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A Systematic Literature Review based on the philosophy of "think global, act local."

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Barriers to the Integration and Adoption of iPads in Schools: A Systematic Literature Review based on the philosophy of "think global, act local."

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Abstract: iPad, with its Apple platform and interoperability-dependent material conditions, bring complex barriers in its adoption and integration in secondary education system as a learning tool. In the schools' context, it is an emerging educational technology for its affordances supporting collaborative learning. This systematic literature review on the barriers to the integration of iPad in primary and secondary schools is based on 13 peer-reviewed and full-text articles. The paper discusses what are the challenges in using iPad as a learning tool in primary and secondary educational settings. The identified barriers are discussed in three broad categories or stages of innovation process in an educational context: basic challenges with the tool, barriers to the integration of the iPad in a school setting, and barriers in the use of the iPad.

Introduction

The children of today spend much of their free time on digital media and various technologies, and the integration of these in learning environments is inevitable, if the elementary schools in Denmark as well as other countries across the globe must live up to their education ministry's common goals for ICT and media skills in schools. The education systems of the countries in the world have significant differences in terms of organization structure, policies, curriculum, pedagogical methods, cultural practices and educational vocabularies. Therefore, it can be difficult to compare the Danish education system with other countries. The review is based on the International Standard Classification of Education (ISCED) developed by UNESCO. ISCED is designed to "facilitate comparisons of education statistics and indicators across countries on the basis of uniform and internationally agreed definitions"(UNESCO Institute for Statistics, 2012). The elementary schools in Denmark, called "Folkeskole", are from age 5 to 17 years (retsinformation.dk, 2014), and cover primary, lower and upper secondary education (UNESCO Institute for Statistics, 2012). The motivation behind this literature review originates from the public initiatives in the Danish context and the ongoing discussion on how digital technologies must be integrated into the learning environments. The intention is to make contributions to the literature so as to give new insights on how to prepare the Danish students to contribute to the knowledge economy with specific focus on iPad as a learning tool. The objective of this review is to learn from the experiences of different context around the globe regarding barriers to the integration of the iPad as part of the learning environments in a school setting. We would first describe what a learning environment, globalization and lifelong learning means in the context of this paper.

Sørensen, Audon & Levinses (2012) emphasizes the material conditions of learning environments as follows (translated from Danish text). "The learning environment should be understood broadly as the physical setting and decor with tables, chairs and study materials in the form of books and various other learning and use objects, digital media, including digital software and hardware, but also the actors involved, children and adults and the way they organize themselves as participants in the teaching and learning processes, are key factors in the school culture that is in play. A learning environment is a complex interaction of physical and technological environment, objects, participants and activities. The thinking behind this learning environment is that all participants are active in the construction of the learning culture that is built" (p. 34).

The concept of globalization is selected as a way to understand to investigate and to circumvent the barriers. Globalization is a broad term that occurs in various contexts and is assigned many different meanings. Spring (2008) describes Lifelong Education, as an angle of globalization and the knowledge economy, and

underlines that: “primary and secondary education becomes preparation for the lifelong learning required by the rapidly changing technology of the knowledge economy. As a consequence, concerns about lifelong learning have a direct effect on primary and secondary curricula” (p. 339).

There will be a requirement for schools worldwide to teach basic skills. Cheng and Yip explains in Spring (2008), how students should be prepared to engage in the knowledge economy through lifelong learning as: “ability to learn new things, to work in teams, to communicate effectively, to manage oneself, to question and to innovate, to assume personal responsibility, etc” (p. 339).

Hallak (1998) suggests that, in order to meet the challenges of globalization: “it would in fact appear necessary to prepare individuals for a workplace where responsibilities are constantly changing [therefore] education must help individuals to perform tasks for which they were not originally trained, to prepare for a non-linear career path” (p. 1). In Denmark giving the children basic technology usage skills, independence and responsibility is obligatory in the primary and secondary schools (undervisningsministeriet, 2009). Technology and ICT in education therefore has a bigger role. For example iPad, the learning tool that the paper discusses, can aid and prepare the students for the evolving knowledge economy. The paper focuses on iPad in this review because iPad is a relatively new technology in a learning environment. The iPad is gaining more and more ground, without initially being created for this purpose (Apple Inc., 2010; Jobs, 2010), and there is an increasing interest in the iPad as a learning tool.

