

Paradigm Shift of Education and Reading during and Post COVID-19

Nallainathan Senthuran¹, Dr. Indang Ariati Binti Ariffin², Dr. Ali Khatibi³, Dr. Jacqueline Tham⁴

¹Doctoral Candidate at Management and Science University, Malaysia

²Associate Professor at Management and Science University, Malaysia

³Professor, Senior VP for Post Graduate, Business & Social Science Cluster at Management and Science University, Malaysia

⁴Associate Professor at Management and Science University, Malaysia

Abstract: *E-Books are evolving these days compared but the usage of Printed books and preference of students to utilize print books still prevails. The situation is supported by the physical inhibitions such as Eye strain resulting in Computer Vision Syndrome increasing Fatigue. Psychologically the Comprehension and Understanding of the book contents, Retention and recalling are inhibited in an e-Book. Even with several factors prevailing the paradigm of e-Book usage is being shifted through force which typically forecast future disaster.*

Keywords: e-Books, print books, e-Books vs Print books, paradigm shift on education, effective education, effective reading

1. Introduction

E-Books being first introduced in back in 1971 (Bartram, 2014) where utilization is rising in trend with Kindle and other similar E-Book readers arriving into the market (Zickuhr et al., 2012) to satisfy consumer needs where the trend is further supported with the support of several books becoming readily available in E-Book version (Connaway, 2003). Preference was seen for a larger screen and the device type plays a vital role with inconvenience factors such as eye-stain where the use of smartphone gradually decreases with age (Myrberg, 2017b). There are different types of arguments in literature when comparing e-Books and Printed books in terms of Retention where Learning process is found to be improved among Dyslexia affected readers due to customizability of e-Books on a fraction of sample studied (Thomson et al., 2013) whereas comprehension and answering capability seen a significant drop after one-week testing among students (Robinet et al., 2014), or even at immediate trials (Olivier et al., 2019). Typically in Asian context where students are more exam oriented (Wong, 2004) where most academic questions could be answered from the framework and textbooks (Entwistle, 1991) the impact of comprehension and retention seemed to be higher.

Observation based on twelve university students where half were assessed based on brief introduction to e-Books and the remaining half on a twelve-week period. This affirms to the fact that short-term exposure results in very brief first introduction who weren't able to comment much while the long-term students reportedly affirmed the use of e-books being a good choice, especially in a university setup (Lam et al., 2009).

Whereas based on students' perceptions to e-books when newly introduced while this research by Lam et al. (2009) identified people were interested in the technology but

significant negative comments such as tiring, less efficient and even painful.

This elaborates differing views are present in the today's era on e-Books and Printed books as preferred mode of reading and its impact on several Physical and Psychological factors. The importance and recent developments and challenges in this industry sector will be discussed in this paper.

Education System and It's Background

This section studies the education system prevailing which is the major pillar to the topic discussed in this article and therefore a brief understanding of it would be beneficial.

"The patient is the one who knows the disease than the doctor" and based on this reader is the best person to comment on easy and effectiveness of that format of reading (Kennedy, 2003; Schneider et al, 2016). Any observation can either be quantitative or qualitative (Booth, 2020)

Sri Lanka population projected to be 22, 427, 812 by 2022 (Dissanayake, 2016) but stood at 20, 271, 464 during last Census 2012 (Sri Lanka, 2014) and was 21.67 million in 2018 based on World Bank predictions (Population, Total-Sri Lanka | Data, n. d.) and Annual Population Growth of Sri Lanka stood at 0.612% based on latest 2019 World Bank report (Population Growth (Annual %)-Sri Lanka | Data, n. d.). Literacy rate is capability of a person to read and write (Literacy Rate, 2020), actually is understanding short simple sentences, based on simple assessments (Indicator Metadata Registry Details, n. d.) but emphasis be made on interpreting data of Literacy rate as they are usually past looking and Less Developed countries may take up to 5 years to gather information (Wagner, 2003) but Sri Lanka is not one of Less Developed Country (LDC) but is a Lower Middle-Income Country therefore could face similar challenges of LDCs but not to the extent of such Less Developed Countries (Haniffa et al., 2014; UN List of Least Developed Countries | UNCTAD, n. d.) and Literacy rate in Sri Lanka is stood at 91.7% in 2018, after slight drop in the rate during the past

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years (Sri Lanka Adult Literacy Rate, 1960-2020-Knoema. Com, n. d.).

