Training teachers to be creative with ICT:
defeating the simplistic view

Hamish Arnold
University of East London

Abstract

This small scale mixed method research project explores creative use of ICT among teachers. Applying Bloom's taxonomy, it finds that most teachers feel confident using technology creatively only when there is a comparable analogue equivalent. Where technology requires teachers to transform existing pedagogy (for example, teaching programming or the use of collaborative workspaces) confidence levels fall sharply.

Introduction

The impetus for this research came about from the observation that, in a number of schools, ICT was being used in a way that did not seem to enhance learning nor reduce workload in any meaningful way. To my eyes, ICT was largely used in a simplistic way in that the tool used often had a direct analogue counterpart (e.g. using the interactive whiteboard in the same way as a regular whiteboard).

A simplistic view of ICT must be defined before it can be measured. For this research it is defined as usage where users only make use of the lower order skills (to 'application' on Bloom's Taxonomy, 1956: 16). While Bloom's Taxonomy is no longer considered a valid cognitive model (Wheeler 2012) it does provide a useful way of defining teachers' application of ICT. For instance, a teacher who uses ICT in a simplistic way would use an interactive whiteboard (IWB) in a similar way to the regular whiteboard, or chalkboard, that would have preceded it. They would use it to display information, record the ideas of the class, and to share instructions. Using the whiteboard in this way does not require the teacher to use their existing knowledge of the technology to synthesise new approaches, it only requires them to apply their existing practices to a new technology.

On the other hand, using ICT in a creative way would require the use of the analysis, synthesis and evaluation levels of Bloom's Taxonomy (1956, p.16). This requires the teacher to use their knowledge of ICT, assuming that it is adequate, to synthesise new approaches that do not have a direct analogous equivalent. As teachers are not simply transplanting their practices from one medium to another, they are forced to engage with the technology at a higher level. For instance, rather than using the IWB to only record or display information, a creative teacher could use the whiteboard as a sensory stimulus for a creative piece of writing. They could then return to using the IWB in a more traditional sense to record feedback from the class and then print the feedback for children to refer to while writing; freeing up whiteboard space for other resources. In this example, the teacher has used the IWB as a whiteboard, a sensory stimulus and a notebook, and has used his or her knowledge to synthesise a number of discrete functions using a single resource.

Encouraging the creative use of ICT is useful for two reasons. Firstly, in an era where school budgets are shrinking (Shepard 2011), it is becoming ever more important to ensure that equipment bought represents good value for money and, most importantly, enhances learning. If teachers are using ICT equipment in the same way as their cheaper and more reliable analogue counterparts, the school is not getting value for money from its investment. At this stage, the school now needs to consider either how it is going to train its

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staff to better use the resources required or whether it is worth having them at all. Secondly, not using the available technology to its maximum potential deprives learners of opportunities to 'experiment and model in a virtual environment as a form of problem-solving' (Kelsey 2010, p.35), or to access learning from a variety of devices and locations (Ibid 2010, p.27). Moreover, it deprives teachers of opportunities to reduce workload by automating certain tasks and improving communication to better share resources, communicate ideas and reduce time spent in meetings. Given that a typical primary school teacher now works an average of 59.3 hours per week (DfE 2014, p.11), any opportunities to reduce workload need to be considered.

Methodology
The research setting comprises a variety of schools in London. The primary setting is a modern four form entry primary school in the London Borough of Redbridge. Despite its size and quality of resourcing in other areas, it is the recently appointed ICT co-ordinator's opinion that ICT provision is weak. In order to broaden the data set, a questionnaire to PGCE students on placement at a variety of schools across London was also sent out.

Ideally, this project would use large scale, random sampling in order to get a result that is as representative as possible. Unfortunately, due to time and resource limitations, it has not been possible to gain an ideal sample. Instead, the survey has been made available to everyone at the school and a self-selecting group of PGCE trainees. This is far from ideal, but it does provide a basic level of data which could be used for a larger scale study in the future.

