Possibilities, benefits and limitations of embedding technology enhanced and remote teaching and learning in compulsory education – and not just because of Covid-19

Editorial

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Introduction

The Institute for Education's Second Annual Symposium 2021 focuses on the topic of 'Technology Enhanced & Remote Teaching & Learning'. In the current educational context, where we have grappled with issues and challenges posed by the Covid-19 pandemic, this topic and Symposium are particularly timely and relevant. The papers presented in this Symposium form an extremely valuable set of contributions that not only place and recognise the work that has been undertaken during the Covid-19 pandemic, but also identify important key features that are pertinent to a next phase, moving forward beyond this period of crisis. In considering this next phase, I believe it is important to consider features of the past (the potential for technology enhanced teaching and learning), as well as outcomes of the present (what has shifted and resulted during the Covid-19 pandemic), and needs for the future (how we can take forward lessons from our current understandings and experiences).

The past – the potential for technology enhanced teaching and learning

There is quite a long history of research that has been published in the field of technology enhanced teaching and learning in compulsory education, spanning a period of some four decades. Some of that research indicates that the overall evidence base that could identify positive impact upon teaching and learning from uses of digital technologies is not always clear (Lim, Zhao, Tondeur, Chai, & Tsai, 2013) or has been shown to have only a low average effect size (of 0.3 from a large-scale second-order meta-analysis by Tamim, Bernard, Borokhovski, Abrami, & Schmid, 2011). Nevertheless, many studies (including early studies) have measured positive effects that have been shown to be statistically significant (for example, Wenglinsky, 1998; Schachter & Fargnano, 1999; Somekh et al., 2007). Some researchers have argued that there are good reasons for these differences of and potential conflicts between research outcomes, and certainly, a number of dependency factors become clear when studying the range of literature that already exists. Considering these differences, key dependency factors are identifiable when the studies are examined. These include the specificity of the technology resource and the focus of use, where the practice being studied ensures that ways that the technology resource is used are linked to the learning activity and its potential outcomes. Additionally, ways that teachers use the digital technology can have an effect on outcomes. Above all perhaps, studies measuring impacts that are clearly linked to the technology's affordances, through uses and outcomes to identifiable impact on learning and learners, have been highlighted in this context as those likely to provide the most reliable evidence (Passey, 2013).

Looking at teaching impacts and effects in the literature as an initial factor, what is clear is that there are many technologies available and that these vary quite considerably in their potential application to pedagogical needs and practices. If we consider some key pedagogical practices, the importance in selecting appropriate technologies and selecting appropriate uses becomes clear. For example, instruction, questioning, summarising, discussing and assessing are all important pedagogical practices, yet there are a range of different technologies that could be used to support each of these. For example, uses of interactive whiteboards and panels have been researched widely in terms of uses for instruction, and ranges of published outcomes have reviewed overall impacts (Hockly, 2013). But interactive whiteboard technologies would not necessarily be used by all

teachers for assessment. Uses of e-portfolios have been explored in the context of assessment practices (Fuglík, 2013), but have not been used in the same ways for instruction. Across all possible digital technologies that teachers could select and use, the importance of supporting professional development is a common thread that is highlighted, often seen as crucial for enabling teacher innovation and implementation across the range of digital technologies that are available to them. An example (Camilleri, 2021) in this symposium explores this in the context of kindergarten teachers using interactive whiteboards. As the author states, the "role of the educator was found to be key in enabling change and innovation".

Similarly, considering learning impacts and effects as a factor identified in the literature, again, the variety of technologies to support learning activities and apply in different contexts is wide. If we consider analysing, conceptualising, modelling, creating, designing, or report writing, for example, then the width of technologies we can consider and apply is certainly not limited to one or two in any of these cases. For example, modelling in mathematics (Molina-Toro, Rendón-Mesa, & Villa-Ochoa, 2019), and creative writing in English (Williams & Beam, 2019) use quite different technologies, but within each of those topic areas teachers still have a choice of digital resources they can use. Appropriateness and selection become crucial, as do factors that affect these choices.