General Certificate in Education: Advanced Levels which is considered as High School students (Grade 12 & 13) are students who prepares themselves towards sitting for that exam on completion of schooling (Jayawardena & Jayawardena, 2012) while 10, 000 plus schools funded by the state, discipline and standardization is enforced to some extent such as uniforms etc., while such restrictions may not exist in some private schools of Sri Lanka but they are low in number (Arunatilake, 2006) but only five percent goes to international schools (Asian Development Bank, n. d.).

High School are also stated to use the word as Post – Secondary students and some sources have excluded creating a distinct Vocational category in between Post – secondary (High school) and Tertiary education (Sri Lanka Education System, n. d.) while University undergraduates are defined as tertiary education students who are following Bachelor's degree programs and are currently actively enrolled in one of those bachelor's degree programs (first-degree programs) ("Education in Sri Lanka, " 2021; Education in Sri Lanka, 2017; Sri Lanka Education System, n. d.; The Educational System of Sri Lanka, n. d.) and some sources have stated that tertiary education be inclusive of Vocational training colleges as well in addition to the University based degree programs (The Educational System of Sri Lanka, n. d.), while total students at all grades is 4, 037, 157, exactly from Grade One to Grade Thirteen ("Education in Sri Lanka, " 2021) while age group of High school students are around 17 – 19 years old and typically obtaining an A/L certificate considering of re-sit attempts makes the age 19 or up to 20 (Dickens & Lang, 1995). 52.6% participates in schooling within age bracket 15 – 19 stood at 2011 (Liyanage, 2014) and minimum mandatory education school entry age is five years (Sri Lanka-Official Entrance Age To Compulsory Education (Years)-1998-2019 Data | 2021 Forecast, n. d.) as total schooling years was defined as nine years which was increased to eleven years by 2016 (Compulsory Education, Duration (Years)-Sri Lanka | Data, n. d.) while compulsory education increased till Grade 11 and supporting this measure by increasing the employment age from 14 years to 16 years (Sri Lanka : Minimum Age of Employment to Be Raised to 16 Years, n. d.) therefore compulsory schooling age is from age 5 to age 16 (Glavin, 2017).

Age bracket six to nine has 94.4% school participation rate and ten to fourteen age group having 92.2% participation rate (Liyanage, 2014) and tertiary education enrollment stood at 21.128% in 2019 based on World Bank statistics (School Enrollment, Tertiary (% Gross)-Sri Lanka | Data, n. d.), Students who are abroad are likely to migrate and went there in order to create avenue to migration through student visa routes, thus may not ever return back to their own home countries (Viet, 2016) while state universities accommodated only 23, 000 students per year during 2013 (New Technical Universities to Fill the Skills Gap, n. d.) thus multiplied by the number of average years needed to complete the degree program which is three years (makes $23,000 \times 3 = 69,000$ students) (Davies et al., 2012; SRI LANKA QUALIFICATIONS FRAMEWORK, 2012) and

students studying in abroad universities stood at 12, 000 per year during 2013 (New Technical Universities to Fill the Skills Gap, n. d.) in addition to Private universities absorption in total absolute number was 69, 000 in 2014 (Education in Sri Lanka, 2017).

2. Review of Literature

The review of literature to establish the foundation concepts are explained under several different heading.

What is Retention?

The definition to the term retention is often complicated and not straightforward and it differs from institution to institution often the measure is developed from researched outcomes (Hagedorn, 2012). There is no standard accepted formula to measure retention. While a dictionary definition to retention is "the continued possession, use or control of something" (Google, 2021), while in our context the "something" is actually knowledge, understanding and similar aspects gained from reading a book or similar content. A more specific definition from (Retention, 2021) is more relevant to our study, as it goes on to say "the act or power of remembering things; memory". While the term "knowledge retention" means the process of transferring new information from short-term memory to long-term memory (Halpern, 2010; Watkins, 2019). Knowledge retention plays a great role in academic institution, for example Wamundila (2011) discusses the importance of the retainment of knowledge using best knowledge retention practices which will help improve the gap of the University through implementation of knowledge management policy based on a knowledge retention framework. The importance of more and better reading will have positive impact on person's lives and retention improvement (Hiebert, 2009). The impact of normal aging without pathological changes and how the leaning part is affected is discussed by (Craik, 1973). This is taken into account of this research where the readers section will include almost all age groups, but the student group doesn't as majority (80%) of students fall within the age range of less than 24 (*Age Distribution of Undergraduate Students, by Type of Institution*, 2017) and there are age-related differences with undergraduate and university performance (Pellizzari, 2011). Learning to read is about giving importance to listening and understanding of the content that's printed and available on the page at the same time, and reading as an enjoyment will eventually help build further knowledge and vocabulary of students (*The Importance of Reading*, 2021), this could be argued that the difference will be doing the same on a content available on the screen. So, for our research we could go with the power of remembering things and knowledge retention, which are seen to be of critical importance for education & reading. As if a person cannot retain what is read the whole reading process turns to be useless. An additional point could be noted that cooperative learning compared to lecture only based learning has significant difference, where studies shows that cooperative learning will have significant positive exam performance post the learning phase. Cooperative learning is supported by students having knowing the content (Tran, 2014), preferably beforehand which involves reading and this could be used to support the argument reading is paramount in learning process and

