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E-books and Middle School Students' Performance on Reading Tasks

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Introduction

As an educator, I believe that my observations of everyday issues and my ability to raise questions about them makes me a better teacher. Recently my friend brought it to my attention that in her daughter's school they do not use regular paper books anymore and children read e-books. My friend's daughter is graduating from 7th grade this year. Until last year she used to bring most of his books home for reading and homework but now most of her reading work is done online. She was concerned that this had increased her screen time greatly and she also wondered if e-books were negatively affecting her reading performance. When we were discussing this issue, it occurred to me that it could be a really relevant issue for a research. In the following paragraphs, I briefly describe this issue as a possible topic for my research.

The issue

With a growing use of technology in every sphere of life, it has become important that we also understand what effects these technologies are having and what is the extent of these effects. One important sphere of the lives of parents like me is schools where the use of new technologies has grown with an aim to equip students with technological skills. Public schools in Indiana PA use Chromebook for class work, they use online tools to learn new concepts and e-books have replaced the paper books. Dunckley (2014) notes that increased screen time in terms of games and other entertainment activities might already be resulting in sensory overload, lack of sleep and hyperactive behaviour of school going children. So, isn't introducing e-books increase screen time further, complicating the situation even further? Although Dunckley's claim needs to be investigated, I believe that if increased screen time

might really have such effects on children's brains, it might as well be seen in their everyday performance in school. Therefore, I would like to study if students perform better or worse on reading tasks when they use e-books instead of regular paper books.

Who does it relate to?

As mentioned earlier, this study responds to a concern felt by parents of children who are using e-books regularly. Moreover, this study will be helpful for reading teachers to understand if use of e-books is having any effects on students' reading performance. Since I plan to conduct this study in the middle school in Indiana, it will be directly relevant to teachers and middle school students in Indiana.

The rationale

Dunckley (2014) reviewed several studies that have found that screen addiction has negative effect on children's brain development. One of the studies she cites, i.e. Lin, Zhou, Du, Qin, Zhao, Xu, and Lei (2012), used brain imaging technology to trace the brain development in screen addicted children and argued that it affected brain matter development negatively. This study is not about brain development, but the effect of increased screen time can be studied in terms of children's school performance.

Expected outcomes

It is expected that this study will be helpful in understanding the impact of using e-books, if any, on children's reading performance.

<u>Literature Review</u>

According to Digital Textbook Playbook (2012), President Barack Obama emphasized the importance of advances in digital learning in K-12 schools and said, "I want all students to be able to learn from digital books" (p. 7). There are no two

opinions on the importance of using digital technologies for student learning as new technological tools have revolutionized almost every aspect of human life. Therefore, it only makes sense that children are taught about and through these new digital tools, so that they are ready to perform in the ways the future world expects them to. This led to #GoOpen Initiative by the U.S. Department of Education, the movement to promote the use of openly licensed educational resources which have "enormous potential to increase access to high-quality education opportunities in the United States" (https://tech.ed.gov/open/states/). So far 13 states have joined the initiative and Pennsylvania is not one of them, yet some school districts in Pennsylvania have recently launched the initiative in schools. Although Indiana School Districts is not an official part of the initiative, e-books have been adopted in Indiana Middle and High Schools and this study has been inspired by this switch toward digital textbooks in Indiana schools. In the following paragraphs, I first present the rationale used by the US Department of Education, schools and the educators who are in favour of using digital textbooks, followed by a review of some studies that have identified the disadvantages of e-books in school.