This review is based on the philosophy, "Think global, Act local”. Think globally and Act locally is a familiar exhortation which have circulated within the slogan system of environmental education for nearly three decades” (Gough, 2002, p. 1). It is therefore desired to obtain inspiration and experience from across the globe, to gain insights in order to strengthen the Danish knowledge economy. The review is based on the research question: What are the barriers affecting the integration of iPad in a learning environment in primary and secondary schools?

The literature review is structured as follows. An overview of the search methods is given which is described later on followed by an analysis of the search results and summarized with a conclusion.

Methods

This systematic literature review is conducted strictly adhering to the PRISMA statement for reporting systematic reviews and meta-analyses (Liberati et al., 2009), and is based on the definition: “a systematic, explicit, [comprehensive] and reproducible method for identifying, evaluating, and synthesizing the existing body of completed and recorded work produced by researchers, scholars, and practitioners” (Okoli & Schabram, 2010, p.1). The selection of databases is via Aalborg University library-facilitated access to databases and their descriptions. With facilitation from one of the librarians, the searches are conducted in three different databases; ACM Digital Library, ERIC, IEEE Xplore, using the following combinations of keywords and synonyms: “iPad”, “Integration, adoption”, “Barriers, challenges, hurdles, obstacles” and “School, teaching, learning”. In order to obtain a global perspective and communication convenience, the search was conducted on English, peer-reviewed and full-text articles published in the period from the iPad were released in 2010 till the search was completed (23-9-2014).

The methodology involving searching, screening, assessing for eligibility and exclusion is illustrated in Figure 1, which is based on the 2009 PRISMA flow-diagram (Liberati et al., 2009). The flowchart shows four stages: identification, screening, eligibility, and included. In the identification stage, the searches in databases resulted in 372 articles. In the screening stage, 19 duplicates were removed and 327 articles were excluded during screening the titles, abstracts and keywords. There were three exclusion criteria at the screening stage: (1) the study is not about teaching situation, (2) the article does not deal with the appropriate age group or those who are not school-goers, and (3) insufficient focus on iPad or summary of survey on various mobile devices. In the eligibility stage, 26 full-text articles were assessed for eligibility and 13 were excluded due to insufficient focus on the aspects required for this study. In both screening stage and eligibility state, the same exclusion criteria were applied. Finally, 13 articles were included for a qualitative synthesis and meta-analysis.

There are challenges involved in this systematic review, particularly due to the inherent challenges associated with the methodology of inclusion and exclusion of articles. The authors of this paper are aware about a number of research articles on iPad integration in schools and those articles significantly emphasize on the theme of this study. However, those articles were not returned from the database searches, which is one of challenges of systematic review as opposed to the hermeneutic reviews (Boell & Cecez-Kecmanovic, 2010).