knowledge retention and reading will have direct impact on exam performance.

Long-term retention is memorization and incorporation of knowledge, Memorization is transferring from short term memory to long term memory Incorporation is adding newly acquired knowledge to brain libraries with their existing knowledge by assigning a new place for knowledge while old style flash cards are recommended for improving retention (Theory of Learning, n. d.) as it is associated with significantly higher exam performance (Golding et al., 2012) which can be further amplified with spaced repetition which increases retention and amplifies the benefits of education (Kang, 2016), where Spaced repetition means content reviewed after certain amount of time and the repetition time gap increased card content is known and repeated with ease while repetition time gap reduced when the student feels it hard to remember the content in the card and there are smart applications which takes care of the repetition timing process itself (Voice & Stirton, 2020).

Concept maps help increase retention, and teachers are recommended to have concept map building skills so they can help impart that knowledge to their students as well eventually leading to better retention among students (Ajayi et al., 2017).

The key question comes here is whether flash cards and other text if not present for the reader then will they be affected with different modes of reading, where for example if a person has e-Book reading but also uses flash cards and thus this will affect the retention as the compensation happens through spaced repetition while on the other hand it could be completely printed flash cards, so this has an impact and therefore controlled study of such is required and recommended.

Before going into empirical studies the definition of is to be understood that is retention is continued possession and use of something or the action of absorbing and continuation to hold such absorbed content (Retention, 2021) and empirical literature states that reading comprehension and retention is often overlooked when shifting to e-Books from printed books, as most shift decision done only basing convenience factor (Wexelbaum et al., 2011) and readers have significantly lower recalling of events of the mystery story who read using e-Book instead while printed books has much higher recalling capacity of events (Readers Absorb Less on Kindles than on Paper, Study Finds, 2014).

Gates-MacGinitie Reading Tests ® results among different groups reading through printed books and e-Books had no significant difference between the motivation factors (Wells, 2015) and television style content had more retention than audio file among preschoolers as they ignored large audio chunks, but comparable retention between both modes in college students (Hayes & Birnbaum, 1980) , where Reading part supports comprehension, and Reading is one of the several requirements from book reading perspective (Daradkeh et al., 2012) . Understanding comprehension terminology is also important to interpret the sections therefore Comprehension is understanding as reading opposed to retention is remembering after reading or at a

later period after reading (The Difference between Comprehension and Retention, n. d.) Kraft (n. d.) suggests that reduced capacity to re-call information when reading from e-Book than from printed book is linked with evolution of humans on remembering information aspect.

Millennials are considered digital natives based on the birth year (Judd, 2018) and they are into printed books, while library users are sixty two percent under age of thirty, even when ninety eight percent under thirty has internet access (Crum, 2015) and it was seen due to millennials gradually making up the university population could be one of the reasons for E-Books rising in schools and universities to supplement printed books and with a vision of ideally replacing entirely but previous studies states reduced comprehension and retention being unsatisfactory among e-Book readers and doing studies on the shortcomings of e-Books and fixing them will help improve the e-Book standards and achieve the same level of retention and comprehension of printed books (Intal & Talens, 2019) because readers absorb less when reading through Kindle, i. e. e-Books (Readers Absorb Less on Kindles than on Paper, Study Finds, 2014) and sleep deprivation influenced by electronic books, which is not the case with printed books (Ebooks at Night Won't Help You Sleep Tight, US Study Finds, 2014). Long-term retention is affected with recalling and repetition as it is seen that the questions which aren't asked in final exam causes reduced long-term (especially life-long) retention and therefore showing exam performance and retention links (Glass et al., 2013) .