Rationale for Introducing Digital Textbooks

The Federal Communications Commission and the U.S. Department of Education organized the Digital Textbook Collaborative to engage K-12 schools in digital learning. This collaborative was constructed based on the FCC's National Broadband Plan and the Department of Education's National Education Technology Plan and it educated and facilitated schools in their process of transition to digital learning systems. The Digital Textbook Playbook (2012) argues that e-books seem to be more flexible and accessible than the regular paper-based books. They provide a rich multimedia-based visual appeal that is considered as more supportive for

personalized learning. There are several arguments presented in support of using digital textbooks and other digital technologies in schools. First, some research has suggested that use of digital technologies increases students' motivation to learn. A survey conducted by the Public Broadcasting Service (PBS) found that 81% of K-12 teachers consider that "tablets enrich classroom education" (PBS, 2012). Second, Price (2012) notes that digital devices that store e-textbooks are a great way of accessing other learning materials like homework, quizzes, and other files, and eliminate the need for students to tote their books to school. This also saves them from the heavy loads of books that they usually have to carry around. Third, and probably the most important reason for this move may be the smaller costs. As a report by Federal Communications Commission (FCC), estimates that K-12 school districts spend more than $8 billion per year on textbooks (Price, 2012). So, adopting digital textbooks meant saving between $250-$1,000 per student per year. Finally, an important benefit of introducing digital textbooks is that students get immersed in a digital environment that they need to be able to work in as they grow up.

Despite the rationale, Woody, Daniel and Baker (2010) point out that it is essential to assess the use and effects of e-books on student learning before using them to replace printed textbooks and they note that this assessment must be carried out systematically, so we understand the impact of this transition. Although, the use of e-books in American grade schools needs to be studied, some studies conducted in other parts of the world have shed some light on the learning with e-books. A study conducted in Taiwan by Huang, Liang, Su and Chen (2012) evaluated two aspects of e-book use in elementary schools. 166 elementary school students participated in this study in which they were engaged in reading activities and then given a reading accuracy test to evaluate any change in their performance because of e-books. The

students were also survey on their perceptions of e-books and paper-based books. It was found that in terms its usability and functionality e-books system used in the study was suitable for most of the students. Moreover, no difference was found between the effects of e-book or printed book. Educators today face the challenge of facilitating learning in this extremely high-tech environment. The internet has not only diversified this environment but has also made learning needs increasingly complex. That is why there is this call for making the school high-tech and up-to-date with new technological tools of learning.

Possible Disadvantages of Digital Textbooks

E-books are gaining currency and more and more students especially in colleges are accessing e-books. However, some educators and researchers believe that in colleges e-books are being preferred because of lower costs. Naomi Baron, professor of linguistics at American University argues in her book *Words Onscreen: The Fate of Reading in a Digital World* (2015) that if there was no difference between the cost of print and e-books, most students would prefer print books. In her study, she surveyed undergraduate and graduate students in her university and 87 percent of them said they would prefer paper books for school. Moreover, 92 percent of her study participants also found paper books easier to work with and concentrate on. A recent study by Scholastic (2015) also concluded that more and more students are showing this preference. In this study, 65 percent of children between the ages 6 and 17 said they would always want to read print books which was an increase from 60 percent in 2012.

In addition to these general findings, there are some specific issues regarding the use of e-books. First of these is the health issues arising from an increasing use of

handheld smart devices on which e-books are accessed. A New York Daily News report (2012) found that according to the American Optometric Association excessive use of handheld devices can be a cause of Computer Vision Syndrome, which causes eyestrain, headaches, blurred vision, and dry eyes. It has also been found that people who use smart devices have a higher frequency of having strain on muscles, including carpal tunnel syndrome, neck pain, shoulder pain etc. (Fishman, 2012; Lin, 2012) In the light of these findings, it seems plausible to ask if introducing these devices to children at early age would pose health risks to them.

In addition to physical health, on screen reading may also have negative effects on cognitive processes. First, reading onscreen may cause other distraction and it becomes difficult to concentrate. According to Lanir (2012), 87% of K-12 teachers believe that "today's digital technologies are creating an easily distracted generation with short attention spans." Secondly, some scholars have suggested that students who read print books show better focus on the text, understand better and remember more of what they have read. Most importantly, a Pulitzer prize winning technology expert Nicholas Carr (2010), having considered several peer-reviewed studies, notes in his article that reading hyper-linked text might cause bigger "cognitive load" on the brain, in turn lowering the ability to process, store, and retain information, or worse making it difficult to absorb the conceptual knowledge.