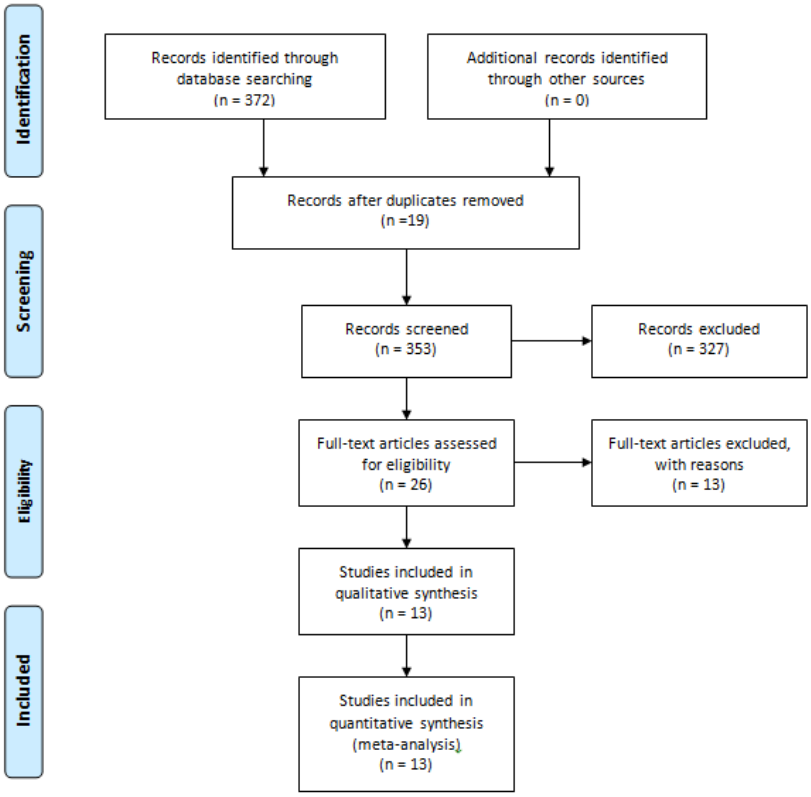


Figure 1. Flowchart for the inclusion and exclusion of research articles for systematic literature review (Liberati et al. 2009)

Results and Discussion

This section presents a qualitative synthesis of the 13 full-text articles and some of the variables used for meta-analysis are included as part of the qualitative analysis. A quantitative synthesis involving meta-analysis is not conducted. The analysis begins with a structured overview of the 13 articles, categorized into different themes related to the problem. Subsequently, for further discussions, the themes are divided into three broad categories.

A result schema (see Table 1) is devised based on the guidelines of a systematic literature review (Liberati et al., 2009; Okoli & Schabram, 2010) and the globalization aspect considered in this study (as discussed in the introduction). The schema is designed so that the articles are listed in order of release year at the upper row, and the themes in the articles are listed the in the first column. The first sets of themes were founded in the scheme at the time of examining the first article. The encoding of subsequent articles was compared with the review of the first themes. If the subsequent article's theme matched the preceding themes then the subsequent articles were noted. If a theme did not match with the existing themes then a new theme was added in the schema. This process is iterated until all articles encoded themes of the articles where reviewed.

Table 1. Schematic overview of the articles and the identified barriers of iPad adoption

Publication year	2010	2011	2012					2013					2014
Author/Authors	Waters, J. K.	Lohr, M.	Wang, T., & Towey, D.	Henderson, S., & Yeow, J.	Crichton, S., Pegler, K., & White, D.	Berson, I. R., Berson, M. J., & Manfra, M. M.	Culen, A., & Gasparini, A.	Northrop, L., & Killeen, E.	Liu, N.	Pegrum, M., Oakley, G., & Faulkner, R.	Richardson, W.	Nikolic, V., Krnelic, L. Z., Kolaric, D., & Nikolic, M.	Crnkovic, K. S.
Background													
Geographical Distribution	Canada	Østrig	Hong Kong, Kina	New Zealand	Canada	USA	Norge	USA	Taiwan	Østrig	USA	Kroatien	Kroatien
Article type: Conference papers / Journal article	T	K	K	K	T	T	K	T	T	T	T	K	K
Themes													
Challenge in the transition between Windows and Mac environment.	**X**									**X**			
iPad is expensive	**X**			**X**			**X**						
iPad's design "consume not create"	**X**			**X**									
Mainly positive attitude to iPad		**X**		**X**					**X**			**X**	
Requires extra hardware acquisitions			**X**										
Educational material is not available in iPad-friendly version.			**X**										
Software costs money and is cumbersome to administer				**X**	**X**								
Hardware maintenance of the iPad is expensive				**X**									
iPad's options can distract students				**X**				**X**					
Extra costs in the covers and screen protection				**X**									
App amount is difficult to command				**X**				**X**		**X**			**X**
Software maintenance of the iPad are consuming and cumbersome				**X**	**X**								
Students learning is hindered because of sharing the iPads				**X**	**X**					**X**			
iPad's are too small in size for shared learning				**X**			**X**						

IT support staff must have expertize in the Mac platform					X								
iPad requires wireless Internet access					X		X			X			
iPads requires that skills of teachers and students needs to be updated						X			X	X		X	
Teaching and learning gets affected when the techniques does not work							X						
The use of the iPad should be adapted to students level								X					
Since the iPad is new in an educational context, there is no enough literature available										X			X
iPad was not designed for teaching										X			
iPad can affect the teaching content and the form										X	X	X	X