Different technologies and their effects are undoubtedly worth considering at this point in time; not that we want to explore the historical legitimacy of such an endeavour, but because the different technologies that have been used in one temporal context might not be so appropriate and applicable in another temporal context. Topic-specific resources (digital resources that are accessible to learners, either with or without overview and support from a teacher) might be usable in past and present contexts, as might curriculum-wide learner-centred software (online digital resource that covers an entire curriculum, either with or without the overview and support from a teacher online or physically present). However, curriculum-wide teacher-centred software (digital resources that cover a curriculum but are used within a classroom environment using a digital medium such as an interactive whiteboard) might not be as usable for remote learning as they have been in classrooms in the past. Certainly forms of digital resources likely to be usable in a Covid-19 pandemic situation would be digital resources involving parents and guardians (usually at home, recommended by a teacher), online resources (digital resources accessible online), online learner support (through synchronous or asynchronous means), and project-based resources (those where teams are involved in problem-solving or design-based activities). With their different underlying pedagogical principles that have made them appropriate for what might be regarded as past uses, it is worth re-evaluating these for future uses if the pedagogic context shifts to one where remote, hybrid or blended learning are more prevalent or acceptable.

One crucially important factor to consider in the past (pre-Covid-19 pandemic) context, has been the largely accepted way in which links between out-of-school and in-school practices exist. These links have often been based on identified interactions that occur at particular periods of time across a year (within school days and terms), within periods of time within a school day, and involving relationships that teachers will have with homes, and homes will have with schools and teachers. The 'blend' of learning in this respect has often been recognised through concepts of 'homework' and 'school days'. Where blended online learning has occurred in the past (prior to the Covid-19 pandemic), Bernard et al. (2014) from their meta-analysis calculated the random-effects weighted average effect size of this mode to be 0.334. This outcome is similar to the results of other blended learning meta-analyses (Means et al., 2013; Spanjers et al., 2015) where results were respectively calculated at 0.35 and 0.34. These results suggest a potentially valuable contribution that can arise from blended learning. However, the ages of young people in these meta-analysis studies from whom data were gathered tended to explore the 16 years or older age range.

In terms of a past model of educational practice involving digital technologies, the roles of teachers, learners and parents and guardians have also been identified in particular ways. That positive relationships are established between schools and homes has certainly been recognised as important, between teachers and parent and guardians (Goodall & Montgomery, 2014; Passey, 2011), using digital technologies appropriately. Nevertheless, the focus of learning has been largely in schools, through interactions with teachers, who have guided young people through teaching (focusing on cognitive needs), tutoring (focusing additionally on collaborative needs), facilitating (focusing additionally on social needs), and counselling (focusing also on emotional needs). In a future model involving remote, hybrid or blended learning, how these roles are conceived and linked may yet to be fully developed.

Indeed, it is entirely arguable that the importance and need for technical and digital skills has in part been based on this agreed or accepted sharing of roles and responsibilities across schools and homes. Teachers have developed technical skills and competencies that have linked pedagogical skills, and subject and content skills (Koehler & Mishra, 2009). Their technical skills have also encompassed technical management skills, concerned with the handling of monitoring, assessment and reporting practices, not just focusing on cognitive needs, but also on social, emotional and behavioural needs, for example (Slovak & Fitzpatrick, 2015).

In a similar way, it can also be argued that technical and digital access has also been based on the agreement or acceptance of past roles. Teachers have relied upon access in classrooms and schools as well as increasingly at home, learners have relied upon access in classrooms and increasingly at home and outside school, and parents and guardians have supported access at home, where possible.