There are also some practical aspects of depending on electronic devices for which may lead to decreased level of access to students. These issues include cost of electronic devices, access to high speed internet, cost of repair in case of a breakdown of the device and other technical issues that may hinder or slow down reading as a result a hack or hang-up of the device. One of the most pressing issues of all may be

that there are still many communities in a developed country like the United States where parents cannot afford to buy an electronic device on which students can access online textbooks or do their homework. All the above-mentioned issues need to be considered when a decision is being made regarding a switch to e-books.

A Research Design

According to Johnson, Adams, & Cummins (2012), the current widespread use of computers, tablets and the internet had been foreseen and it was a matter of a year or so that these technologies became very important in K-12 education. So, the adoption of eBooks in public schools was a logical step in that direction. However, this situation calls for a serious consideration of their effect on academic performance. Reading comprehension is an essential skill that every student needs to develop to achieve their academic potential. That's why instruction in reading comprehension starts in kindergarten and continues throughout the educational process. This understanding led me to consider the effect of eBooks on middle school students' reading performance. Since in the schools in Indiana, Pennsylvania, electronic textbooks have recently been introduced, it seems to be appropriate to consider parents' and teachers' concerns about eBooks' effects on reading development. Dunckley (2014) has discussed with reference to the research in the field that increased screen time in terms of games and other entertainment activities might already be resulting in sensory overload, lack of sleep and hyperactive behaviour of school going children. So, as a researcher I wonder if introducing eBooks in K-12 school will further increase students' screen time. Therefore, I would like to study if students perform better or worse on reading tasks when they use e-books instead of regular print books. In the following sections of the paper, I first present a description

of the problem statement, followed by research questions and research hypotheses. Then, I provide a brief overview of my research design.

Problem Statement

Dunckley (2014) reviewed several studies that have found that screen addiction has negative effect on children's brain development. One of the studies she cites, i.e. Lin, Zhou, Du, Qin, Zhao, Xu, and Lei (2012), used brain imaging technology to trace the brain development in screen addicted children and argued that it affected brain matter development negatively. Although the concern of this study is not the effect of technology on brain development, the effects of increased screen time can be studied in terms of children's school performance. According to National Reading Panel (2000) reading lays the foundation for the learning process and it has been listed as one of the five most important areas for further study. In view of the rapid technological changes, the effect of technology, particularly computer technology on reading, is also viewed an important area in need of further study (National Reading Panel, 2000). Furthermore, as reading comprehension skills are essential to understanding and achieving academic success in any academic discipline, it seems necessary that middle school students reading comprehension skills are considered as they learn to read on screen.

Several benefits are cited to support this move from print to digital format. These benefits include, decreased costs, lower environmental impact and increased access. Particularly the cost of print books compared with eBooks have been an important consideration in this transition. However, educators' first concern is students' learning and improved academic performance must take precedence over costs or other benefits. The first and foremost should be the question whether students actually understand what is presented in the e-text. Thus, the effect of eBooks on the

reading comprehension middle school students must be examined. Since reading provides the basis of all learning in school, this study will look at the effect of eBooks on middle school students' reading performance.

Research Question and Hypotheses

Following will be the research question this study will attempt to answer: Is there a statistically significant difference in the reading comprehension of Indiana Junior High school English students using electronic books compared to students using print books?

The following hypotheses will be tested in this study to answer the above-mentioned research question:

Null Hypothesis: Indiana Junior High school English students using print and electronic books will not display statistically significant different levels of reading comprehension as measured using the Gates-MacGinitie Reading Tests.

Alternative Hypothesis: Indiana Junior High school English students using print and electronic books will display statistically significant different levels of reading comprehension as measured using the Gates-MacGinitie Reading Tests.