Basic challenges

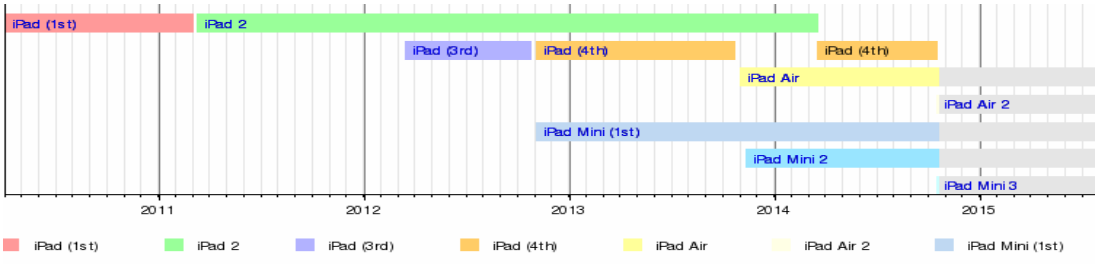
As the first stage in the study of barriers of using the iPad as a teaching tool, consideration is given to the basic elements of the tool, the iPad, and the literature on this subject. The starting point is iPads' design and use, and how these have evolved to match a teaching situation, and the overall impression of the literature available on the topic that the paper discusses upon.

iPad as a learning tool

It is seen that majority of the mobile handheld devices which are used as educational or learning tools were not originally designed to be a part of a learning environment Technologies, which are not originally designed for learning, should be redesigned for learning taking into account the challenges of dealing issues like small screen and also general characteristics of the design (Pegrum, Oakley, & Faulkner, 2013). Pegrum et al (2013) describe iPad as: "seen by many as primarily a consumption tool rather than a productive or creative device" (p. 70), which is also seen in Apple's own presentations of iPad's design and application (Apple Inc., 2010; Jobs, 2010). With the release of the iPad 2, it was possible to record audio and video, as the new entity had built-in camera and microphone (see information box 3 from Wikipedia), which was seen as a positive benefit of using the iPad (Berson, Berson, & Manfra, 2012; Crnkovic, 2014; Culen & Gasparini, 2012; Henderson & Yeow, 2012). As hardware improvements came with the iPad 2, there also developed a range of apps in the Apple App Store. There were more and more creative and productive apps which also contributed to the making iPad more relevant in in educational contexts (Pegrum et al., 2013).

The development of the iPad went very fast in the seventh generation (See Figure 1), which was presented at Apple's October event, and a lot has been improved in the design dimension of iPad as a tool and the Apple App Store since the first iPad was released in 2010. Apart from the addition to hardware and software development Apple's own focus on the iPad as part of the instruction (see Apple Education (Apple Inc., n.d.)), also helped to maintain the discussion on iPads' potential as a teaching and learning tool. It is difficult to give a definite moment status on the experience of the iPad as part of the learning environment, but with the growing discussion on the topic, it must be noted that there is still a need for exploration and development in the area.

Figure 1. Timeline of the innovation of seven generations of iPads



Literature on the iPad in an educational context

The amount and timeliness of the articles found through this review, together with the mostly positive news value associated with the iPad as a tool is considered as a critical point for this study. Literature states that iPad was not originally designed for teaching contexts (Henderson & Yeow, 2012; Waters, 2010). "The iPad was created for users to listen to media, view web content and access applications in different ways, but doesn't allow easy creation of content" (Henderson & Yeow, 2012, p. 81). The iPad and its use in the educational context has evolved a lot in a relatively short period of time, which can be seen as a relative weakness of articles submission in this area. Several of the issues, compared to just iPads design and application are treated herein, is no longer current.

Pegrum et al. (2013), states that : "Because these technologies are a very new addition to classrooms, there is as yet little published research on which devices are being used at which levels; on how they are being integrated into different curriculum areas; on what benefits are being observed, what challenges are being faced, and how these are being addressed; and whether, on balance, mobile handheld devices are living up to their apparent promise." (p. 67). The literature review showed that most of the articles reflect positive experiences with iPad while the media shows many frustrations with iPad when used as a part of the learning environments (Devantier, 2013; Jensen, 2013). This literature search thus gives the impression that the positive side of the articles has overshadowed most of the material thereof. The review shows that the literature is overshadowed by articles which have mostly positive arguments especially in (Lohr, 2011; Liu, 2013 ; Nikolic, Krnelic, Kolaric, & Nikolic, 2013).

Barriers to the integration of the iPad

The next stage in the study of barriers to the use of the iPad as a teaching tool contains considerations regarding the integration itself. The literature review found that cost which was dependent on the school economics and skills of the actors were the main consideration that influenced the decision for investing in iPad's in an educational context.

