The Effects of E-Reading and Printed Document Reading on Students' Comprehension and Retention Power

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ABSTRACT

The study attempted to measure the effects of e-reading (reading from the screen of a laptop, tablet or other electronic display) and printed documents reading. Objectives of the study were to measure the effects of e-reading materials on students' comprehension and their retention power, to investigate the effects of traditional printed documents reading on students' comprehension and their retention power and measure the differences between the effects of both types of readings (printed and electronic). The study was experimental in nature and from true experimental research design pre-test posttest comparative group design was adopted for the study. Students of B. Ed honor constituted the population of the study. After pre-test students were divided into two groups and one group was presented for e-reading and the second group to reading from printed documents. Reading materials were selected from the subject of research methods in education. Students understanding and retention power was measured through a self-developed test. The collected data were analyzed through Mean, standard deviation and t-paired sample test. Results obtained, illustrated, that students reading from printed documents had more retention power and greater understanding of the text than students who read from screen (e-reading). Students' retention power was found strongly associated with their interest in the media (E/printed) of reading. Expected causes according to the respondents were students' concentration, interests, and level of comfort in reading from printed materials than from electronic materials. The study recommended reading of printed materials for better understanding and high retention power of students.

KEYWORDS: Electronic Reading, Printed Document Reading, Comprehension, Retention Power

1. INTRODUCTION

Reading is the foundation of all formal and informal learning. Future success is dependent on the learners' reading ability. It is the gateway to success-the amount of time students spends in reading is the indicator of successful academic life in future {Wigfield, Guthrie, Perencevich, & Taboada, 2008}. Students' initial education concentrates on basic skills such as listening, speaking, reading and writing. Speaking is a source of communicating ideas to others which is suitable for present audience, speaking skills of students cannot be developed till the time they get competence in listening skills. Listening skill provide base for strong speaking skills. In the same way there is vital connection between reading and writing. Good writers are always good readers and vice versa {Parrish & McGlinn, 2002}.

There are various reading methods and techniques, adopted according to the mental level of the students, keeping in view the nature of the materials to be read; for example, loud reading, silent reading, controlled reading, guided reading, free reading, feedback reading and other reading skills like extensive and intensive reading and skimming and scanning. Every reading technique has its own philosophy which channelizes it in its own fashion with its own merits and demerits. Learners are taught reading formally at primary level with training in phonemic awareness, alphabet principles and word sound recognition to develop their skills of transforming words into exact sounds (Pronunciation) which enable them to read fluently and accurately. At primary level loud reading is preferred as to identify and correct students' mistakes in reading. Once they become skilled readers they are advised to read silently so as to comprehend and enjoy the text {Chiong, Erickson, Takeuchi , & Ree, 2012}.

With the emergence of electronic media, books, research periodicals, journals, magazines, news-papers and so many other reading materials were transformed into electronic text. The expenses of paper and allied

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materials used in the printing of books and other reading materials were considered wastage of materials, money and human energy, that is why in the United States of America the purchase of e-books have surpassed the printed books and magazines today {Jones & Brown , 2011}. E-reading materials and convergence of printed reading materials into electronic format have not only increased the access opportunities throughout the world for readers but also have reduced the expenses. There are evidences for the support of e-reading materials particularly in term of access, quality, beauty, effectiveness and learning for students and general people {Korat & Shamir, 2008}. Readers' attitude towards e-reading and printed reading materials is crucial in term of understanding and retention. Learners' reading experiences influence their beliefs about the effectiveness and ineffectiveness of reading materials. A reader who is habitual of printed reading materials and haven't got any practice of reading from e-materials would not be able to benefit from e-materials {Jones & Brown , 2011}.

It is often, that during teaching reading for comprehension emphasize is given to the ends of the activity (product) while process is ignored which is very important. However, the process of comprehension includes two approaches, monitoring approach where the reader is monitored and corrected on the spot; readers' monitoring identify weak areas of learners' reading which may include words, sentences and para reading and sometime it also includes the logical sequence of reading materials which not only make the learner a competent reader but also a good writer. The second approach concentrates on the creative aspect of reading where the reader is informed with clues of reading materials; they are sensitized for evaluating, criticizing and hypothesizing the reading materials. This approach also familiarized the reader with summarization and conclusive comments on the text {Collins, Smith, & Beranek, 2007}.

