

EFFECTS OF LINEAR TEXTS IN PAGE SCROLLING AND PAGE-BY-PAGE READING FORMS ON READING COMPREHENSION INTRODUCTION

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ABSTRACT

This research aims to analyse the Effect of Scrolling and page by page moving Static Texts on Comprehension of Screen Reading of 4th grade students. The sample was composed of 46 students of 4th grade students of an elementary school in Kırşehir Central Province. The classrooms of the participants were selected by random sampling method and compared in the quasi experimental design. The students were assigned to experiment and control group according to the result of drawing. The achievement test for reading comprehension has been applied as a baseline test in order to understand the readiness level of the two groups. Then, 6 texts, compliant with the level of the students, (two narrative and two informative texts and a poem) were read by the students. The students in the experiment group read the text with scrolling method and the students in the control group read the text with page by page moving method. As a post test, reading comprehension test, which composed of 30 questions, has been applied to students of both groups. Results showed that there is no significant difference between the comprehension scores of students who followed the page scrolling method and those who followed page-by-page reading method.

Key Words: Linear texts, page scrolling, page by page moving, screen reading, comprehension.

INTRODUCTION

With the technology making its mark on all areas of the age we are living in, it is now a necessity to utilize technology in the field of education, as well. The technological advancements have affected the reading habits, mostly in a negative way. Differently from the traditional ways, today's youth tend to perform reading on computers, which is a cheaper and easier source of information. Screen reading has become very common due to the rapidly developing information technologies of today. Because texts are more and more transferred into computerized pages and published by means of computers. In order to reach new information, readers have to read on the screen. By this way, a new way of reading known as "screen reading" and a new kind of reader called "screen reader" have appeared. This way of reading, which became widespread in all areas, has distinctions from the conventional way of reading from paper (Güneş, 2009). It is now possible to learn through screen reading and to design and develop the customizable reading media that distinguish the individuals and differentiates according to their differences (Brusilovsky, 2003).

The fact that the amount of information to be learned increases incrementally and the learning needs to be continuously updated because of information losing their currency in time necessitate a change in learning and learning environments (Khan, 1997; Alotaiby, 2005). This requires the implementation of a number of changes pertaining to modernization of learning programs. It is known that the effectively used instructional technologies increase the effectiveness of the learning - teaching process. For this reason, the educational development objectives of many countries in the recent years also cover the integration of computer technologies with instructional programs (Korkut & Akkoyunlu, 2008).

In this context, also the Ministry of National Education (MNE) of Turkey establishes Information Technology Courses in all schools and stipulates students to learn to use computers and more importantly raises generations that reach information through internet access. The skills for "using information technologies" have been included among the basic skills to be taught to students in the primary school programs modified in 2005 (MNE, 2005).

Besides modifying the programs, MNE also restructures learning environments in order to raise individuals capable of utilizing the technology. With the Increasing Opportunities and Improvement of Technology Project of 2010, which has been planned in line with the objective related to the utilization of information technologies in our education system stated in the (2006-2010) Information Community Strategy prepared by State Planning Organization as "Information and communication technologies will be among the fundamental tools of the educational process and the active utilization of these technologies by the students and teachers will be ensured.", the Ministry has initiated efforts for equipping 620.000 classrooms of all pre-school, primary and secondary schools with laptop computers, projection tools and internet infrastructure in order to ensure the effective utilization of IT tools during the courses, for the purpose of providing equal opportunities and

improving the technologies of our schools. (URL-1, 2011). For this reason, it is believed that electronic texts will be more frequently utilized in educational environments in the forthcoming years.

Since the functionality of the reading process is directly related with the design of these environments (Altun, 2000), it is important to know how to present the reading text to students in what sort of a learning environment. With this purpose in mind, the effect of linear texts prepared in page scrolling and page-by-page reading forms used in Turkish courses, on the reading comprehension skills of the fourth grade students has been examined. The pages where information are provided in a computerized environment can be designed in two separate forms as the long pages where the information is viewed by moving the page up and down by using a *page scroll* bar or the *page-by-page* designs where information is divided into small pages that can be viewed one by one by using the next page or previous page buttons.

