

# Does technology make education fairer?

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## Introduction

This essay will consider the effect that digital technologies in education have had on the 'fairness' of the education system. In doing this, we will be examining what we mean by 'fair' through the notion of 'social exclusion' and the much discussed 'digital divide'. I will examine the title question in two ways; first through the impact that technology in schools is having on educational access and outcome; second by considering how societies which may not have a formal schooling system have attempted to introduce technology for education, and what affect this has had (if any) on the access and outcome of such education systems. I will begin, however, with a look at the background and historical perspective of education and inequality.

## Context

Recent developments in digital technologies coupled with a perceived ease of access in schools (Cuban *et al* 2001) has led to many critical discussions surrounding the impact that technology has actually played in reducing social exclusion, how that looks and how it can be measured. (Selwyn, 2002, Warschauer 2004) It's not a new debate, as Postman, 1996 explains:

'C.P Snow made what he regarded as a definitive answer to technology pessimists. He remarked that the industrial revolution made by possible advanced technology, was the only hope for the poor. Their lives were rescued from centuries old degradation by technology. Can anyone deny it?' (Postman, 1996: 144)

Deliberately simplistic, no doubt, however the central point reiterates our question; if technology is regarded as an 'equaliser', as it was seen as such for the housewife, (Cowan, 1976) can the same be said for digital technology and education? Are we seeing greater access to learning, better outcomes and better results? Is technology creating a fairer education system? Is digital literacy so important for the economy it is overtaking the more traditional educational outcomes as an aspiration?

Answering these questions is not easy, there are many theories surrounding the importance of ICTs when discussion social equality, the digital divide and social inclusion. As Warschauer, 2004 explains,

'The shift from a focus on a digital divide to social inclusion rests on three main premises: (1) that a new information economy and network society have emerged; (2) that ICT plays a critical role in all aspects of this new economy and society; and (3) that access to ICT, broadly defined, can help determine the difference between marginalization and inclusion in this new socio-economic era.' (Warschauer, 2004: 12)

Our educational system has certainly invested in digital technology, Selwyn *et al*, 2009 puts that figure at £320 million annually. Freeman, 2009 discusses the economic thinking behind such a decision:

'the notion of information-rich and information-poor households suggests social inequality is not only a question of employment and unemployment. Each new wave of technical change brings with it many social benefits in the form of more new skilled occupations and professions' (Freeman, 2000: 161)

Freeman, 2000 goes to explain, how, for a society who is serious about reaping the benefits of such skilled occupations and professions then an educational investment is a must. The investment is also supported by parallel claims for citizen participation. Allen and Miller, 2000 investigate claims over the decades for radio, cable TV, video and the internet for improving citizen participation and social inclusion. They conclude that whilst the internet has many features that other technologies did not, such as low cost and easy access, it is the actions people take with such technology will eventually prove the impact. A sentiment which explains why the use of

technology for education is much debated. Before we go on to look at technologies in school let us consider the background to educational inequality and the impact that technology has had on the debate.

### **Educational Inequalities and Technology**

The effectiveness of schools on reducing social inequality and increasing 'life chances' is a discussion that has long been in the political sphere. During the last century it was widely accepted that education was a means for people to overcome any disadvantages or 'negative effects of other societal pressures' (Mortimore, 1997). As Selwyn, 2011 explains, educational inequalities are perhaps one of the most important influences on an individual's 'life chances'. An historical and traditional view reinforced by Halsey, 1997 who states:

'Rightly or wrongly the major focus of traditional concern was with social class as the largest obstacle to mobilising the productive power of nations and realising a more acceptable social equality in the distribution of power.' Halsey, 1997: 638

When considering the title question, there are two key concepts we need to make clear in order to ensure there is no ambiguity. We have to consider who we are making education 'fairer' for. Can the catch-all term 'socially excluded' be used when discussing educational life chances? Is it a matter of sorting pupil groups into socio economic status, or do we need to consider the implications of a 'digital divide' on wider society? This assumes that we are able to sort pupils into socio-economic groups, something that in itself is not straightforward. Let's examine the notion of 'social exclusion' first.