Short-Term Retention

Short term retention is one of the aspects to be studied in this research, thus it is important to look after the definition of it and relevant features through literature.

Based on the experiments of Keppel (1962) reveals that based on the laws of long-term retention, the number of items retained will decrease in proportion with the number of items exposed to remember due to the proactive inhibition factor. This experiment revealed that forgetting of the second or third item is higher than forgetting the first item and forgetting the second or third item was shown no difference. This entails that the questionnaire to assess should be prepared giving equal weightage to content on second paragraph and thereon to nullify the impact of remembering the first learnt content. The content given to read in both formats should also be sufficient in length, preferably longer in order to limit any impact which may arise due to shorter content, based on the experiments of the study by Keppel (1962) .

Retention Tests and The Practice Effect

The retention was 100% when single item was presented regardless of the intervals, this shows the distortion the researcher's study may have if used smaller amount of content for retention testing observations (Keppel, 1962) .

The study also includes the possibility of practice effect where significant improvement in retention was identified over six tests when single item was tested. There was no evidence of constant proactive interference and the interaction between length of retention interval and number

of potentials proactively interfering items were very evident (Keppel, 1962). The need for use of large content will probably eliminate the impact of practice effect to greater extent, and the need to not issue the same content at least most of the time in order to eliminate the practice effect is also understood from this.

In recent years Gradual and continuing rise of e-Book users among the world (Ashcroft, 2011) while some university libraries have even made e-Books mandatory (Lederman & Armour, 2018) , but such Universities choosing e-Books readers (e. g. Kindle) decision is based on subscription fees & maintenance costs (Wexelbaum et al., 2011) and lower costs of e-Books tends to be the motivation factor behind switching to e-Books (Lynch, 2013) while Universities of the developed nations achieved 50: 50 equilibrium between Printed books: E-Books by end of 2020 (Wells, 2015) .

Importance of Considering Paradigm Shift

Usage pattern of the smartphone is gradually decreasing with age considering the eye strain factor (Myrberg, 2017) resulting adult learners might forgo e-Books. Electronic Readers which are used for e-Books are seen to be effective for learning process of Dyslexia affected readers (Thomson et al., 2013) . This study was focussed on hundred and three high school students and the experiment was assessed through two groups of students each group being either accompanied with printed text books or e-Book reader (few words per line configured), and the study found significant improvements in comprehension and speed of reading among some students. Only a small percentage benefited thus the study couldn't be generalized and few words per line optimization would have shown an impact according to the author (such setting is not available in a printed book). Thomson et al. (2013) acknowledges that little is known about e-Readers helping struggling readers but this suggests that people with some learning disability can be benefited, and opens up ways for further study.

Readers mostly show preference to printed books and remembering of chronology of story order was higher in printed books rather than e-Books with one-week pause after reading (Robinet et al., 2014) .

Olivier et al. (2019) 's experiment among 24-year old adults who read 28-page book (10, 800 words) in an hour either in a Kindle or printed pocket book, results revealed similar identical performances between both reading modes except the chronology and temporality which were higher among printed book readers and the author it is linked with less informative kinesthetics feedback of Kindle.

Comprehension is understanding (comprehending) text as read, and is something that doesn't last long (Kintsch, 1979) while Retention is the ability to remember read information after some time (James, 2019; Mark et al., 2014). This shows the importance of both comprehension and retention as both are important for students in order to succeed in their academic lives.

Retention can become more significant especially among Asian students as they are mostly exam focussed (Wong, 2004) , and usually most examination questions are

answerable from a pre-defined framework given by the lecturer during class or from a textbook (Entwistle, 1991) .

E-Book has reduced retention rates than printed books (Mangen et al., 2013; Robinet et al., 2014) and evidenced as experimented by Mangen et al. (2013) where seventy-two tenth-grade students of Norwegian school randomly given text of 1400 to 2000 words given to two group of students each group given either e-Books (read on computer screen) or printed books and significantly better comprehension test results achieved among printed book readers opposed to e-Book readers, should be carefully noted that this research studies of comprehension and not retention.