Regarding the philosophical approaches, this research will be nominalist and anti-positivist. It is nominalist because it focuses in particular on teachers' views. A teacher's view of ICT in the classroom does not have to be tied to any measurable objective reality and thus must be in part at least, constructed by the teacher (McGrath and Coles 2013, p.92). It is anti-positivist because it is not yet possible to measure a teacher's opinion via sensory experience alone and also because opinions are temporary and ephemeral. This means that a positivist would reject it out of hand (Gerber and Macionis 1978, p.32). McGrath and Coles (2013, p.93) suggest that nominalist, anti-positivist researchers will generally choose to use a qualitative methodology because they focus on the lived experiences of individuals, rather what can be observed through sensory media. While the research data has been collected in a largely quantitative fashion, the data itself, which relates to teachers' subjective views, is qualitative in nature and thus, this research uses the same methodology.

The research strategy for this paper is action research because it 'specifically refers to a disciplined inquiry done by a teacher with the intent that the research will inform and change his or her practices in the future' (Ferrance 2000, p.1). The first part, the disciplined enquiry, will find out whether the majority of teachers do in fact view ICT usage in a simplistic way. The second part, the intent that the research will change practice in the future, allows for the exploration of approaches that might defeat the simplistic view. Moreover, the cyclical nature of action research (Ferrance 2000, p.9) is key because upon the completion of the research project, an intervention aimed at improving teachers' ICT skills will be put in place. Action research is not without its disadvantages however. It is very difficult to know if the intervention itself has brought about the desired change. This is because there is no control group with which to compare against and because, much of the time, the interventions are looking to change things which are difficult to measure quantitatively. This also means that any findings may not be generalisable as it is not possible to duplicate the context of such a research setting. However, no research method is without shortcomings. This is why, despite these disadvantages, action research remains the best strategy for this project.

This project abides by The British Educational Research Association's (BERA) ethical guidelines (BERA 2011). All participants agreed to their participation without any duress, prior to the research getting under way (BERA 2011, p.7). Participants were presented with an explanation of what they were participating in, including their right to withdraw, before they began the survey. Regarding BERA's requirement for the avoidance of deception and subterfuge (BERA 2011, p.6), there was no need for any deception and no vulnerable people were involved in this research. All participants remain anonymous for the purposes of this project and no identifying information was collected in the questionnaire.

Reliability, validity and generalisability of the data
McGrath and Coles (2013, p.85) define validity in this context as measuring what one intended to measure. In this case, I am looking to find out how teachers view ICT use in the classroom. I have attempted to find this out using two different approaches to questioning. The first is a basic ICT skills audit. A recurring theme in the observations prior to this project was that many teachers, regardless of age, were not aware of all the ways ICT use can contribute to their pedagogy. If teachers lack knowledge and skills in certain areas of ICT, they are, arguably, unlikely to be able to develop a rounded view of ICT use in the classroom. A good example of this is that 96% of teachers surveyed felt the need to improve, or had no knowledge of VLEs (virtual learning environments). This is despite the fact that the school had a VLE. 72% also rated their spreadsheet knowledge as requiring improvement. From this, it is possible to conclude at least 72% of teachers are unlikely to know that it is possible to use data gleaned from VLEs to inform assessment data. The second approach to questioning asks teachers to input the first five things that come into their mind when they think of ICT use in the classroom. If teachers have a more rounded view of ICT, one would expect to see a variety of different keywords with smaller concentrations on the most common ones. If the same keywords come up, then it suggests that a more simplistic view is prevalent. This mixed approach helps to triangulate the results, which can identify any discrepancies and thus improve reliability. Reliability in this project is limited by the sample size (n = 25 participants), the sample was largely self-selecting and mostly limited to one school. This means that the most technophobic teachers may not have participated as the survey was electronic. They also may have refrained from taking part in the research as they were not actively approached. These two factors may have skewed my results in favour of teachers who have at least a basic interest in ICT.