Social Exclusion as defined by the report An Action Plan on Social Exclusion (Cabinet Office, 2006) covers a multitude of areas, such as poor housing and unemployment but can be succinctly defined:

'Social exclusion is a process and a state that prevents individuals or groups from full participation in social, economic and political life and from asserting their rights. It derives from exclusionary relationships based on power.' (Beall et al, 2005: 9)

This term was the feature of much political debate over the lifetime of the last government, and much stock was put into education as a means to overcome 'social exclusion' and to offer opportunities for all (Selwyn, 2002). This concept is further complicated when viewing from a 'digital literacy' perspective, as concerns of 'digital exclusion' begin to be discussed; Wreach, 1996 describes this as the 'Have and Have nots in the Information Age'. Selwyn, 2002 goes on to explain that those groups most likely to be defined as digitally excluded will also be 'remarkably similar' to those who can be described as socially excluded; specifically in terms of low income or socio economic status. These concerns leads us to the conclusion that technology is irreversibly linked to the question of how 'fair' education can be; how easily overcome social disadvantages are and the potential of new media to overcome such inequalities, (Tsatsou, 2011 and Warschauer, 2004).

The 'Digital Divide', the difference between those who have access and the skills to use to quality technology is becoming increasingly important. The concept of the 'information age' and the role technology in schools play in the 'Digital Divide' has been a focal point demonstrated at the turn of the century by the then Prime Minister, Tony Blair:

'We will connect all our libraries and schools to the Internet by 2002. We will have 1000 IT learning centres open by next year. We are leasing inexpensive refurbished computers to 100,000 of our poorest families. We are giving through learning accounts an 80% discount on the cost of basic IT courses' (Speech - Blair, 2000)

Now we understand the context to the debate and the importance placed on technology in schools, is it making education fairer?

### **Digital Technology in Schools**

Schooling over the last thirty years has seen an increase in the amount of digital technology within its walls. Much has been written to local authority and school leaders regarding the use of this technology and how to get the best for learners and teachers alike. Teachers, politicians,

students and parents have all brought their own experiences, expectations and opinions to the debates concerning the impact and effectiveness of the introduction of such technology over the decades (Collins *et al* 2010). Questions remain; who benefits from this technology? How are we measuring outcome? Do we have value for money and is it effective for individual learners? These questions are not easily answered. It is important that we look at these issues when considering if technology makes education fairer as there is the assumption that technology is in use in schools already, and that it has an impact that is useful and measured. How far has the research considered the impact on learners who may find themselves socially excluded? Before we look at specific examples let's first consider the difficulties faced by measuring the impact of technology on education.

### **Measuring the impact**

One measure of technology in schools is that of computer provision across a population. Does having access to computers mean that technology is being used in schools?

The study carried out by Hess and Leal, 2001 discussed the amount of money spent by the American Federal Government (\$900 million) for educational technology and asked the question is it shrinking the 'digital divide'? They focussed on computer provision as they wanted to examine the impact of the spend. Interestingly they pointed out that 'less than half' of that (\$900 million) was earmarked for 'low income' districts. They concluded that there was 'no evidence that community education, community income, or Latino population affected classroom computer provision' (Hess and Leal, 2001: 775). They admitting that equitable computer provision does not necessarily translate into 'equitable utilization or training.' There is no measurable outcome for the fairness of access to the technology, as the schools in the areas which were identified by themselves, and the report, as needing support did not receive the technology. A look at whether this was by choice, and the political decision making for who receives technology is much needed.

However, let's continue looking at the measurement of computer provision, or 'high access'. This is an area that Cuban *et al*, 2000 tackles head on, explaining that there is a paradox whereby the access that schools have to technology is ever-increasing although the actual use is still relatively low.

These large scale studies, which look at provision, monetary resources and impact allow us to place education and technology debates within a wide context, but they do not allow us to consider the impact on learners.