Costs

The first barrier that was found in the integration of iPad's in educational contexts was the element of cost. The iPad is relatively expensive to buy, and more expensive than some notebooks and tablet PCs in the market (Henderson & Yeow, 2012; Waters, 2010). Waters (2010) further states that the price of the iPad is too high for most school districts, and Henderson and Yeow (2012) also elucidate that "Because of the high cost it may be difficult to get an iPad for every student in a classroom due to budget constraints" (p. 80). In addition to the cost of purchasing iPad's, there may also be costs in the form of purchases of software, as not all apps in the App Store are free. Similarly, there are costs in terms of extra hardware that allows interacting with other technologies. "For schools and districts already on the Mac platform, it's a much easier decision to go with an iPad […] for districts running Windows, that's probably not the case" (Waters, 2010, p. 41). "Having no USB interface on the device is one problem, making it difficult to import and export data without a special dock

connector" (Wang & Towey, 2012, p. 3). Another cost factor that the schools have to consider is for the wireless connectivity. For the iPad to be fully exploited, it is also necessary that it has to be connected wirelessly to the Internet, and not all schools have installed wireless internet (Crichton et al., 2012; Culen & Gasparini, 2012).

If an iPad is broken, it's expensive to replace or repair it, and when the iPad is used in a school setting there will be a high probability that the iPad may be broken or damaged (Henderson & Yeow, 2012). So, costs also come in terms of protection, such as covers and screen protection. As reflected by Henderson & Yeow (2010) "Additional costs are also incurred through the purchase of protective gear for the iPad, such as cases and screen protectors […] which is an ongoing cost because the screen protectors only last about two or three months"(p. 82). Culén and Gasparini (2012) also expresses concerns about the cost and as iPads' rapid development is difficult to catch up with: "It is expensive to introduce new technology in the first place; getting it replaced every time an addition to the existing technology is significant, is not realistic for many schools or families" (p. 6).

Skills

For the efficient use of any new technology adequate skills are needed and iPad is no different. Skills play an important role in using any technological tool when it is used as a learning tool in an educational context. When we talk about the skills it is with relation to acquisition of new skills related to the integration of the iPad by both students, teachers and IT support staff. Waters (2010) expresses a barrier to the iPad in terms of whether the school has been accustomed to a Mac or Windows platform, and thus how easy it is for them to adapt to the new technology. A schools IT support should be equipped regarding the general setup of having the ability to install apps, update the operating systems, installing and taking care of Internet connections and safety with regard to iPads. Teachers should also have sufficient skills to install apps and integrating iPad to the classrooms. Teachers should have the skills to find the right learning style to suit either the class or the individual student's needs (Liu, 2013; Nikolic et al., 2013). iPad brings lot of new possibilities to the learning environment and students should also have the requisite skills to make use of iPad as a learning tool. Pegrum et al. (2013) states that: "Students must learn to navigate, interpret information from, contribute information to, and communicate through the mobile web, mobile apps and the 'mixed reality' they engender, where the real and the virtual are interlinked"(p. 70)

Barriers in the use of the iPad

The final stage in the study revolves around the possible barriers that can come in the way for its efficient use as learning and teaching tool. This revolves around the impact of IPad as a technology on both learning and teaching.

Barriers in learning

As the number of apps increasing rapidly there is a challenge of having to find the right application to students' needs (Northrop & Killeen, 2013). Henderson and Yeow (2012) reflects that "There's thousands upon thousands of apps out there so it's quite difficult finding one that's suitable for the right level and you may have to get five or six, trial them out, see whether they're going to be any good before you find the right one...The trouble is new stuff comes out all the time it's quite hard to keep up with it" (p. 82). Northrop and Killeen also underlines that the use of technology does not necessarily lead to increasing students' presentation and the use of a technology and its contents must match the students level of competence (Northrop & Killeen, 2013). Northrop and Killeen (2013) states that "Because student achievement may actually be hindered by the use of technology, it becomes important, then, to ensure that the iPad app is used to enhance curricular integration and support identified learning goals and is not simply used for technical integration or as an instructional add-on" (p. 532). Another barrier which iPad could bring is that because of the many features which it offers it can bring possible distraction for the students (Henderson & Yeow, 2012 ; Northrop & Killeen 2013).