Due to the small sample size of this project, and its qualitative nature, it will not have a great deal of generalisability. This is partly because the sample size is too small and too limited in scope to be able to generalise the findings across other schools. Furthermore, it focuses on the participants' personal perspectives at the time of the survey. As a result, it is not possible to generalise these perspectives across other schools and areas. The work is, however, relatable. This means that while it cannot be applied generally, it can be related to similar settings to the one in the project (McGrath and Coles 2013, p.81). This means that while the work might not be generalisable to all schools, it can be related to other schools where there are low levels of ICT resourcing and training, and also that the findings may be useful to those in such situations.

Literature Review
Two main themes emerge in the research: Teachers' perceptions of the usefulness of technology in their pedagogy; and the effect of training on successful integration of ICT use into a teacher's pedagogy. Almas and Krumswik (2008, p.106) argue that teachers who use ICT in the classroom use it because it fits in with their existing pedagogies, and it is used best by teachers who are experienced in using ICT and know how best to integrate it into their learning. This is borne out by Ingleby (2012, p.483), who found that teachers who had not been taught in a school that used ICT in their curriculum struggled to integrate it into their own pedagogy. Moreover, Ingleby's focus group stated that they did not see ICT use in the classroom as bad, only that they lacked the skills to use it and so simply avoided it. Others, who have the skills to

integrate ICT into their pedagogy, simply replace an analogue task with its digital counterpart. Burden (2002, p.3) gives the example of a teacher who has the children write a draft version of their work on paper before typing it up 'in best' using the word processor. While this approach ostensibly integrates ICT into their pedagogy, it fails to take advantage of the main benefits of using the computer – to edit and refine work.

Another reason that teachers may be reluctant to add the use of ICT to their practice is because some teachers are slower to adopt the use of technology than others. Rogers (2003 cited in Morris 2010, p.150) notes that those who are late adopters tend to be cynical about change and will only embrace it when they feel it is safe to do so. These teachers tend to be older (Morris 2010, p.149), and so they are more likely to have more established pedagogies. As teachers are most likely to use ICT to support their existing pedagogy (Almas and Krumsvik 2008, p.106), and older teachers are more likely to have existing practices which do not require the use of ICT, such teachers may not perceive a need to integrate ICT into their practice.

From these examples it can be seen that many teachers are willing to make use of ICT in the classroom but, largely because of a lack of good quality training, they are either unable or unwilling to integrate it in an effective manner. If some teachers still struggle to integrate ICT into their pedagogy at all, and many more do not know how to make the most of the technology available to them, it is not surprising that ICT use in the classroom is viewed in a simplistic manner. In an ideal world, schools would be able to provide as much ICT training as they deem necessary. Unfortunately, due to time and resource constraints this is not the case. Morris (2010, p.142), notes that the vast majority of teachers in 2010 had received some form of ICT training. If this was the case in 2010, then it is probable that more teachers will have received training now. Therefore, the issue is most likely with the quality of training provided. Teachers' receptiveness to training may also be an issue but, just as a child's receptiveness to teaching cannot be used as an excuse for poor progress, neither should it be used as an excuse for teachers' poor ICT knowledge. Training needs to be made engaging and provide value for teachers and, at present, it appears that ICT training is merely instructional in nature (Ingleby 2012, p.484). Just as constructivist thinkers argue that children should be enabled to build their own concepts, teachers need to be allowed to construct their own understanding of how ICT systems work, rather than rote learning the use a given piece of technology.

Data Analysis
As discussed in the literature review, the first electronic practices to be integrated into a pedagogy are those which have a direct, analogue equivalent, such as an IWB (regular whiteboard), a word processor (paper) or a visualizer (over-head projector). The vast majority of teachers consider their knowledge in these areas average or better.

Technology	% of teacher who feel that their knowledge is average or better
Interactive whiteboard	80%
Word Processing	92%
Use of a visualizer	92%

On average 84% of teachers are now comfortable with these technologies; this suggests that they have been able to effectively integrate them into their pedagogy.

Integration of ICT into existing pedagogies is one thing, while using ICT to develop entirely new and innovate practices is quite another. Initiatives such as the 'New Opportunities Fund' and the 'Hand on Support' initiatives appear to have brought basic ICT skills up. However, the skills that teachers require to

use ICT more creatively are still lacking.