Readers' reading skills, their comprehension and retention power is strongly affected by the nature of the reading materials. The nature of reading materials-that is essay, poetry, novel, report or news and striking words usage or the different styles of writing; apart from these the printed and non-printed (electronic style) of reading materials are also significant in affecting readers' comprehension and retention capacity {Collins, Smith, & Beranek, 2007}. According to the learning laws presented by famous US psychologist Edward Thorndike, the effects of learning remain strong if it is based on the interest of the learner. He basically presented three basic laws of learning; law of readiness, law of exercise and law of effect. To generalize these laws to learners' readings, if learners are provided the type of reading materials in which they take interest; they would be ready to stick to the reading materials for a long time which will lead for a stronger effect because time matters.

There are two main approaches with regards to reading materials; one is electronic reading materials and the second is printed script reading material. All the 21st century readers are in touch with both of these approaches and both have their own merits and demerits but have different effects on learners too. For example the readers who are habitual in reading printed reading materials are good at reading and comprehending that sorts of reading materials as compared to the ones reading e-reading materials and vice versa.

1.1 Theoretical Background and Problem of the Study

Interest, flexibility, and time duration of reading have significant relationship with comprehension of readers. Taking into consideration the element of interest, e-reading materials are attractive and invitational in nature, but most of the time readers are unable to focus and concentrate on some specific materials which negatively affect readers' comprehension {Moody, 2010; El-Mouelhy, Poon, Hui, & Sue-Chan, 2013}. As far as flexibility is concerned, they are flexible in nature as compare to the printed materials as a reader can read it anywhere anytime through his tablet, mobile phone or laptop; however, all these equipments are electronic and areas where we are short of power, these opportunities cannot be availed to the fullest. Lastly, according to Robert and Barber {2013} the time expenditure on reading in these reading format are also different. Reading from printed documents takes less time as compared to reading from non-printed documents. It is also a notable fact the readers can read a book, magazine, newspaper or book in printed form for a long time and they don't feel boredom/hesitation as compare to reading in electronic form which most of the time affects their concentration. Keeping in view these two types of readings, the study aims to distinguish between them, the one that is more effective for readers' in terms of comprehension and retention power.

1.2 Study Objectives
Main objectives of the study were;
1. To measure the effect of e-reading materials on students' comprehension and their retention power.

2. To estimate the effect of traditional printed documents reading on students' comprehension, and their retention power.
3. To quantify the differences between e-readers and printed document readers' comprehension and retention power.

1.3 Study hypotheses
Null hypotheses were formulated on the basis of objectives framed which were;
  1. There is no significant effect of e-reading materials on students' comprehension and their retention power.
  2. There is no significant effect of traditional printed documents reading on students' comprehension, and their retention power.
  3. There are no significant differences between e-readers and printed document readers' comprehension and retention power.

2. LITERATURE REVIEW

Bill Gates discussing one of the project of Microsoft "Anytime Anywhere Learning" and was of the view that technological developments have affected every aspect of human life. It has provided great opportunities to students in their learning as well as their access to laptop and other scientific equipments which facilitate them in learning. Gates' claim that learning is no more confined to classroom walls, has been proved by laptops, PCs, mobiles and tablets as these equipments have enabled every student to connect to the world of learning at his own pace and level {BBCNEWS, 2000}.

The introduction of computer and internet into the world of education has given new dimensions to educational and educational resources. Once Libraries were considered great resources of educational materials for students and teachers. These libraries were enriched with valuable books related to almost every subject as well as research dissertations and other periodical journals. All these documents were available in printed form and were accessed and available only to the local people. Moreover, the printed materials were not only expensive but also had negative effects on environment and leads to environmental pollution {Korat & Shamir, 2008}.