The present - what has changed during the Covid-19 pandemic

It can be seen from ranges of evidence and reports by individuals and groups that the Covid-19 pandemic has altered this past scenario dramatically. The alterations that have been brought about in the different parts of that previous model have been responsible in no small way for the challenges (and sometimes difficulties) that have often been faced by teachers, learners and parents and guardians in accommodating the changes needed during the Covid-19 pandemic. Having said this, the outcomes of this shift have opened up opportunities that we could not have foreseen in many ways, or that we would have struggled to implement without this critical requirement for us all to adapt - as quickly and effectively as possible.

The Covid-19 pandemic has provided an imperative for us to adapt, yet to continue to maintain. In itself, this description of the shift, which is one that has often been stated, is itself a conundrum. For, what exactly should be adapted and what should be maintained is sometimes not stated. What is clear from UNESCO data is that the shifts and adaptations have been large-scale and worldwide. UNESCO (2021) reported that about 150 countries had by April 2020 fully closed their schools, about 10 countries had partially closed their schools, while in another 10 they were fully open. UNICEF reported that between March 2020 and February 2021, schools had been "fully closed for an average of 95 instruction days globally, which represents approximately half the time intended for classroom instruction" (2021: 2). Additionally, UNICEF stated that "214 million students from pre-primary to upper secondary education in 23 countries have missed at least three-quarters of classroom instruction time", and of these "168 million in 14 countries missed almost all classroom instruction time due to school closures" (2021: 2). UNICEF also reported that: "More than 90 per cent of ministries of education enacted some form of policy to provide digital and broadcast remote learning" (2020: 1). They added that whilst "most students (about 70 per cent) have assets at home that would allow them to learn remotely via digital or broadcast classes,… at least 31 per cent of schoolchildren worldwide cannot be reached by remote learning programs, mainly due to a lack of

necessary household assets or policies geared toward their needs" (UNICEF, 2020: 1). Even within one region of the world, the pattern can be quite different in different countries or localities. In Latin America: "Among the online distance learning modalities, the use of virtual, asynchronous learning platforms in 18 countries is noteworthy, while only 4 countries offer live classes (Bahamas, Costa Rica, Ecuador and Panama)" (ECLAC UNESCO, 2020: 3).

At an overall level, the data and related experiences show that the teaching medium has changed in many localities, largely from a face-to-face medium to an online medium. Sometimes this has been from a synchronous medium to an asynchronous medium or to a mixed synchronous and asynchronous medium. The teaching medium has often been a major focus of research and policy attention, as has change during this present period. The uptake of virtual learning environments and remote learning environments such as Microsoft (MS) Teams, Google Classroom and Zoom are evidenced in research and reports (see, for example, https://www.businessofapps.com/data/), and it is clear that uses of these forms of digital technologies have played a major role in this change.

The teaching mode has similarly been adapted during the Covid-19 pandemic period. Sometimes, entire remote teaching has been undertaken, whilst at other times this has been blended (in some lessons face-to-face and in other lessons online), whilst hybrid teaching (teaching some young people in class with others outside class and online connected to the lesson at the same time) has also been implemented at other times.

In parallel, the learning medium for young people has changed. Instead of a face-to-face medium, the medium has often become a screen, perhaps with associated and connected technologies. This screen for some may be quite large, while for others it may be quite small. The means to communicate may also have changed, involving uses across a spectrum, from a keyboard-entered communication medium on one end of a spectrum to a direct-spoken but distant synchronous video conference medium on another end.

The learning mode has also changed. The mode has become more online, sometimes entirely online. On occasions, it may have shifted within weeks, from face-to-face, to an entirely asynchronous online mode, and finally to a hybrid mode. How learners have coped with that change in mode is not fully known, but anecdotes suggest that some learners have coped well and have been seen to benefit enormously, while others have not coped well and have found engagement with learning difficult.

Subsequent changes to the learners' learning environment should also not be underestimated. The learning environment in classrooms, with its associated routines and procedures, may have changed beyond recognition for young people. Having a learning environment in a small bedroom, in a comfortable patio, or on a shared dining table have all been reported by young people as their new learning environments.