### **Impact on learners**

Smaller scale studies are being carried out which look at the specifics of technology use and the impact on outcomes within schools. A study by Fessakis *et al*, 2013 looked at the use of computer programming and the effect it had on problem solving for Kindergarten children (age 5 and 6). They found that many elements of language and mathematical development were indeed supported by the use of the programme although the study demonstrates typical concerns. It was very small scale and the specifics of socio-economic status or home access to technology was not discussed. A similar research focus was looked at in a larger scale study carried out by Shin *et al*, 2012. They examined older primary age children and their results in mathematical scores when using a programme on a Nintendo Game Boy. The study showed variable results; there were performance differences but the authors were reluctant to attribute this solely to the use of technology, highlighting instead a reoccurring theme:

'We suspect that the performance differences between males and females, and among ethnic groups resulted from their prior experiences rather than the gaming activity itself.' (Shin, *et al* 2012: 555)

The introduction and use of the Interactive Whiteboard in schools is another aspect of digital technology that has drawn the eyes of researchers. Interactive Whiteboards, large touch screens used for displaying interactive materials straight from the computer, were the subject of much educational debate. Their introduction was linked directly to pressure from government and other initiatives such as the introduction of the National Grid for Learning and the expectation that teachers would use ICT much more within their pedagogy (Glover *et al* 2005). Their interactivity, ability to encourage pupil participation and the development of tailored lessons has been much discussed (Glover *et al*, 2005 and Smith *et al*, 2005). Evidence for improvements in educational

attainment, particularly for specific pupil groups is not so easy to find. Anecdotal and qualitative data points to specific examples of technology making education more accessible. Smith *et al.* 2005 discuss the evidence that the technology supports pupils who may have difficulty with gross motor skills and that particularly anxious and reticent pupils are supported to come forward and contribute. They discuss the benefits for lower ability groups, or pupils with specific and identified special needs. However, their findings do contain the important caveat:

'There does not appear to be empirical research evidence linking increased pupil attainment with the use of IWB for teaching and learning.' (Smith *et al* 2005: 97)

Empirical evidence for pupil attainment is the subject of a review by Machin *et al.*, 2007 who looked at the 'pay-off' for the doubling of ICT funding per pupil from 1998 to 2000. Again the results are mixed, and at first glance seem to suggest no improvement at all. They talk about a 2 percentage point increase in Level 4 in English at age 11, a 1.6 % increase in Science at the same age and no notable change to the results in Maths for the same age group, (Machin *et al.*, 2007: 1161). They do warn about the differences that LEAs had with their focus on technology training, or provision of resources and highlight that in 2003, ICT was reported to be used regularly for teaching in 82% of primary schools, compared with 55% of secondary schools. These contextual elements are important as they suggest that the delivery and take-up of ICT was not the same across the country, thus the impact on learners cannot be compared. Nevertheless the results are not encouraging; for our purposes we are looking at the attainment for specific groups therefore we would seem to be assuming that technology is improving some measurable elements of education generally. This would not appear to be the case. Instead we are looking at the benefits for skills which are not so easily measurable, so-called 'Soft Skills' (Selwyn, 2011) As well a societal belief, pushed by the government, as discussed earlier, that our pupils need these skills to ensure they are employable in a modern economy.

These studies in the use of technology in schools allow us to understand how it can be broadly aligned with Selwyn's, 2011 explanation of 'educational opportunity' and 'educational outcome'. Many studies differentiate between the two, explaining how pupils can be encouraged to participate in lessons more or motivated to ask and answer more questions (Smith *et al.*, 2005) or how collaboration and diversity can be encouraged by the use of wikis in the classroom (Grant, 2006). However, when we begin to look at equality of educational outcome the evidence is not so clear, nor so positive. In order to understand if there is a measurable impact on 'fairness' and on access to education then we need to look further than our recognisable educational system.

## **Outside of the school**

Lets consider next the use of technology away from the compulsory school system. How is digital technology used inside the home? Is access to computers, the internet and the skills associated allowing families greater and equal access to education? Have digital technologies been used successfully in other social climates and countries to make education 'fairer'?