The introduction of these information communication technologies compelled developed countries to work for the transformation of printed documents (books, reports, scripts and other educational materials and informative magazines) into electronic and scanned materials so as to make these materials available to students in particular and others in general. In addition, different projects and efforts have been made to transform the already available printed documents into screened form through scanning and re-composing and other measures; one among these projects was Large-scale Digitalization Project in 2007 by the University of Illinois at Urbana Campaign library where a huge number of printed books were scanned and were uploaded to internet for e-readers {Collins, Smith, & Beranek, 2007}. Such sorts of efforts were also made by the Higher Education Commission of Pakistan where all the PhD dissertations were scanned, important reports, books, and periodicals were scanned and re-composed for e-readers and which are available on e-prints, and HEC digital library.

Such a huge investment in this area has positive contribution to the overall learning spares of life from environment to classroom teaching. Teacher in a very short span of time can collect the needed information for his teaching; students can make themselves prepared for the classroom learning; universities and other institutions can disseminate their work and service to its clients in a very easy and accessible way and so on. To determine which one between the two is more effective for the students, comparison of these reading styles have been done in different areas of the world with different grade students. In the study of {Jones & Brown , 2011} elementary school grade two students were engaged in reading of e-reading materials and printed reading materials. Results of that study showed that students took more interest in e-reading materials as compared to printed document reading.

Chiong, Erickson, Takeuchi, and Ree {2012} studied students' and their parents' converstaion, story comprehension and engament in reading from e-books and printed books. Findings illustratedthat parents and childern had good conversation in printed books than e-books that usually focus on non content materials which brcomes a cause of concentration distraction in reading. Story studied in e-story books are less comprehensive than printed story books; hence, the later is more helpful in the development of content literacy of students.

Roberts and Barber {2013} viewed reading format as one of the factor that affect students comprehension. Readings from e-reading and printed reading have no significant differences in the comprehension of independent readers. Studies organized by National Reading Panal have studied different aspects of research in reading regarding the format of reading materials and also recommended further studies in this context. Additional studies of {Grimshaw, Dungworth, McKnight, & Morris, 2007; Korat & Shamir, 2008;Shamir, 2009} investigated the relationship between the formate of reading materials and students' reading comprehension and engagment in reading.

American Association of School Libraries adovcated that the 21st century learners must have a good command on both formats of reading. They need to have competence in comprehending, analyzing and evaluating text as they have to confront in their lives with both of these sources {American Association of School Librarian, 2007}. A plan issued by US Department of Education {2010} argued to provide wireless access to internet and allied technological equipments to all the educators and students of all level for the purpose to enable them to deal effectively with the demands of the 21st century. These reports might motivate the researchers to know the effectiveness of these measures in the students'academic lives in general and reading comprehension and retention power in particular. Because reading habits, reading comprehension and retention power of students are the core areas of their future success. Results obtained from research studies on reading comprehension using the electronic format of reading materials are not as clear as it need to be. Some studies found no statistcial difference among e-readers and printed document readers while some other found printed document readers superority to e-readers in comprehension and even in retention powers {Roberts & Barber, 2013}.

3. Methodology and Procedures

The study was experimental in nature. Pretest Post-Test Comparative Group Design was adopted for the study. Two groups were formed from the students of B. Ed. Efforts were made to equalize the groups, eighteen students were in experimental and eighteen in control group. They were pre-tested and then were provided with these two reading approaches. Reading materials were selected from the subject of Research Methods in Education. Equal time was given for reading to both the groups and equal guidance along with teaching support they were prepared for reading.

Students' reading understanding was measured through a self-developed test which was again administered to both the groups for the purpose of estimating their retention power. The test was contained on paragraphs and questions were given in the end. Total time for the test was one hour where six paragraphs were included in the test; each paragraph in the test was about seven lines in length, which were followed by three to four questions asking for short answers, measuring students understanding.

Pre-test was given to all the students with printed documents while the posttest of the study was given to each group according to the nature of their treatment (electronic/printed reading). A rubric was developed for the scoring of students' tests scores. The rubric was used to ensure the objectivity in scoring process. Before the administration of the pre and post test its reliability was calculated. It was administered to ten students of B. Ed and the data were placed in SPSS version 16. The reliability co-efficient value of the test was .63 which was acceptable. Only two statements in 4th paragraph were changed. To ensure the validity it was discussed with English and research teachers in the departments and changes were brought about in the test items.