The support that goes with that environment may also have changed. Procedures and routines in classrooms and schools may not mirror those in homes. Support from teachers and others in school may not be the same as those at home. Similarly, forms of monitoring may be quite alien to the young people when they are home. Reports of parents and guardians working positively with their children are equalled by reports of parents and guardians who have been over-bearing and over-anxious.

Parental and guardian roles have shifted during the Covid-19 pandemic, and the support and responsibilities that parents and guardians have needed to take on board have not always been either welcomed or understood by either teachers or young people. Whether parents and guardians

should take the role of teacher, tutor, facilitator or counsellor has not always been clear. Whether teachers should continue to support socially and emotionally through remote teaching and learning, as well as supporting cognitively, has also not been discussed or clarified in all cases.

What is clear is that many questions remain unanswered or partially answered at this stage. Nevertheless, there are positive lessons that have been learned and can be learned (Osborne, 2021). In the sections that follow, lessons that have been identified in compulsory school contexts are referred to where possible, but in some cases, lessons from other educational phases have been included, where these are felt to apply also to the compulsory sector context.

Flipped learning was a pedagogical approach that received some attention prior to the Covid-19 pandemic (Lundin et al., 2018). Some teachers have taken this on board during the pandemic (Smith, 2020), and have adopted this approach in order to enable young people to work remotely, but then to have chance to discuss, reflect on and collaborate beyond the initial exposition work. The initial exposition work is sometimes made accessible through pre-recorded video or audio, and sometimes through synchronous video or audio.

Collaboration has not been put aside as a pedagogical approach during the Covid-19 pandemic. Whether using MS Teams, Google Meet or Zoom, many teachers have been able to develop activities that can be run collaboratively using breakout rooms (Jan, 2020). Additionally, some teachers have encouraged joint and shared writing and presentation through using, for example, Google Docs.

Lengths of sessions and pace of working have often been found to be crucial factors that have affected the continuing engagement of young (and adult) people in remote or online learning. Remote learning lengths of activities have often been kept to 20-30 minutes, or 1 hour at a maximum. Breaks between remote online sessions have been ensured, and the spreading out of sessions across the day has often been important (Kaden, 2020).

Access and availability have often been recognised as factors that have affected young people's abilities to engage and complete activities (Lassoued, Alhendawi, & Bashitialshaaer, 2020). Without access to a large screen monitor, to a large keyboard, or to assistive technologies that some young people would all have in a school environment (Schuck & Lambert, 2020), this lack of accessibility has often reduced their engagement and subsequently lead to lower levels of output.

Assessment and moderation have needed to shift to an online medium where possible (García-Alberti, Suárez, Chiyón, & Feijoo, 2021). In some the online medium is used to offer alternative assessment formats (such as online quizzes), and in others the medium enables completed written work to be uploaded and marked online. Approaches have varied and have been adopted in different ways in different contexts. In some cases, assessment and moderation that has been undertaken nationally has been abandoned, and alternative teacher-based assessments have been introduced.

What we have learned from experiences and outcomes gathered across the period of the Covid-19 pandemic is that teachers have adopted a range of techniques and skills that have enabled forms of remote, blended and hybrid teaching and learning. Whilst the balance and details of these is yet to be known (or indeed, whether it will ever be fully known), is not certain. However, there are lessons that have been gleaned from this incredibly valuable set of experiences that could help to shape the next phase of educational practices.

The future – taking forward lessons for the next phase

Undoubtedly, different teachers, learners, parents, and schools will have different experiences that have arisen from handling the challenges of maintaining education during the Covid-19 pandemic. Having evidence about learner and educator readiness for adaptability and change provides insight about features that might need particular attention (Vassallo & Spiteri, 2021). Having evidence about experiences that arose, Rolé and Gatt (2021) from their research have identified the width of challenge, outcomes and opportunities from students, which offers related insights. In moving forward, it will be important for impacts and outcomes that have arisen to be considered in the next phase context. A part of this context will be the development and implementation of pertinent national strategies that relate to the development of appropriate skills and competencies of the lifelong learners that are moving through the next phase within the compulsory education sector (Grixti, 2021).