Literature also shows that challenges to deal with when iPad is used as a shared learning tool considering the cost element of iPad (4.3.1 Cost) (Henderson & Yeow, 2012: ,Susan Crichton et al. ,2012) ; and Culén & Gasparini, 2012). It was found in Culén & Gasparini (2012) study that the students at the beginning

did not show any apprehensions in sharing iPad. However, this view was changed at the end of the study where they preferred to work on the iPad alone or at the most with another person than to share with a group. Similar view is also expressed by Henderson and Yeow (2012) who also brings into notice the challenges with the size of the iPad when used for a group work: "while multiple students can view the device together, only one can realistically operate it at a time, and thus there is the potential for some students to monopolize the device. The ability for multi-touch to support multiple users seems to be valid for interfaces with larger surfaces, but not for devices with a form factor as small as the iPad's." (p. 86)

Henderson & Yeow (2012) also reflects that the problem with iPad's size, also affects the experience of the keyboard, and erodes the iPad as a writing tool: "Nevertheless, word documents can be created on the iPad using the on screen keyboard, which may be tedious to use for long periods of time. While a physical keyboard can be attached onto the iPad this somewhat defeats the purpose using the iPad for its superior mobility" (p. 81).

iPad's influence of the teaching method

In the recent literature on iPads in educational context, the question arose about the learning environment and its content (Crnkovic, 2014; Nikolic et al., 2013; Pegrum et al., 2013; Richardson, 2013). Technologies have been seen as a digital addition to teaching and have addressed question concerning the devices to be selected, where the devices shared, did the students owned a device, installation of smart boards etc. Pegrum et al. (2013) describe this focus on technology as a threat, and involves TPACK model in their argumentation, emphasizing the need for complex nature of knowledge and skills in relation to technology, pedagogy and content. Teaching content and teaching approach should be promoting and enabling technologies added: Pegrum et al. (2012) emphasize that "what is important is not the technology per se but how it is used to support teaching and learning" (p. 69).

So far, the teaching method influenced the use of iPad's, but now there are indications that the use of among other things the iPad also has begun to affect the teaching method and content. According to Pegrum et al. (2013) students should: "learn to navigate, interpret information from, contribute information to, and communicate through the mobile web, mobile apps and the 'mixed reality' they engender, where the real and the virtual are interlinked" (p. 70). According to Richardson (2013) it is no longer about placing technology above the traditional curriculum but focus should be on meeting the new needs for knowledge about the technology and students can make use of it. Richardson (2013) raises the question: "What do we mean by learning? What does it mean to be literate in a networked, connected world? What does it mean to be educated? What do students need to know and be able to do to be successful in their futures? [because the teachers can] lead inclusive conversations in their communities around such questions to better inform decisions about technology and change" (p. 2).

Two of the articles in this review, which are based on case studies from Croatia describing a positive effect of having an IPad also states that iPad should not just be an addition. Crnkovic (2014) writes in his case study on iPad's implementation in foreign language teaching that the teachers trained students to use the iPad in a way that suits their learning style. Teachers discuss with students on how iPad can be an alternative and could be replaced with paper, pencil, books and computers and how they can now learn in new ways. Crnkovic (2014) and Nikolic et al. (2013) describe in their study of the implementation of iPad's in the classroom on how the school has designed a new learning environment for both students and teachers. In Nickolic et. al's (2013) study the aim was to reorganize the educational environment through integration of iPad. During the integration of the iPad, their goal was to: "completely reorganize the educational environment and create a new modern curriculum" (Nikolic et al., 2013, p. 526)

Conclusion

The aim of the paper was to review and investigate the barriers of integrating the iPad in a learning environment at school level. It has been a challenge to find articles on how iPads is used as a learning tool at the specified grade levels, and the articles that have been found generally reflected a positive attitude towards the integration of iPads. After review of the articles, the core themes were identified by using coding technique and these identified themes on the integration of the iPad in the school's learning environments were divided into

three categories: the basic challenges, barriers to the integration of the iPad, and barriers in the use of the iPad. These categories can be viewed as the barriers in the stages of adoption of an innovation.