Variables

The independent variable in this research project is the format of book. There were two book formats: print book format, and electronic book format. For this study, an electronic book is defined as a book published in electronic form that could be delivered, via the internet, to any electronic device capable of receiving it (Sparrowhawk, 2005).

The dependent variable in this study is students' reading comprehension as measured using the Gates-MacGinitie Reading Test (MacGinitie, Maria, & Dreyer, 2006). The GMRT is a test designed to diagnose reading achievement of students from 3rd to 12th grade and it is used nationally (MacGinitie et. al., 2006).

Research Design

To answer the research question mentioned above and test its relevant hypotheses, this study will use an experimental design. A sample of middle school English students will be selected from Indiana Junior High School and the students will be randomly assigned to two groups: eBook readers and print book readers. The same reading text from Gates-MacGinitie Reading Test battery will be used for both the groups but the reading text will be read in different ways by the two groups. The test scores achieved by the two groups will be compared through a *t-test*.

<u>A Methodology for the Study</u>

Joining the #GoOpen Initiative by the U.S. Department of Education, Indiana School District has introduced e-books to replace regular print textbooks in Indiana Middle and High Schools and this study has been inspired by this switch toward digital textbooks in Indiana schools. Several benefits are cited to support this move from print to digital format. These benefits include, decreased costs, lower environmental impact and increased access. Particularly the cost of print books compared with eBooks have been an important consideration in this transition. However, educators' first concern is students' learning and improved academic performance must take precedence over costs or other benefits. The first and foremost should be the question whether students actually understand what is presented in the e-text. Thus, the effect of eBooks on the reading comprehension middle school students must be examined.

Since reading provides the basis of all learning in school, this study will look at the effect of eBooks on middle school students' reading performance.

Problem statement. The purpose of this study is to determine if there is a difference in reading comprehension scores obtained by Indiana Junior High school English students using electronic books compared to those using print books.

Research questions. Following are the research questions that this study aims to answer:

1. What are the reading comprehension scores of Indiana Junior High school English students who use electronic books for reading?

2. What are the reading comprehension scores of Indiana Junior High school English students who use print books for reading?

3. To what extent is there is a difference in the reading comprehension scores of Indiana Junior High school English students using electronic books compared to the students using print books?

Methods

To answer the research question mentioned above, this study will use an experimental design. Below I present my research hypotheses, sampling strategy, data collection method and data analysis method:

Research hypotheses. Following hypotheses will be tested to answer the research questions outlined above:

Null Hypothesis: Indiana Junior High school English students using print and electronic books will not display statistically significant different levels of reading comprehension as measured using the Gates-MacGinitie Reading Tests.

Alternative Hypothesis: Indiana Junior High school English students using print and electronic books will display statistically significant different levels of reading comprehension as measured using the Gates-MacGinitie Reading Tests.

Variables. The independent variable in this research project is the format of book. There were two book formats: print book format, and electronic book format. For this study, an electronic book is defined as a book published in electronic form that could be delivered, via the internet, to any electronic device capable of receiving it (Sparrowhawk, 2005).

The dependent variable in this study is students' reading comprehension as measured using the Gates-MacGinitie Reading Test (MacGinitie, Maria, & Dreyer, 2006). The GMRT is a test designed to diagnose reading achievement of students from 3rd to 12th grade and it is used nationally (MacGinitie et. al., 2006).

Sampling strategy. The current enrolment in Indiana Area Junior High School is 642 (http://public-schools.startclass.com) which is the population for this study. A random sample of 241 English students will be selected from the school and the students will be randomly assigned to two groups: eBook readers and print book readers. The sample size for this study has been calculated using an online sample size calculator on surveyservice.com. This sample size calculator is an open source software made available by Creative Research Systems. The sample size was calculated using a confidence level of 95% and a confidence interval of 5.

Data collection method. To assess the participant students' reading comprehension, Gates-MacGinitie Reading Test battery will be used for both, the digital textbook and print textbook groups. Polly Goltche, a reading specialist notes (2016) that Gates-MacGinitie Reading Test can be used to diagnose children's reading problems and assess their reading achievement at all levels of K-12 education.