There is a great belief in the need for 'digital literacy' and the opportunities that come if children and adults alike are seen to be proficient in these skills. Parents and teachers speak about the accessibility and employability of pupils who are able to use and access information digitally. This appears to be the case across the world, with Gyabak and Goding, 2011 explaining how parents of pupils in Bhutan were anxious for their children to be chosen for the technology trial that they were implementing. "Parents shared how computers would be able to provide their children with a better chance to participate in a professional career, such as engineering or medicine." (Gyabak and Goding, 2011: 2239) The complicated, interlinked relationship between socio-economic standing, life chances and education is echoed by Warschauer, 2007 and Freeman, 2000:

'Their own socio-economic standing, the cultural and social capital within their families and the social structure of American schools shapes children's access to and use of digital media in the U.S.' (Warschauer, 2007:47)

The belief that greater access to knowledge and accessibility of digital technologies, such as the internet, increases the equality of opportunity is echoed by Tsatsou, 2011, who points out

that the 'digital divide' is an important phenomenon, 'not only for the market area economy but also for social inequalities which can either be increased due to digital gaps or decreased due to the curative potential of new media' (Tsatsou, 2011:319).

We need to look at all the evidence. Is it possible that digital technology is having a greater impact on reducing social exclusion from outside of the classroom?

The findings of Attewell et al, 1999 in an article which looked particularly at the effect home computers had on education outcome found that experience at home benefited pupils at school. They quote data from NELS, which indicates that children with computers at home score, on average, 6 points higher on reading and 5 on maths. They rightly point out that many other variables can impact on this data, parental engagement being a high impact factor. They also point out that the higher the Socio Economic Status (SES) of the subjects the more 'educational pay off' they received from computers in the home. Cuban *et al*, 2001 talk about 'Open Door' Students, for whom technology has changed their lives not through school but due to proficiencies and skills gained by encountering technology at home. Use of technology has made them visibly more self-confident and motivated. Cuban identifies them as 'predominately, though not exclusively male and from various ethnic backgrounds.' They identify that these students, alongside already recognisable 'tech gods' benefited the most from the technology available in schools, because they brought their experience in from the home.

Gyabak and Goding, 2011 examined how new media and technology could be used to bridge the digital divide in a rural school in Bhutan. We have already read how eager teachers and parents were to take part in this trial, which involved laptops being used in a small school for a digital storytelling project. The authors were especially careful to ensure that the technology was backed up by technical support, and suited the specific environmental and social contexts of the school. They judged the project a success because the teachers wanted to continue with the laptops, and parental and pupil engagement was so high. Explaining that afterwards:

'the teachers at the Jumping Frog School had built a special room dedicated for a computer lab, and digital storytelling had become an eagerly anticipated component of the school curriculum.' Gyabak and Goding 2011:920

It is interesting to note that because of the reliance of the technology on the English Language, the initial participants had to have some experience of English, and as the authors note this led to the 'privileged few' accessing the first stages of technology use.

These studies focus on the use of 'artefacts' as an indicator of access to technology and the education offered. They look at the impact that the presence of the devices have on the access to education and the narrowing of a 'digital gap'. As we are looking at education away from compulsory schooling we should consider more than a particular technological device. Outside of the school the participant may have access to the internet and not restricted to a device, that then means that the technology which has an impact on education is not a device, but a conduit; (Warschauer, 2004) television, radio and more recent developments such as the internet.

Matzat *et al*, 2012 asks the question, Does the Do-It-Yourself approach to learning reduce Digital Inequality? In order to ascertain whether the greater freedom of a self-directed approach to learning allowed for the greater development and acquisition of digital skills, this study took from a random sample of 885 respondents in Eindhoven and followed their progress with self learning courses which were carried out online. A typical respondent was 50 years of age, with a college education and in a household with 2.7 other people. This study measured frequency on internet access against key concepts of digital skills such as:

'How familiar are you with the following computer – and Internet-related items? Please choose a number between 1 and 5 where 1 represents no understanding and 5 represents full understanding. Scroll on a website/refresh and re-load the webpage/Use a search engine/Preference setting ..' (Matzat et al, 2012: 4)