The paper found that there are two fundamental challenges for using iPad as a learning tool. The paper brings to the notice that iPads are not fundamentally designed to be used as learning and teaching tool, and that there is a limited research done on this. Secondly, the iPad is a constantly evolving technological tool, and there is a growing discussion of its potential as a teaching tool. It is difficult to give an accurate status of how close or far iPad is as an efficient teaching tool as there is lack of sufficient body of literature in this area and the review shows a largely positive approach to the iPad in their studies, and most problems which are studied are superficially. What role iPads can play in a learning environment is still being debated. Indications are that there might be still some barriers that could be identified for the iPad to be efficiently used as a learning tool. Therefore, there is a need for more critical analysis on the iPad, and more focus on the barriers experienced in the process of integration and use of the iPad. The barriers in the integration of the iPad focused primarily on the cost of the iPad and the skills that would be acquired. In this literature review, cost is identified as major barriers to the iPad, both in the developing and developed countries. If the school does not have a sufficient budget, and the staffs do not have the necessary skills, why should you choose a new technology, in the form of the iPad, rather than the old familiar one that fits? Such a question is not raised as skeptics, rather as pragmatist due the massive budget cuts in education sector around the world and reduction of man-hours.

In the final stage, on the barriers in the use of the iPad, the paper talks about two issues; the barriers to learning, and iPad's influence of the teaching methods. The paper argues through the review that barriers to learning stems from the fact that there could be a mismatch between the students level of competence and use of iPad as a technology. This mismatch can be quiet challenging because of the constantly evolving applications of iPad. The paper also brings to the notice the options of the iPad can sometimes bring distraction for the students considering the age group that the review focused upon. Another point that the paper brings to the notice is a barrier that comes as the size of the iPad as it can bring some challenges with group and major writing assignments. There is now evidence that the use of among other things the iPad is also beginning to affect educational form and content, in contrast to earlier. There is growing evidence that technologies such as the iPad must be seen as part of the teaching and content, and not as an extra layer of this.

Through this paper authors stress the need for more in-depth research on use of iPad in the primary and secondary schools. This is very important because the literature generally shows an optimistic view about this new technology in learning and teaching environments. There is a lack of literature which can possibly bring out the psychological factors and human centered interactive elements of using a new technology so that learning through this new age learning tool could bring better results. The paper is not taking the position that iPad does not have significance and relevance but the argument put forward is that because of its potential as a new age learning tool, barriers for the effective integration and adoption needs to be identified to maximize its usage. To help schools with an understanding of the degree of integration of iPads, as well as the adaptation of teaching to global development, research should be intensified in this area so as to bring new dimensions and perspective on how iPad can help the students to be better equipped with the evolving digital world.

References

Apple Inc. (2010, January 27). Apple Launches iPad. Retrieved February 10, 2014, from http://www.apple.com/pr/library/2010/01/27Apple-Launches-iPad.html

Apple Inc. (n.d.). Læring med Apple. Retrieved February 10, 2014, from http://www.apple.com/dk/education/

Berson, I. R., Berson, M. J., & Manfra, M. M. (2012). Touch, Type, and Transform: iPads in the Social Studies Classroom. *Social Education*, *76*(2), 88–91.

Boell, S. K., & Cecez-Kecmanovic, D. (2010). Literature Reviews and the Hermeneutic Circle. *Australian Academic & Research Libraries*, *41*(2), 129–144. doi:10.1080/00048623.2010.10721450

Crichton, S., Pegler, K., & White, D. (2012). Personal Devices in Public Settings: Lessons Learned from an iPod Touch/iPad Project. *Electronic Journal of E-Learning*, *10*(1), 23–31.

Crnkovic, K. S. (2014). Use of iPads in foreign language classes (pp. 937–939). Presented at the Information and Communication Technology, Electronics and Microelectronics (MIPRO), 2014 37th International Convention on. doi:10.1109/MIPRO.2014.6859702