Linear text or linear hypertext are designs of hypertext that allow transitions from the current screen only to the next or previous screen are possible and where a linear movement is allowed between the screens through the links given (Çakmak & Altun, 2008). When working with linear texts, the reader or the learner has to follow the path provided by the designer in order to access the information necessary for learning. Information beyond the linear path cannot be accessed from the current point. Both in printed materials and conventional computer aided educational materials progress is made in a linear way. Linear order is considered to be more convenient for presenting details and cause and effect relations (Ayersman, 1996: 505 quoting from Gordon, Lewis, 1992). Emphasizing that linear texts are one of the fundamental structures of hypertexts, Karadeniz, Karataş and Kılıç (2004) states that "(a structure where) the reader or student reads the information in order and passes to another one after finishing one is a linear structure".

During the preparation of this paper, many studies on the text-reading for students and environment for text-reading have been found in the literature (Eyüboğlu, 2007; Dunser & Jirasko 2005; Karadeniz 2004; Kılıç & Karadeniz, 2004; Calcarterra, Antonietti, Underwood, 2004; Schwartz, Andersen, Howard, Hong & McGee 2004; Lee & Tedder, 2003, Graff, 2003; Kim 2001; Ford & Chen, 2000; Leader & Klein 1994). Yet, these studies were generally conducted with high-school and university students. Very few studies conducted with primary school students have been found (Çakmak & Altun, 2008; Riding & Grimley, 1999; Reinking, 1988). Similarly, according to Eyüboğlu and Orhan (2009), although there are many studies on the design properties of hypertexts (such as the page arrangement of the menus, different types of menus and links, and browsing tools) the page lengths of hypermedia or hypertexts have not been studied with sufficient depth. With the purpose of filling this gap in the literature, this study has been conducted in order to set forth the effects of scrolled and page-by-page displayed texts on the reading comprehension of the students attending to the 4th grade of primary school. Within the frame of this general objective, the answers of the below given questions have been sought:

1. Is there a significant difference between the reading comprehension pre test success rates of the students in the experimental and control groups?
2. Is there a significant difference between the reading comprehension pre test success rates among the students of the experimental group?
3. Is there a significant difference between the reading comprehension pre test success rates among the students of the control group?
4. Is there a significant difference between the reading comprehension post test success rates of the students of the experimental and control groups?

METHOD

The study is an empirical study based on pretest-post test model with control group.

Study Group

The research has been conducted with a total of 44 participants who were randomly selected from two different fourth grade classrooms in a primary school located in Kirsehir city center, during the Spring of 2010-2011 academic year. The students which were available in school on the days when preliminary and final tests were conducted have been included in the study. After drawing one group as the control group where the texts are presented in a page scrolling format, the other has been determined as the experimental group where reading texts have been submitted in a page-by-page format. Experimental group consisted of 19 students. 31,6 % of these were females while 68,4 % were male students. The control group consisted of a total of 25 students, of which 44 % are females and 56 % are males.

Preparation of the Texts

The texts have been compiled from the textbook by Koza Publications, which was distributed by the Board of Education and Discipline to primary school 4th grade students as textbook in the previous years. This textbook was not being used when this study was being held because of the expiry of its recommended term. This book has been purposefully selected to make sure that the students did not read it before. The 2005 Turkish Curriculum for Primary Schools stipulates that three kinds of texts are to be included in the textbooks. These are narrative texts, informative texts and poems. It has been paid attention for the texts to be given to the students in this study to include all of these three kinds of texts and two texts for each type have been selected. The titles of the selected texts are given below:

Narrative texts; "Seeing Bird Chirps and Bakery Smell" and "The Flute that Lost its Sound".

Informative texts; "How to Cope With Your Phobias" and "The Hand".

Poems; "Farmers" and "The Requiem of the Olive Tree".

When the selected texts have been arranged to fit both page scrolling and page-by-page reading techniques by the researcher, also visuals that will aid and ease the comprehension of the context of the texts have been added and computerized.

Procedures

The administration of thereading the texts from screen have been carried out in the information technology classroom of the school of the participants. Before starting the administration, the computers in the classroom have been checked if they are in working condition. 13 computers have been determined to be properly working and the text files to be read have been saved on the desktops of these computers. The administration and data collection have lasted for a total of 6 weeks. Each week, on the hours when the students attend to their Information and Technology course, the students of both control and experimental group have been separately asked to perform screen reading by the researcher for 2 hours. Due to the fact that the number of the students in both groups exceeds the number of available computers, the students have been divided into two groups and they have been allowed to the classroom separately to read the same texts. When a group has entered into the information technology class to read the selected texts, the other group has continued their courses in their own classes with their class teachers. Before starting the implementation, it has been checked whether the students know about the basic computer commands. Since the students have attended computer course through their fourth grade, it has been observed that they all have the basic computer using skills.