The authors conclude that 'self-learning in general *does not* reduce inequality in digital skills' (9). They found that if you were already proficient in the digital skills required then you did not necessarily access online and self directed learning in a more sophisticated manner. If you did not previously use the internet then your digital skills would develop as you accessed the learning. Practising these skills would help develop the digital skills needed. They also draw the readers

attention to the association between self-learning and digital skills, which is said to be stronger than learning in other contexts, such as schools. Does this mean the motivation and freedom are connected, or would it be about age and maturity? Of course we have already discovered that more digital technology in schools does not mean more teaching and learning makes use of it (Cuban *et al*, 2001). It is interesting to note that the use of technology does develop stronger learning outside of school contexts. Matzat *et al*, 2012 do acknowledge the limits of their study and the difficulties in measuring digital skills. However they make the connection that older internet users benefit greater from self learning, and that men made larger gains than women. (Matzat *et al*, 2012:8-9). A focus on the socio-economic standing of the participants would be useful for our purposes, as we are unable to draw satisfactory conclusions regarding equality of access.

Support for the internet as a means to narrow the gap gathered pace throughout the end of the last century and as we have seen there was much political support for a National Grid of networked schools, and for every home to have internet access (Warschauer, 2004:49). A review paper by Di Maggio *et al*, 2001 considered the implications that the internet has on social change. They argue that technological determinists consider that the internet has great potential for social change, 'enabling new forms of communication and cultivating distinctive skills and sensibilities' (Di Maggio *et al*, 2001:309). They contrast the views of enthusiasts who argue it will enable access to jobs and knowledge in an unprecedented way against those who argue that it will only benefit those who are already of a high socio-economic status. Similar debates can be read in Freeman, 2000. Di Maggio *et al*, 2001 argue that there is much research to be done into the sociological implications of increased internet use, and there is plenty of change happening as we write. They point out that 'much research and policy assumes that people can convert Internet access into other valued goods, services and life outcomes' (Di Maggio *et al*, 2001:312). The question remains, how is education to be made fairer if it does not take advantage of the fact that as of August 2001 an estimated 513 million people around the world are online? (Warschauer, 2004). It stands to reason that this figure will be much higher now, almost nine years later. Are we seeing a greater access to education because of this? Or, as we discussed earlier, does the physical connection to information technology not actually transfer to any educational gains?

One example in which the education world is beginning to embrace the technological developments and turn internet access into other valued goods, is the development of Massive Open Online Courses (MOOCs). Courses developed in part by large universities offering learning and resources online, around the world, to many thousands of participants at once. The educational outcomes of such schemes are not so easily measured; this is one area in which quality, longitudinal studies would be of benefit. In the first instance the numbers of students who sign up for the free courses and the growth of the courses seems to be incredibly encouraging Daniel, 2012. Daniel quotes the wikipedia entry explaining how MOOCs are integrating information technologies:

*'all the course content was available through RSS feeds, and learners could participate with their choice of tools: threaded discussions in Moodle, blog posts, Second Life and synchronous online meetings'*  
(Wikipedia, 2012 quoted in Daniels, 2012:6)

MOOCs, due to their recent development and international context, have many questions of their own to answer. The quality assurance of their teaching, content and the uptake against completion rates for the courses all need to be examined. Daniel, 2012 also highlights two questions that are pertinent to our discussion. First, the consideration of cost. Who will pay for the MOOCs and will this have impact on the courses offered? The implications are obvious when considering whether or not they can make education fairer. If a MOOC is able to give greater access to highly regarded educational establishments, or specific courses for subjects that would otherwise be nearly impossible to reach, then this would indeed be diminishing social barriers. However if these are only available at a premium cost, then that would be a step backwards. It seems odd to ensure the technology is cheap and the skills to use the technology are there, only to make the course content so unobtainable. Likewise, the cost of the MOOC has to be balanced against teacher time, each student on the MOOC will take the time of the tutor. Technology can be utilised to reduce the time, or to make it flexible, but the students will have to have some point of contact.