All the collected data were placed in SPSS version 16 and the data were categorized and with descriptive and inferential statistics. Mean scores, standards deviation and t-paired sample test were applied to the data. Differences between the performances in experimental and control groups were calculated through mean scores difference and t-test.

4. Analysis and interpretation

The collected data were placed into SPSS version 16 t-paired sample test was applied to analyze the data. Tables and its interpretations are as follows;

Table no 4.1. Experimental and control groups on pre-test

Study Groups	Mean Scores	Std Deviation	M.S Diff	t-value	Sig	r	Sig
Experimental	09.67	1.6322					
Control	09.33	1.5775	.3437	1.097	.274	.312	.000

Table 4.1 shows the performances of control (printed Document readers) and experimental (e-readers) groups' students. There is significant co-relation in the scores of both the groups while the mean differences among the groups are very low (.3437) and t value is1.097 which is not significant as the significant level is higher than .05. So it could be concluded that there are no significant differences in the performances of both groups.

Table no 4.2. Experimental and control groups on post-test

Study Groups	Mean Scores	Std Deviation	M.S Diff	t-value	Sig	r	Sig
Experimental	13.95	2.147					
Control	12.98	2.031	.9765	3.489	.001	.526	.000

The table 4.2 demonstrates a high co-relation in the performances of control and experimental group students. The mean difference is also higher than the pre-test that is .9765 which is near to 1 (one) and the t value is 3.489 and is also significant as well at .001. These results show that the control group students (printed document readers) have higher comprehension than the experimental group students (e-readers). The difference is not very high but contribute to printed document readers superiority. Therefore the hypothesis made at the start of the study that e-reading materials have no significant effects on e-readers' comprehension has been accepted while printed document had significant effects on students comprehension therefore the stated hypothesis is rejected with H_1 that there is significant effects of printed documents on readers' comprehension.

Table no 4.3. Retention of Experimental and control group students

Study Groups	Mean Scores	Std Deviation	M.S Diff	t-value	Sig	r	Sig
Experimental	13.12	1.73					
Control	11.96	1.239	1.164	3.987	.000	.249	.000

The r value in the above table 4.3 is .349 which is significant at .000, the mean difference between control and experimental groups is 1.164, and t value is 3.987 which is significant at .000. All these results explain that students of control group have higher retention power and can retain the information for a long time as compared to the students' experimental group. However, with regards to retention power the hypothesis made for e-readers is accepted as it doesn't has significant effects of students retentions while for printed document readers the hypothesis made was rejected and $H_1$was formed that there is significant effects of printed documents reading materials on readers' retention power.

5. DISCUSSIONS AND CONCLUSIONS

Reading is one of the basic skills of learners; therefore they need to attain command in it. Reading material formats have close co-relationship with students' reading comprehension. Roberts and Barber {2013} were of the view that there is no such relationship between reading material formats (e-reading) with students comprehension which is rejected by the results of this study while the results of {Chiong, Erickson, Takeuchi , & Ree, 2012} has been accepted as the results supports their findings. E-reading is difficult in focus, mind and body adjustment also contribute to readers' distraction which affects their comprehension capacity.

Reading comprehension leads to critical reading. It enables the reader to retain the information that he/she has comprehended for a long time. The present study results also support the claim that the reading of printed documents instead of electronic materials has high and positive effects on students reading and their understanding {Korat & Shamir, 2008}. On the other hand {American Association of School Librarian, 2007; Moody, 2010; U.S Department of Education, 2010} and some other studies are emphasizing on the need of e-reading and the use of technological equipments in the teaching learning process and according to standards for the 21st century learners the reading competence in both format of reading, its comprehension, critical analysis and creative evaluation of reading materials are essential.

It is therefore recommended that students may be provided all the necessary materials in printed as well as in screened format so that they could attain the desired target.According to the results of this study students and concerned authorities are recommended to provide the students good reading materials in printed form on priority basis and in screened format as well to ensure students comprehension and retention power. Future

researchers are advised to study the same area with a lower level students that is primary level and in some language subjects like regional or international language.

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