Each week one of the texts prepared with page-by-page reading form have been read from the screen by the students of the experimental group. Each time, the texts have been read aloud by the researcher one time before the students. After the exemplary reading, the students have been asked to silent read the texts a couple of times. Then, the texts have been read aloud by the students. In the meantime, the other students have been instructed to listen to and follow the text being read. After it has been ensured that the text has been comprehended by the students, they have been asked to take a multiple choice text concerning the read text.

The same process has been implemented with the students of the control group in their own Information Technology courses for the same 6 texts arranged in page scrolling format.

Instruments

Pretest: After the students had been divided into experimental and control groups, a reading comprehension test consisting 30 questions has been administered as as the *pretest*. In order to prepare the reading comprehension test, the 39 acquisition goals concerning reading comprehension for the fourth graders as per the Primary School Turkish Curriculum has been determined (MNE, 2005: 92-94). It has been ensured that the questions included in the reading comprehension test meet these attainments. At first 50 questions have been prepared. The words, sentences and paragraph lengths have been paid attention to in order to balance the difficulty levels of the texts included in the test. Two Turkish teachers and two class teachers have been consulted in order to ensure that the questions are understandable and suitable for the skill levels of the students. After being rearranged as per the experts' opinions, 40 questions have been submitted to 120 students attending to the fourth grade of a primary school in the city center of Kirsehir. Item discrimination and item difficulty indices have been determined for each item as per the results of the application. By correcting the questions with low item difficulty and discrimination indexes, the measuring tool has been given its final form with the number of questions reduced to 30.

To test the internal consistency, we checked KR-20. It has been calculated as .83. The 30 questions about comprehension have been applied to the students in experimental and control group at the same date for an hour for each group and in the form of reading from paper.

Post-test: The measuring tool implemented as the post test has been formed out of 5 questions at information level for each text read. The initial scale consisted of 48 questions (8 questions for each text) and then had been evaluated by 4 experts (2 Turkish teachers and 2 classroom teachers) in order to test its validity. In accordance with the feedbacks received, some of the items have been removed from the test and some others have been rearranged. 130 students attending to the 4th grade of a primary school in Kirsehir has been subjected to the new form of the test that covers 40 questions. In conclusion of the analysis conducted in order to determine reliability, items that have lower reliabilities have been removed from the test. However, with the purpose of the test covering all six texts equally, the distracters of some questions have been rearranged and kept in the test. The KR-20 reliability coefficient of the test prepared in this way with 30 questions, as 5 questions for each text, has been calculated to be .81. Şencan (2005) emphasizes that, in case the KR-20 formula is implemented for a test consisting low number of items, even a score as low as .50 can be sufficient for deeming the test reliable. According to this, it has been accepted that a .81 reliability coefficient found for a 30 question test indicates a good level of reliability in terms of the norm based test approach.

The students have been given one point for each question they have answered correctly during the tests. Wrong answers have been ignored. Therefore, the highest score the students can get from the pre and post tests can be 30.

Data Analysis

Average, percentage, frequency and standard deviation have been utilized in analyzing the data. For comparing experimental and control groups, T-Test for independent samples and for comparing the difference between pretest and posttest results of the students, T-Test for dependent samples have been conducted. Significance level for comparisons has been determined as .05.

FINDINGS

The findings related to the reading comprehension scores of the experimental and control group have been summarized in the following tables:

Table 1. *Independent sample T-Test Results of the Pre Test Scores of Experimental and Control Groups*

Groups	N	\bar{X}	S	Sd	t	p
Experimental	19	21,63	4,43			
Control	25	25,76	3,14	42	3,61	0,01

P< 0.05

According to the findings given in the table, there is a significant difference in favor of the control group between the points scored by the experimental group (X= 21,63) and control group (X= 25,76) from the preliminary test, conducted in order to determine the students' reading comprehension levels (t (42) = 3,61 and p<.05).

Table 2. *Dependent T-Test Results of the Preliminary Test - Final Test Scores of Experimental Group Students*

Measurement	N	\bar{X}	S	Sd	t	p
Pre Test	19	21,63	4,4			
Post Test	19	20,32	4,3	0	18	1,7
					7	0,9
						3

P>0.05

No significant difference has been found between the pre test scores of the experimental group students regarding paper-reading comprehension and the post test scores they have obtained in relation with the text they have read by means of page-by-page screen reading (P>0.05). While the preliminary test point average of the students has been calculated as X= 21,63, their post test point average has been determined to be X= 20,32.