Secondly there is the question of educational outcomes, Daniel, 2012 speaks of establishments such as MIT offering certificates instead of credits for completion of courses and

the ramifications of that for students who want to use such certificates for entry into recognised degree courses. The danger is that MOOCs will place students in a situation where the completion of a course is not enough to gain them entry into university. Will universities have to change in order to recognise MOOCs? Daniel cites the Open University as an example where it is 'easy to gain entry' but 'exit with a degree is difficult'. MOOCs then are not a clear cut example of opening up education but in fact represent a repetition for similar issues of technology in education. The quality of content, recognition by educational establishments and the outcomes are all still relatively unknown and in need of more research.

## **Conclusions**

This essay, in drawing in evidence from many sources discusses the question, does technology make education fair? I have considered this question through the viewpoint of technology diminishing social exclusion, allowing greater access to the education system and therefore improving educational life chances. We have looked at specific, school based examples of technology being used to make access to education fairer and examined examples from around the world which aimed to bring education to a wider audience through technology.

It is not a clear cut case of digital technologies improving life chances and breaking down social exclusion. Consideration needs to be given to the nature of the technologies, the social context and the political drive behind the technologies use in schools. It is impossible to separate, for example, the introduction of the Interactive Whiteboard and the creation of a national online 'Grid for Learning' from the political drive at the time to train teachers, open up education and parental choice for schools. The social context of educational technology is incredibly complicated and one reason why measuring the outcome is so difficult (Warschauer, 2004). There is evidence, as we have seen, that specific needs can be met through technology, but there are problems when upscaling this to a greater population size. A good example of this is the use of Interactive Whiteboards, a very specific classroom based technology which enables pupils with specific needs to be supported (Glover *et al*, 2005), but is completely reliant on teacher proficiency and classroom context. This point is echoed by Warschauer, 2004 when he states:

..the disabled can make especially good use of ICT to help overcome problems caused by lack of mobility, physical limitations, or societal discrimination. Warschauer, 2004: 28

However larger studies which correlate non-specifics, the resources and the outcomes, find no improvement in educational outcomes for any specific pupil groups. (Machine *et al*, 2007)

Meanwhile, although social commentators agree that the 'digital divide' needs to be bridged for society to become fairer (Selwyn, 2002), the empirical evidence that technology in school supports this is scarce. Specific needs can be addressed, pedagogy can be impacted upon, but studies which show it has actual impact on educational outcomes or access, for those who are socially excluded, needs more research. In fact, economic commentators such as Freeman, 2000 offer an argument that keeping up with technological pace can actually create social exclusion as educational systems struggle to keep up.

Interestingly, a discussion point that revealed itself throughout is what Cuban *et al* 2001 referred to as the 'open door' students. The students who were already experienced with technology and the increased benefits that they received from the technology when compared with students who did not have access. This is supported by studies that have been carried out overseas, with Gyabak and Goding, 2011 explaining how the children who took part in the pilot projects were already 'privileged' thanks in no small part to the use of English as the key language.

The danger of technology actually making education *less fair* is also made by Collins *et al*, 2011 in their paper. They give many examples of how education provision is diversifying and moving away from school and authority control; such as online learning, chat rooms, sharing of resources and electronic books. They warn this could have a negative effect on social equality as there is a finite amount of resources for education, both human and material. There is a danger that these resources will be withdrawn from the state education system, with negative consequences:

'if this withdrawal of resources causes the education world to fragment it may begin to relinquish responsibility for universal access to high quality student education. In this world, the lives of the

economically disempowered are likely to suffer the most' Collins et al 2011:p22

To draw conclusions then it seems that as a society we do have to be careful with the use of technology in schools. We need to ensure that the finite resources we have are used with all aspects of society in mind. There is some doubt that the resources we have already spent are having any affect at all, and as educational researchers we need to dedicate ourselves to finding what works, and why. Is technology creating greater access to education from the home, rather than school? Ensuring that it is not purely the information 'haves' who benefit from the technology in society is a critical responsibility.

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