The balance of face-to-face to online, of synchronous to asynchronous, will certainly be a key question to consider in that next phase, taking cognisance of how this has worked (or not) as a teaching medium during the Covid-19 pandemic. Associated with this, decisions about the teaching mode should also be questioned, to accommodate the roles that remote, blended or hybrid models of teaching might play. De Luca and Molias (2021) have studied this in the context of developing hybrid teaching practices in higher education through pedagogical training. In the more specific context of science, da Silva (2021) explores the professional development of innovative approaches for teachers from student teacher perspectives. The need in the next phase for teachers to share experiences and practices is likely to be important in this developmental context. Wang (2021) provides perspectives on this need and practice through the context of a professional learning network.

For some young people, the learning medium of a screen has been problematic, while for others it has been a benefit (Osborne, 2021). How this might be balanced, or focused for different individuals or groups, and what technologies young people might need to ensure that a learning mode of face-to-face or online or blended can work for them, will be important questions to consider. A strategy that can offer future flexibility in this respect is likely to be of potential value. As a part of this flexibility, and considering how learners can engage, the skills and competencies that learners do not have and yet need, in moving from a face-to-face environment, also requires focus, as highlighted by Muscat (2021).

If there are shifts towards more remote or blended or hybrid learning, important dependency factors within the learning environment will need to be identified and approaches taken where these might be addressed. The ways that a learning environment also provides a support environment (social and emotional, as well as cognitive), should have due consideration (Wright, 2021). In terms of a blend of the cognitive, social and emotional, Calleja and Maggi (2021) illustrate the role that robotics might play in this respect in schools. In the context of shifts towards remote, hybrid or blended learning, parental roles will also need to be managed and opened up for wider discussion.

Important lessons that should be explored and that can be taken forward are how teachers, learners, parents and guardians have experienced this shift, how they have worked effectively and ineffectively during the Covid-19 pandemic (Vassallo et al., 2021). Examples of flipped learning are known to have been effective in some cases, while synchronous activities including project-based activities have involved and supported online collaboration in other cases.

In managing remote, blended and hybrid learning, space, timing lengths and pace of sessions have been identified as issues that should be reconsidered in a next phase context (Premazzi & Quieroz,

2021). Access and availability of digital technologies have been identified as important factors in some cases, but wider skills and competencies to use them have also been recognised as factors that can either limit or can enhance use and outcomes. Caruana (2021) highlights the need for learners to develop skills and techniques that include time management and self-reflection, even at the level of higher education students. Alternative forms of assessment (both formative and summative) and moderation in an online medium have been developed in some contexts and some countries, but shifting to these new models will require a focus of attention, as Said Pace (2021) highlights.

Overall, what the future holds in terms of remote, blended and hybrid teaching and learning is in part open to our imaginations and capacities to engage with these arenas. Whatever choices we make, decisions about how we enable remote, hybrid or blended learning should have a focus on how we will address fundamental learning needs, such as those listed by Twining and McCormick (1999) – instruction, explanation and illustration, direction, demonstration, discussion, scaffolding, questioning, speculation, consolidation, summarising, initiating and guiding exploration, and evaluating learners' responses. Similarly, how we will ensure creativity, enquiring, conceptualising, comparing, reasoning, collaborating and interpreting will need deep understanding about how we can apply and use digital technologies emerging from our research. Relating a concern for exploring these fundamental learning needs to subject, topic and age should be supported by our prior understandings and knowledge, as indicated in the context of literacies, in the research by Seguna (2021). However, what is certain, is that our understandings at this time are stronger than we might have hoped, due to the dedication of our learners, our teachers, our parents, our administrators, our advisers and our researchers. The Covid-19 pandemic has shown how practice, policy and research can and do work together in exploring and addressing the 'impossible'; we should not lose the importance of that collaborative endeavour; it is a strength we should maintain.

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