Table 3. *Dependent T-Test Results of the Pre Test - Post Test Scores of Control Group Students*

Measurement	N	\bar{X}	S	Sd	t	p
Pre Test	25	25,76	3,14	24	4,23	0,00
Post Test	25	22,84	2,85			

P<0.05

There is a significant difference between the paper reading comprehension preliminary test points and the page scroll reading comprehension post test points of the students of the control group ($t(24) = 4,23$ and $P > 0.05$). While their pre test point averages of the students had been $\bar{X} = 25,76$, their post test point averages has declined to $\bar{X} = 22,88$.

Table 4. *Independent T-Test Results of the Post Test Scores of Experimental and Control Group Students*

Groups	N	\bar{X}	S	Sd	t	p
Experimental	19	20,32	4,30	42	2,34	0,24
Control	25	22,84	2,85			

P>0.05

Independent T-Test results for the post test point averages of the students of experimental and control groups are given in Table 4. According to the findings presented in the table, there is no significant difference between the post test point averages obtained by the students of the two groups ($t(42) = 2,34$ and $p > 0.05$). This indicates that 4th grade students comprehend the texts they read by page scrolling and page-by-page forms with similar levels. While the control group students have answered 22,84 of the 30 questions related with the text they have read by page scrolling correctly, the experimental group students have answered 20,32 of the questions related with the same texts they have read page-by-page.

CONCLUSIONS AND DISCUSSION

Although a significant difference has been found in the study for the students of the control group between the paper reading comprehension pre test results and the page scrolling reading comprehension post test results, no such significant difference could be found for the students of the experimental group between the points they have scored from the tests examining their comprehensions from paper reading and the page-by-page screen reading. However, it can be stated that this results from the fact that a significant difference in favor of the control group has been found between the pre test results of the experimental group students and the pre test points of the control group students. Since the students have been randomly assigned to experimental and control groups, it can be interpreted that the equalities have not been established before the experiment. Also, there are studies in the literature pointing out that reading from paper or from a screen does not have any advantages over each other. In this context, in the study conducted on 33 students from fifth and sixth grades Reiking (1988) has reached the conclusion that reading linearly presented texts from a computer screen does not bring any advantage over reading them from printed materials, in terms of aiding recollection.

In this study, the point whether the linear texts, which had been prepared for Turkish course, read through page scrolling and page-by-page screen reading did not have any significant effect on the reading comprehension skills of the 4th grade students, and it has been determined that there is no difference between the post test success rates of the control and experimental groups. This result indicates that students comprehend the texts they read by page scrolling or page-by-page display at similar levels. In the literature, it is possible to find many studies with conclusions either supporting or contradicting with the conclusions of this study. Eyüboğlu (2007), Bernard, Baker and Fernandez (2002) and Nielsen, 1997 have found that readers and students mostly prefer texts presented in long pages. In his research examining the effects of page scrolling and page-by-page reading on comprehension, Baker (2003) has once again found that page scrolling has a more positive contribution in the comprehension levels, compared to advancing through the pages with a forward button. On the other hand, Roussey and Thunin (1998) have determined that dividing information into separate pages and presenting it in a form that can be viewed page-by-page increase performance of the students (cited in Bernard, Baker & Fernandez, 2002).

In another study, it has been concluded that page-by-page reading is mostly preferred by inexperienced users, yet it does not create a significant difference in completing a given task or conducting a search within the text (Schwartz, Andersen, Howard, Hong, and McGee, 2004). In some other studies it has been concluded that neither of the techniques have any effect on user performance (Bernard, Baker, and Fernandez, 2002 quoting from Mills & Weldon, 1986). These findings support the findings of the present study.

SUGGESTIONS

By conducting researches similar to the present study, in which the comprehension levels of the 4th grade students from page scrolling and page-by-page reading have been examined, with different regions, different schools and for different grades and age groups, the matter how the page lengths and designs of the screen reading or learning materials are to be prepared for primary school students can be determined.

In this study, the students have been provided with linear hypertext samples of a single type and structure, where the students have to follow the path the designer provided and cannot jump to the information beyond the designed linear path. Accordingly, the determinations are limited for the texts of this type and structure. Therefore, the study can be repeated for hypertexts of different structures as hierarchical, nonlinear and mixed hypertexts.

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