The test offers two options, the regular paper-pencil format and the online format and so, it can be a suitable test for this purpose. The reliability of GMRT has been established, as it has a test reliability coefficient of 0.90, and a reading comprehension reliability coefficient of 0.89 (MacGinitie et. al., 2006). The test has been known to have high content validity although the report does not discuss that in detail.

      Data analysis method. The research questions will be answered by analysing the test scores achieved by the two groups through a *t-test*. An independent t-test will help evaluate the null hypothesis that middle school English students using print and electronic books will not display a statistically significant difference in reading comprehension as measured by the Gates MacGinitie Reading Tests. This seems to be the appropriate statistical test because the research is about testing hypotheses of difference with one independent variable having two levels, i.e. the format of the book and one dependent variable, i.e. reading comprehension.

Ethics and Implications

The purpose of this study is to determine if there is a difference in reading comprehension scores obtained by Indiana Junior High school English students using electronic books compared to those using print books. This research has been inspired parents' concern about the use of textbooks in Indiana Junior High School. These textbooks have been introduced to replace regular print. Although several benefits are cited to support this move from print to digital format, including decreased costs, lower environmental impact and increased access, it is important to first consider if this initiative is beneficial for students' learning and improved academic performance. Hence, this study will look at the effect of eBooks on middle school students' reading performance. In the following sections of the paper I discuss the ethics and implications of this study.

Ethics of Research

An important step in the research process is the ethical consideration taken to ensure integrity of the procedures and to protect the identity and interests of the participants. Research ethics largely concerns itself with the protection of research participants. I have a clear understanding that I am supposed to follow the protocol of ethical practices in all phases of the research process: data collection and analysis, interpretation, and dissemination of the findings of the study. Also, as I intend to complete the mandatory Collaborative Institutional Training Initiative sessions that will further equip me with the knowledge of the procedures to be followed in compliance with the ethical considerations for the study. The purpose of such steps is to establish safeguards that will protect the participants' rights (Resnik, 2015, Smith, 2015).

The, data collection method used in this study will be reading tests. Therefore, I intend to take the following steps to safeguard my research participants' identity, rights and privacy:

- Since my participants are minors, I will be required to provide all the relevant information to their parents and seek their consent. I will send them a letter to seek their permission to include their child in the study and give them an opportunity to ask questions before data collection activity. They will be informed of the main objectives of the project, and its methods. This information will be included on the informed consent form for parents.

- The next step will be to share all the information with the participants. Then they will be asked to sign an assent form.

- To show that all participants' autonomy, dignity, security, knowledge, and self-worth are of primary importance and concern in this study, each participant will

not be identified with his/her name and will be assigned a numerical code. No other identifying information will be included in the discussion to ensure anonymity and security of the participants.

- Upon completion of the data collection process, the data will be securely kept in password protected electronic files and/or safe locked cabinet, and room. All identifying information such as names will be removed from the electronic database, and no other person will have access to this data. I will maintain the data security until five years after the study has been completed and then all the electronic and hard copy data will be shredded or destroyed completely.

- After completing this study, I will make efforts to disseminate the information to the concerned departments. Moreover, the findings of the study will be shared with the scholarly community in the country through conference presentations and journal publications.

Implications of the Study

This study will have two important implications for the teachers and students. First implication draws from the purpose of the study which is to see if reading online affects students' reading performance. So, if the results of this study indicate a negative effect on students' performance, it will be helpful in informing teachers and school administrators' decision about further use of textbooks. Secondly, this study will add to the scholarship about the use of technologies especially eBooks and in general help teachers and educators in their decision-making processes.

Conclusion

With an increased use of technological tools in the learning process, it has become important that we understand the effect of new technologies on young

students' learning and performance. This study proposes to study the impact of the use of e-books in schools especially on children's reading performance.

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