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Special Issue

Inclusive Technologies and Learning

Editor

Don Passey

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Editorial

Inclusive Technologies and Learning: Research, Practice and Policy

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Keywords
digital technologies; disability; education; learning; social inclusion

Issue
This editorial is part of the special issue "Inclusive Technologies and Learning", edited by Don Passey (Department of Educational Research, Lancaster University, UK).

1. Background and Focus of this Special Issue

This special issue focuses on an important contemporary concern—inclusive technologies and learning. Since the 1960s there has been a continued development and diversification of digital technologies used across societal sectors (Bijker, Hughes, Pinch, & Douglas, 2012), enabling applications not solely within business and commerce, but significantly within educational and social settings (such as those discussed by The Metiri Group, 2006, for example), supporting communication and learning (for example, shown by Richardson, 2012), providing opportunities to widen and deepen reach and interactions (as indicated, for example, by Kim, Hagashi, Carillo, Gonzales, Makany, Lee, & Gàrate, 2011). It can be argued that such developments have created many divisions and challenges too (Resta, & Laferrière, 2008); individuals as well as nations may not have the same access or facilities as others (ITU, 2015); and issues such as exploitation and exclusion are regularly highlighted (Dutta, Geiger, & Lanvin, 2015). This special issue is concerned with inclusive technologies and learning, related to social inclusion. Key questions considered in the papers selected for this special issue include:

- For learning, training or employment, do digital technologies enable social inclusion within educational or training settings (helping to address the range of problems identified in the extensive study of Vaughn, Wexler, Beaver, Perron, Roberts, & Fu, 2011, for example)?
- Are digital technologies being developed to enhance learning and social inclusion (such as the way the development of virtual worlds is described by Doyle, 2010, for example)?
- How are online learning and social networking practices influencing social inclusion in learning (engaging in practices and realising outcomes in the forms detailed in Coomey, & Stephenson, 2001, for example)?
- Do digital technologies benefit certain groups to greater extents, or specifically, in terms of learning related to social inclusion (in situations such as those discussed by Campigotto, McEwen, & Epp, 2013, for example)?
- Do digital technologies support learning and social inclusion across all ages, in terms of intergenerational learning, and independent of cultures (through processes such as those described by Palaigeorgiou, Triantafyllakos, & Tsinakos, 2011, for example)?

In this special issue, six papers are presented, each providing a different perspective, but all focusing on inclusive technologies and learning. Whilst all six papers offer different views, there is, however, a common message that emerges from across these six papers; that is—there is a vital need for research in the field of inclusive technologies and learning to continue to explore ways that allow individuals who have disabilities or communication needs to collaborate and be involved in research activities if we are to effectively

identify outcomes that can be applied purposefully through policy and practice.

2. Research, Practice and Policy Perspectives

In essence, these six papers offer perspectives that throw light on the research, policy and practice arena. In the field of inclusive technologies and learning, the three elements of research, policy and practice are seen and recognised as being necessarily closely connected and affected:

- Research in this field can (and it is argued, should) draw out findings that have implications for policy and for practice.
- Policy should take research and practice into account if it is to afford voice to those with disabilities or communication needs that are a part of an inclusive community or population.
- Practice should not only be aware of policy and research in this field, but should review regularly what effects this awareness is having on activity and on outcomes in terms of learning.

Although these six papers have clear and important messages and implications for policy, it is interesting that few policy makers have been involved directly in that research. The research that is reported has focused mainly on gathering evidence from learners and from teachers. But the three audiences of researchers, policy personnel and practitioners are all important in the context of these papers. A way of considering this is to think of the actors being influenced by an audience 'slice' (shown in Figure 1).

Thinking about this form of relationship through each of the papers, important emerging points from each of them arise.

3. An Overview of Each Paper with Key Emerging Points

McDowell (2015) offers a qualitative case study of an undergraduate university cohort, exploring the ways that online learning can support individuals on the autistic spectrum in engagement with group work. This case study investigates practices that teachers provide, where the teacher is also the researcher. However, the focus is clearly on the learners, undergraduates in a university course. The paper raises questions—how can group work be effectively managed to include learners on the autistic spectrum, and what are the implications for practice and policy? The paper argues from a practice viewpoint that there is a need to strongly consider these questions. What will happen beyond the course and the university context is certainly not clear, and how the involvement that has been achieved can be supported in the long term for these learners is not within the gift of those undertaking the study or even within the institution of the learners. This paper shows that while practice clearly needs to consider how to support collaborative and group work when cohorts include individuals on the autistic spectrum, policy at a local and wider level importantly needs at the same time to recognise the importance for individuals on the autistic spectrum to be able to work in groups. Taking this practice forward may well, therefore, be a concern not just at a local university level, but at national and international policy focus levels too. In terms of Figure 1, the study directly involves the research and practice slices, but has vitally important messages and implications for the policy slice.

