Using Tablet Computers to Improve Learning Outcomes:

Summary of Dissertation for Project Module S810, Master of Science Program at The Open University, Milton Keynes, UK.

Submitted: 13th September 2016

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Introduction

Having been a regular user of technology for teaching I was interested in whether this was improving the learning outcomes of the students I taught. I clearly believed it did as I wouldn't have using various websites, apps and hardware but couldn't be certain. After reading an article on the BBC website, '[Computers 'do not improve' pupil results says OECD](#)', I became even more confused. To try and resolve some conflicting arguments running through my head my final MSc project was dedicated to finding some answers. Specifically, I looked at how tablet computers are being used in science lessons, however my findings could be applied to other subjects, and to a lesser degree, other aspects of technology use. As evidence, academic literature on research into tablet computers in secondary school science was reviewed. Tablet computers as we know them today have only been available since 2010 so research was contemporary if not plentiful. A list of papers reviewed for the study is available on request.

Tablet computers are being used for learning and the educational suppliers group, [BESA](#) monitor what goes in and out of schools. They are an invaluable source of information for anyone doing research on trends in UK education. BESA found an increase in the number of tablet computers in schools and predicted a rise from 600,000 in 2015 to 1.8 million in 2020. This is a significant number of tablet computers being used with iPads being the most popular choice. My experience of using tablet computers in

schools are that they are underutilised often used for little more than internet research. Schools that have spent huge sums of money on tablet computers and by making a few changes they could make better use of their investment which could result in improving learning outcomes for students. What my MSc set out to do was first find out if tablet computers currently improve learning outcomes. Then, determine what changes can be made to their current use to help improve learning outcomes.

Do tablet computers currently improve learning outcomes in schools?

If you are a teacher, your answer to this question is likely to have been formed from personal experience, perhaps some CPD, a book, news media or blog posts. If using academic literature to find the answer to the question the best evidence comes from the synthesis of the results of many separate studies. This could be through a literature review, such as the one completed for this summary or meta-analysis, which uses statistics to combine results in a more systematic manner. A well-known meta-analysis is John Hattie's book, 'Visible Learning' which looks at the impact of different teaching strategies, including some technology based practices. One paper I used significantly, Zydney and Warner's, 'Mobile apps for science learning: Review of research'. This analysed 23 papers and reported that 16 found positive learning outcomes, 5 found no difference and 2 reported negative outcomes. This seems like pretty conclusive proof that tablet computers do improve learning outcomes. This trend was similar in the rest of the literature in my review, however when analysing each paper in detail you it is important to ask a few more questions.

1. Are these studies conducted in typical classroom environments? If students know they are involved in academic research, will they react the same way on set tasks? Also, teachers are usually involved in these studies so are likely to influence learning outcomes of students. If students have never used tablet computers before are they going to react differently to if they are regular users?

2. What is being tested? Are you testing an app on the tablet computer or are you using the tablet computers to engage students in blogging as part of a blended learning environment? Tablet computers can be used in many ways and while some may improve learning outcomes others may not. One way to determine if learning outcomes are due to tablet computer use is to ensure that only the features of the tablet computers are being used as the learning activity. This isolation of the tablet computer features is, in theory, is a good idea but in practice more difficult to simulate.

3. To what degree are learning outcomes influenced by tablet computers? If we are going to use tablet computers in lessons they should be more effective than what is currently being used. Perhaps using laptops would be a more effective method of improving learning outcomes or perhaps it is better to focus on improving student feedback? Some researchers use 'effect sizes' to compare the impact of different interventions. John Hattie considers 0.40 medium improvement which could be used a benchmark to compare other interventions.

While it seems that tablet computers are having a positive impact on leaning outcomes, on deeper inspection, this question becomes difficult to answer. Researchers who do not commit to answering this question do so wisely and wait for more evidence to emerge. I found many studies highlight how tablet computers improve motivation and engagement. While these are positive changes in behaviour it should not be automatically assumed that this leads to improved learning outcomes. While some discover huge benefits to using tablet computers this doesn't mean that everyone will have the same success. What was stated by many researchers was that when tablet computers were used well, outcomes were good but when not used as well outcomes were poor. It is arguably more important, therefore, to find out **how** tablet computers can improve learning outcomes as opposed to **if** they improve them.

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What changes can be made to tablet computer use to help improve learning outcomes?

Where tablet computers have been introduced into schools analysis of the results has been well researched. There have been successes and failures in introduction and we can learn a lot from their findings. One example from the Los Angeles education district, introduced 30 thousand tablet computers.

Using Tablet Computers to Improve Learning Outcomes
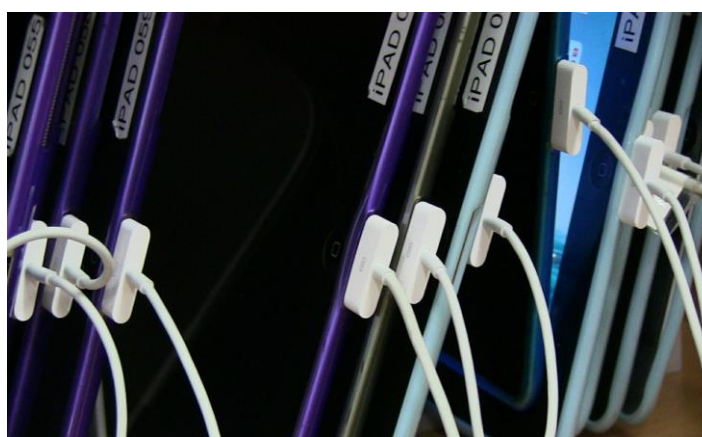
Students got around the security features that restricted Facebook and music streaming sites and the program was dropped within the first few weeks. A significant number of these studies into tablet introduction highlight that tablet computers can be a distraction to learning. This is usually when learning activities are left unstructured and unsupervised therefore student attention is allowed wander. Solutions to issues such as these could involve better education into responsible use of the internet, better methods of identification of individuals trying to hack the security, or simply better security. It is unlikely schools would want to remove internet filters completely but a combination of better education and better filters would surely help. As well as educating students in responsible tablet computer use it is important to inform [teachers](#) and [parents](#) to ensure the message gets across.