E-Books require same content to be re-read several time (repetition) to achieve same retention level which could be achieved from a single reading of printed books (Szalavitz, 2012) , which shows the significant time consumption of student's learning time and could be argued against time-effectiveness of the reading mode, and also considerable long-term implications that is reduced grasped content over time.

Whether convenience, lower cost, easy access to wide range (Harman, 2018) of content other superficial benefits obtained (Kouis, 2014) through an e-Book actually justifies the losses (if any) occurring due to electronic reading instead of physical.

Schema theory states creating links with existing knowledge in an interactive way enables long term retention (Pardede, 2008) while meta-cognitive methodology of learning could be linked with self-regulated learning strategy which helps achieve skills in new discipline of study (Agarwal & Argaliou, 2019) while The Theory of performance explains effectiveness in the basis of performance where a person is able to improve his or her performance and through that capable of performing further in their respective fields and it also states humans are capable of achieving extraordinary things (Elger, n. d.).

Theoretically Spaced repetition helps improve retention and also problem-solving skills, and provide superior level of long-term retention and implementing spaced repetition is cost-effective, further amplified when using integration of tests (Kang, 2016) and significant findings present regarding improvement of exam performance having positive co-relationship by utilizing spaced repetition (Voice & Stirton, 2020) while higher examination scores can be achieved through the utilization of flash cards (Golding et al., 2012) and real world usage of spaced repetition is lecturio website which allows medical students study more effectively and efficiently through pre-available flash cards which would be enabled through spaced repetition on a daily basis and based on the student's response pattern it would be using an artificial intelligent solution and the long-term retention is prioritized through that instead of just short-term memorization (Beating the Forgetting Curve with Spaced Repetition | Lecturio Medical, n. d.)

Empirical evidence suggests that very limited number of studies in the in the perspective of effectiveness studies among e-Books and also within e-Books and there is link between the area of effectiveness of the electronic books and

the different ways of electronic books such as text-based e-Books and animation-based e-Books (Dalla Longa & Mich, 2013) and contradictory statement states that E-Books shows significantly successful and higher student performance in examination among Rural Schools of Indonesia based on an experimental class study (Budi Santoso et al., 2018).

Based on switching to e-Books will have impact on the student's intellectuality and careful consideration to be made during Paradigm shifts.

3. Methodology

Performed analysis using Google Scholar and Research Gate as main platforms in addition to the Google Search Engine to identify relevant documents with regards to e-Books and printed books which were published during the recent COVID-19 pandemic (2020 Q1 to 2021 Q4). The literature articles were manually examined for development of the recent findings evolved the industry and sector of concern and established the framework and discussed on the important changes headed during COVID-19.

4. Discussion

Paradigm Shift during COVID-19

During the COVID-19 pandemic situation the availability of printed books dropped due to several reasons including but not limited to shutting down of libraries (Ashworth, n. d.) , closure of libraries as a preventive measure to the spread (*Closed Bookstores and Libraries Remain a Challenge for Bibliophiles*, 2020) and even quarantining books which were returned (Steele, n. d.) causing an hold or cooling off period for each books to be reused. In Sri Lanka due to the curfew the library re-opening strategy was impacted even when the government staff were required to report to duty and the strategy includes usage and promotion of electronic versions of books, magazines and newspapers through and explained to the users through library's official websites (Gamage et al., 2020) , reopening of libraries are expected to be delightful through the re-opening time and the impact of libraries of lockdown imposed locations are questionable (Fernando & Jayasekara, 2020) and therefore essentially limiting the reader's ability to visit the library. It was also seen that library access policies and re-opening strategies enforces the fact to offer services online and promote digital access while closing down physical access (Samanta, 2020) , this in turn is an indirect promotion and support towards electronic books but still this is not challengeable as the library is doing their best in order to produce the best services even during lockdown and pandemic situations, but this creates the importance of a study in this aspect. It is highly acceptable that the spread should be controlled which is in turn will save many lives and libraries are no exception but still the coronavirus pandemic had created a situation to study the importance on retention among different types of reading modes and to study existing literature of this aspect to get a full picture and also provide further research recommendations, additionally this shows the importance of the study of this regard in this situation.

5. Conclusion

Based on the review of literature it can be understood that in the recent past there has been a significant paradigm change especially fueled by COVID-19 pandemic. The usage of e-Books did not outsell print books due to preference for print books still significantly prevalent (Richter, 2021) even in developed nations and further proved by ten-times higher print books sales (Handley, 2019) .