Culen, A., & Gasparini, A. (2012). Tweens with the iPad classroom — Cool but not really helpful? (pp. 1–6). Presented at the e-Learning and e-Technologies in Education (ICEEE), 2012 International Conference on. doi:10.1109/ICeLeTE.2012.6333771
Devantier, N. (2013, December 5). Her er tre grunde til iPad-fiasko i folkeskolen. Retrieved October 20, 2014, from http://www.computerworld.dk/art/229251/her-er-tre-grunde-til-ipad-fiasko-i-folkeskolen
Gough, N. (2002). Thinking/acting locally/globally: Western science and environmental education in a global knowledge economy. *International Journal of Science Education*, *24*(11), 1217–1237. doi:10.1080/09500690210136620
Hallak, J. (1998). Education and globalization. *IIEP Newsletter*, (2). Retrieved from http://www.iiep.unesco.org/fileadmin/user_upload/pdf/apre98.pdf
Henderson, S., & Yeow, J. (2012). iPad in Education: A Case Study of iPad Adoption and Use in a Primary School (pp. 78–87). Presented at the System Science (HICSS), 2012 45th Hawaii International Conference on. doi:10.1109/HICSS.2012.390
Jensen, T. K. (2013, December 3). Pisa: iPad-elever klarer sig dårligere end deres kammerater. Retrieved October 20, 2014, from http://www.dr.dk/Nyheder/Indland/2013/12/03/172036.htm
Jobs, S. (2010). *Apple iPad: Steve Jobs Keynote Jan 27 2010 Part 1*. Retrieved from https://www.youtube.com/watch?v=OBhYxj2SvRI
Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gotzsche, P. C., Ioannidis, J. P. A., … Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: explanation and elaboration. *BMJ*, *339*(jul21 1), b2700–b2700. doi:10.1136/bmj.b2700
Liu, N. (2013). iPad Infuse Creativity in Solid Geometry Teaching. *Turkish Online Journal of Educational Technology - TOJET*, *12*(2), 177–192.
Lohr, M. (2011). e-Learning Using iPads - An e-learning Scenario Using Mobile Devices and Sensors for Measurements (pp. 237–238). Presented at the Advanced Learning Technologies (ICALT), 2011 11th IEEE International Conference on. doi:10.1109/ICALT.2011.75
Nikolic, V., Krnelic, L. Z., Kolaric, D., & Nikolic, M. (2013). Tablet learning environment in iSchool Vežica (pp. 526–528). Presented at the Information & Communication Technology Electronics & Microelectronics (MIPRO), 2013 36th International Convention on.
Northrop, L., & Killeen, E. (2013). A Framework for Using iPads to Build Early Literacy Skills. *The Reading Teacher*, *vol. 66*(issue 7), 531–537. doi:DOI:10.1002/TRTR.1155
Okoli, C., & Schabram, K. (2010). A Guide to Conducting a Systematic Literature Review of Information Systems Research [Article]. Retrieved October 2, 2014, from http://sprouts.aisnet.org/10-26
Pegrum, M., Oakley, G., & Faulkner, R. (2013). Schools Going Mobile: A Study of the Adoption of Mobile Handheld Technologies in Western Australian Independent Schools. *Australasian Journal of Educational Technology*, *29*(1), 66–81.
retsinformation.dk. (2014, June 24). Bekendtgørelse af lov om folkeskolen. Retrieved October 20, 2014, from https://www.retsinformation.dk/forms/r0710.aspx?id=163970
Richardson, W. (2013). Students First, Not Stuff. *Educational Leadership*, *70*(6), 10–14.
Sørensen, B. H., Audon, L., & Levinsen, K. (2012). *Skole 2.0* (1. udgave, 2. oplag). Århus: Klim.
Spring, J. (2008). Research on Globalization and Education. *Review of Educational Research*, *78*(2), 330–363. doi:10.3102/0034654308317846
undervisningsministeriet. (2009). Fælles Mål 2009 - It- og mediekompetencer i folkeskolen. Retrieved October 20, 2014, from http://www.uvm.dk/Service/Publikationer/Publikationer/Folkeskolen/2010/Faelles-Maal-2009-It-og-mediekompetencer-i-folkeskolen/Digital-kompetence
UNESCO Institute for Statistics. (2012). *International standard classification of education: ISCED 2011*. Montreal, Quebec: UNESCO Institute for Statistics. Retrieved from http://www.uis.unesco.org/Education/Documents/isced-2011-en.pdf
Wang, T., & Towey, D. (2012). A rethinking of digital learning device projects (p. W2C–1). Presented at the Teaching, Assessment and Learning for Engineering (TALE), 2012 IEEE International Conference on. doi:10.1109/TALE.2012.6360298
Waters, J. K. (2010). Enter the iPad (or Not?). *T.H.E. Journal*, *37*(6), 38–40.