A more successful introduction of tablet computers has been seen in Turkey during the [FATIH](#) project. This is still on-going and plans to introduce 15 million tablet computers to students and teachers across the country. Other implementation programs that have worked well involved thoughtful planning and consideration of all aspects of tablet computer use. One of the most accessible and comprehensive articles I have read on this topic was produced by [Techknowledge](#) however [another](#) produced by NAACE was also very good. Simply giving out sets of tablet computers to students does not work. For many the temptation of social media and YouTube is too much so should follow the examples of others, it has been done many times before.

Changes on a whole school level.

Connectivity

The majority of tablet related learning activities will require an internet connection. Sometimes schools do not consider setting up enough wireless routers so students have access in all classrooms. Although this may sound obvious my personal experience of having poor connections causes a lot of frustration for both teachers and students. Having access anytime, anywhere allows students to complete work before, or after school, even during break times. However extra vigilance is needed in this circumstance to ensure save and responsible use.

Resources

While tablet computers are useful tools for research and internet use, there are many other resources that can improve learning outcomes. When tablet computers are distributed to schools consideration should be made as to what apps will be made available. E-books can also be uploaded to devices and consideration made whether subscriptions to any websites are required. There is advice on good resources available on line via sites such as [Educational Apps Store](#) as well as various blogs. It is also worth consulting subject specialist teachers to find out what they want to use.

Training

While some teachers will naturally adapt to using tablet computers in lessons others will be more resistant to change. Much of the literature on using tablet computers suggests there is a real lack of training provided to teachers. This is likely due to costs associated with training teachers. If so, it may be better to purchase less tablet computers but ensure they are used to their full potential than not used at all. What I have seen work well is when schools identify teachers that have an interest in using a particular type of technology and they are asked to provide training to others. More reluctant teachers may wish to support others within their department.

Another factor thought to have an impact on student learning was the ownership model. This is related to how students access tablet computers. The method that requires the least input from schools are the 'bring your own device' (BYOD) or 'bring your own technology' (BYOT) models. Sometimes this results in only a few students bringing their devices and its left to the teacher to decide if they want to use them. This makes it difficult to achieve any potential benefit and whole class activities difficult to run. Sometimes schools insist **all** students bring devices, every lesson but enforcing this can be problematic if parents don't want to buy a device. Some researchers suggest funding could be provided to families who cannot afford to purchase a device. Most researchers suggest that 1:1 ownership is the best option. Whether provided by the school or from home, this encourages student to take ownership of the device and therefore ownership of their learning.

Changes in the classroom.

Students

Studies into changes in student behaviour when using tablet computers in lessons have found interesting outcomes. Most researchers report high levels of student agency; they are more engaged in learning activities and they feel more interested in the subject they are studying. These changes have been well documented but again should not be linked to learning more efficiently or improving learning outcomes which would need additional confirmation. These changes in attitude may cause students to be more self-motivated when leaving school or when completing unsupervised tasks such as homework. Despite criticism from some that increased use of computers reduces social skills it was shown

Using Tablet Computers to Improve Learning Outcomes

that using tablet computers better allow students to collaborate with each other on tasks and offer critique of each other's work. This allows students to develop skills such as teamwork and analysis as well as becoming more adept in using technology. These types of skills often called '21st century skills' are highly favoured by some educationalists whereas others believe focus should be maintained on measurable academic performance.

Teachers.

As described, the use of tablet computers in lessons allows for students to become more independent and this can lead to changes in teaching practice. The traditional teacher centred model of education tends to change so that students become the centre of the learning process. Teachers then become facilitators and support students in their 'learning pathways'. It was found in some science lessons that programs on tablet computers could facilitate immediate feedback to students. This immediate feedback is thought to help improve student learning outcomes and has the advantage over a teacher who cannot provide as much personalised feedback to each individual student. It was found that personalisation or differentiation of learning materials can be facilitated using tablet computers. It was also found that teachers could observe student progress from a remote location such as their own tablet. This gave them better insights into student misconceptions so they could identify them quickly and give appropriate feedback. Concerns about these additional features were that it would require some technical expertise such as networking the tablet computers which may not be available in all schools.

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Summary

While it seems evident that using tablet computers in lessons can improve learning outcomes, being able to determine how much is difficult to measure. It seems highly dependent on how passionate schools and teachers are about making it work for them. Designing a curriculum around having tablet computers in the classroom is a significant investment in time, money and effort which is not for everyone. Schools that do invest in tablet computers should expect to see students who are more responsible for their own learning, more independent and have greater insights into student performance.