Hence this paradigm was shifted during COVID-19 pandemic due to closing down of libraires (Samanta, 2020) and forcing electronic versions among readers (Gamage et al., 2020) , where the usual paradigm changes to technology which was not seen in the e-Book history was forced upon especially during COVID-19 pandemic, which though unavoidable should not be taken as chance to push the paradigm shift.

6. Findings & Recommendation

The usage of printed books is supported by several evidences such as higher retention rates (Flood, 2014) , reduced need for repetitive reading to grasp the same level of contents (Garland & Noyes, 2004; Kraft, 2012; Staff, 2013) , higher comprehension and understanding capabilities (Allcott, 2021; Baron, 2017) eventually leading to higher knowledge retention eventual academic performance.

Preference is hampered with the increased eye strain factor caused by reading e-Books (Rosenfield, 2016) . With need for repetitive reading takes more time, aggravated by eye strain reducing the number of hours of study further affected by the reduced retention leads to overall intellectuality downgrade on students.

Hence Libraries should consider providing preferred mode of reading of the reader concerned rather than focusing on digitalization and pushing things into paradigm shifts.

It is scientifically questionable where taking into account of the benefits of print books, and the fundamental right of citizen for having their own preference, enforcing e-Books might hamper the intellectuality and knowledge growth of the next generation and careful consideration to be taken.

7. Further Study Scope

Studies can be made on several independent academics and librarians in their own libraries and universities to quantitatively study the impact explained within their respective areas.

Studies recommended to be geographically spread over including poorly developed nations and developing nations in addition to the developed nations in order to create multi demographic study results on this research area.

Geographical extension quantitatively and qualitatively by future researchers of this area would fill the knowledge gap in greater detail and also entail to greater generalizable study findings.

Research on the benefits of having few words per line and the benefits of e-Books supporting Dyslexia learners can be studied in great detail with the actual contributing factors be studied and further developed from Thomson et al. (2013) 's research.

Smartphone usage is declining with age (Myrberg, 2017a) , therefore further study on the factors causing such decline and retention and academic performance of students with age and reading through smart phone or usage hours of smart phone per day having such impact could be studied in detail.

Research by Robinet et al (2014) and Olivier et al. (2019) shows benefits of e-Books or at least similar performance except some factors, while such factors and the dependencies contributing such can be further studied and also there is a significant impact of retention capabilities of readers which creates a knowledge gap which can be studied too.

Comprehension was much lower with e-Books (Mangen et al., 2013; Robinet et al., 2014) thus the retention aspect could be studied, and also the comprehension aspect in different settings and larger sample groups.

Repetition requirements in knowledge grasping through e-Books (Szalavitz, 2012) can be further studied in different settings for more context and improve validity of the statement.

Harman (2018) and Kouis (2014) discussed the benefits and potential transitional technical obstacles thus this could be studied further in-detail analysing the factors mediating or moderating the transition and also research into whether the benefits outweigh the loss can also be studied.

Rising e-Books in universities (Carlin, 2012) can be studied in different setting and among universities spread among different regional geographical locations.

Only 30% of students are satisfied with e-Books (Neyole, 2014) while this can be re-validated among different settings and at the same time analyse and find the major contributing factor for such preference change among students which will help e-Book companies modify their e-Books to improve user acceptance.

Limited number of Long – Term studies and Retention aspect specific studies (Frank, 2017) can be compensated with such studies in the research area while larger group of sample among general population without single destination specific is another solution for (Frank, 2017) 's statement on small group research, while a review article comprising of all such different location specific empirical studies will help create a fuller picture even without a larger population study. Studies of this nature which is usually academic therefore this can fix the current problem of e-Book delivery company-based research bias and non-adherence to academic research standards.

Olivier et al. (2019) 's recommendation can be adopted by comparison of different presentation modes text by the way of experimenting.

User needs to scroll through the screen to read them (Rao, 2003) as opposed to no scrolling required when reading from a printed book

Negative comments were tiring, less efficient & even painful (Lam et al., 2009) which can be studied among different groups in geographically distant places to extend coverage and at the same time the reasons behind such issues and the method to improve e-Books by eliminating or at least reducing such side effects could be studied.

Most studies of e-Book Learner's Age and Preference being in US is justified in this article and therefore it can be further established or same research replicated in other geographic continents will improve the existing identified knowledge gap.

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