Technology	Percentage of teachers who feel that their knowledge is average or better
Programming	4%
Ability to troubleshoot technical difficulties	8%
Understanding of networking	20%
Virtual Learning Environments	4%
Computer hardware and peripherals (CPU, RAM, Monitor, Speakers)	16%
Confidence with email use including mailing lists and mail merge	28%

The deficit in these areas demonstrates a simplistic view of computing for two reasons. The first is that programming and the ability to troubleshoot technical issues (which includes knowledge of computer hardware and peripherals) require higher level thinking on Bloom's Taxonomy. This is because programming and troubleshooting are fundamentally problem solving activities, and in order to solve a problem one must analyse it and synthesise, or create, a solution. It is not possible therefore to solve a problem without using the analysis and synthesis levels of thinking, which are both higher levels. Creativity requires that one creates something new or does something in a novel manner; the earliest point at which one creates on Bloom's Taxonomy is the synthesis level. Therefore if teachers are not confident in the areas of ICT that require some level of synthesis then they cannot be using ICT in a creative way.

The second reason the results demonstrate a simplistic view of ICT is that they show that 82.7% of teachers have a below average understanding of networking, how to use mailing lists (rather than resorting to their paper counterparts) and the use of VLEs. These are areas that give a huge amount of scope for more interactive learning (online homework and assessment with multimedia resources) and reducing paperwork (automating assessment, online booking of parents evening slots etc.). These approaches do not have an analogue counterpart and so will not necessarily fit in with existing pedagogies. A lack of knowledge in these areas suggests that ICT use is viewed in a simplistic manner. The results of the keyword question also gave a similar impression: when asked what came to mind when thinking of ICT in the classroom, the top result was overwhelmingly IWB, followed by laptops and tablets.

While there has clearly been some progress since Morris' (2010) assessment of ICT competence in the classroom, there is still much work to be done in order to bring teachers up to a standard where they are able to confidently integrate ICT into the practice. A recurring theme in literature is that most teachers are very willing to learn how to use ICT, if given the opportunity to do so. However, another is that the availability and quality of CPD is not what it should be. To quote a PGCE student mentor after he was shown how to use the scanning feature on the school photocopier: "If only someone had told me that I could do this, I would have done it a long time ago." The CPD provided as it stands, though, does not appear to give teachers the skills they need to use ICT creatively. Rather, it appears to teach them how to do a specific thing, such as use a particular brand of IWB software (Ingleby 2012, p.484). This training appears to focus only on the items of equipment in the classroom, which does not seem to have given teachers a sufficiently

rounded knowledge in order to use ICT more creatively.

Conclusions

In order to answer the research question fully one must first decide whether teachers view ICT use in a simplistic manner. The data from this project has shown that this is the case. While 84% of teachers are comfortable with technology with a direct analogue counterpart, 82.7% are not comfortable with technology which has the potential for more creative use. If schools and teachers are to make the most of the technology they have available to them, there needs to be a huge improvement in the latter result.

In order to defeat the simplistic view, I would agree with Ingleby (2012, p.484), that the training teachers get must be delivered differently. Training should follow a constructivist approach, giving teachers the opportunities to build their own understanding of technology in the classroom. In practice this would focus on the fundamentals of computing to give teachers the basic knowledge that they need within the context of the classroom, in order to show them the value of technology. This newly found understanding will give teachers the confidence to try new things, and synthesise their own approaches. Additionally, it has the benefit of making better use of the technical support available as teachers will be much better able to support themselves, particularly for simple issues. This also means that pupils will have more access to ICT facilities as there will not be such a long wait for support. Finally, this approach to CPD will provide teachers with the confidence to try things for themselves rather than giving up at the first hurdle. To paraphrase Munroe (2012), the only difference between a technical support expert and a normal user is their ability to use Google to find the answer. This is particularly important as schools and teachers alike do not have unlimited resources and time. Giving teachers the confidence to develop themselves in this area without the need for support from others will, in the long run, result in far more creative use of ICT than any training session.

Acknowledgement

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