' attention of the connection between sounds, words and text message (Frost 2001).

Clay (2000) point to the development of handwriting will follow a certain process for first graders*:*

1. Repetition
2. Further development
3. Semiotic signs as concept
4. Flexibility in shaping letters
5. Linear direction
6. Arrangement of page
7. Word as concept
8. Space between words
9. Word collection
10. Dividing semiotic signs

Schrader (1990) found that points 4-6 did not exist in the process of writing on a digital platform. And the development of digital writing therefore developed quite faster than handwriting. Or, as Hagtvet says, the students are supported in the in-coding-process.

An interpretation of the numbers connected to the second issue could be that in the process of digital writing, the students train these abilities as well. The digital platform points out the linear direction and how to arrange the page. This framework has a possible relationship to when the students write with a pencil and paper. The issue of shaping letters was not addressed in this study. The HUN and HPS-schools are the schools with the highest socio-economical starting point. When these schools have the highest performance, it could be due to the students' mastery of school discourse (jf. Gee 2007). These students *know what to do* when it comes to writing text. The WriteReader-app is a platform, which builds the connection between grapheme and phoneme. However, the app provides little support to students when it comes to developing the content of the text. This can present a challenge to some students (Hagtvet 2004). But these students need less support and can be motivated by the free form of the platform in the development of text message.

Hagtvet (2004) suggests that digital platforms can provide a motivational spark for some students, especially students with greater social challenges. This motivational spark in combination with the support of in-coding could present a possible interpretation of the data, which shows that all students, despite socio-economical factors, seem to benefit from working with the app as a teaching aid. This seems to apply to both digital and analog platforms, since the test students produced results in the analog test equaling the control students.

Discussion

It is important to note that this study only tries to measure the students' skills on writing in a quite narrow sense relating to the phonics paradigm (Ex Elbro 2001). Earlier studies of the app have pointed to that it promotes mutual togetherness between parents and children (Labutz et al 2012) which indicates that the app possibly can promote skills of writing in a more broader sense. Therefore, it could be interesting to examine the effect of the app in a study with a sociocultural or social semiotic approach to writing (ex. Kress 2003).

Overall conclusion

The study seems to verify the hypothesis that the WriteReader-app promotes first graders' ability in learning to write and in building phonological strategies. The classes subjected to the study showed a more rapid progress than the control classes in using phonological strategies in their writing of texts. It can be concluded that the WriteReader-app can function as an efficient teaching aid for teaching first graders to write – and possibly also to read.

Literature

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Appendix

Appendix 1: Test design for analog testing

Før-test: ___   Efter-test: ___   Elev-id-nr.: _____

Skriv om dit bedste legetøj

_____

_____

_____

(Skriv om dit bedste legetøj = Write about your best toy)

Appendix 2: Test design for digital testing

Skriv om din første skoledag i 1. klasse
_____

(Skriv om din første skoledag i 1. klasse = Write about your first day at school)