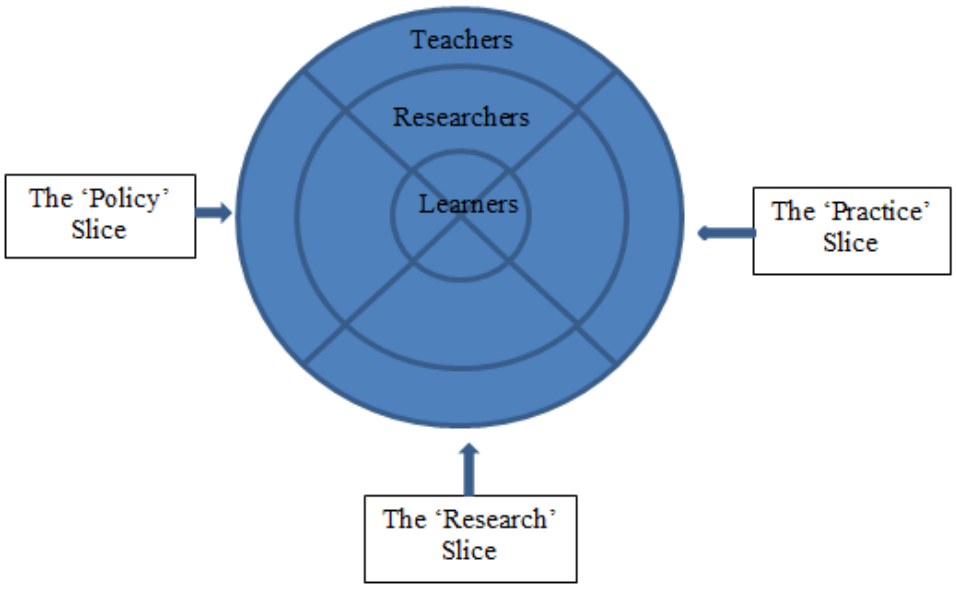

Figure 1. A relationship of actors and audience.

Davidson (2015) provides a contrasting study, a collaborative action research study, which looks at how adult learners living with an intellectual disability can be involved in producing videos that tell their story and gives others access to their achievements and successes. The study focuses on the learners, adult learners, but also investigates how they are supported by and interact with 'counsellors' and other adults in the community. Whilst the study focuses on how to involve these learners in video production, rather than them being involved in simply receiving information or ideas through video channels, the questions of who can lead this for individuals beyond the study, and who can take this practice forward, are important if the successes of this work are to be seen more widely. The paper raises questions of how individuals with intellectual disabilities can be effectively involved in producing rather than receiving through video, and how this will be done in other contexts by others in the future. The author provides an effective model that is linked to a supportive context, but how this can and will be replicated is a question that goes beyond the study itself. From a policy perspective, there is clearly a need for policy makers to be aware of the fact that involving those with intellectual disabilities in producing rather than receiving through video is an important practice to develop and support. Taking this practice forward, local, national and international support structure policy focus groups can all play a part. Again, in terms of Figure 1, the study involves the research and practice slices, but has vitally important messages and implications for the policy slice.

Hayhoe, Roger, Eldritch-Böersen and Kelland (2015) provide us with evidence from a case study, undertaken in a university undergraduate context, concerned with developing what they term 'inclusive technical capital' to counter effects of changes in policy for supporting university-level students with disabilities. The study focuses on the learners, but the role of the researchers is clearly important in creating potentially positive alternative activities for the learners to gain basic study skills. While teachers are less directly highlighted in this study, it clearly raises questions of how mobile technologies and drop-in sessions can effectively support students with disabilities in enhancing their basic study skills in universities when allowances are being changed. In this context, finding out that mobile technology-based activities and uses of virtual learning environments (VLEs) appear to be favoured by learners, clearly has implication for policy and practice. The authors indicate the importance of mobile technologies and VLEs in this situation, but how these technologies can most effectively be used in practice, and who will model this practice, are also questions for policy. Outcomes of the study imply that there is a need to consider appropriate and relevant policy at individual, institutional and national levels to recognise ways to effectively support students with disabilities, with practice seeking to introduce ways that are effective for students with disabilities. Taking this practice forward, local university policy focus will clearly be an important next step. In terms of Figure 1, the study informs us through the research and practice slices, with clear messages and implications for the policy slice.

Hardman (2015) reports a study using an action research approach, involving mixed method data gathering, exploring how teachers supporting special education can be prepared and updated in their practices through community building using Web 2.0. This study focuses on teachers and their practices, specifically on teacher trainees and teachers in the compulsory school sector. However, the researcher has a clear role too, in providing facilities and support for the building of a community. With low levels of contribution by the teachers following their graduations, the study raises the questions of whether communities of practice work in supporting ongoing practice in all cases through their involvement as observers, whether there are specific difficulties for teachers working with special education in contributing in these ways, and what limits that use. While it is clear that there is a need for these teachers to be using technologies in order to be as aware as possible of how to support children with special needs with technologies, and for them to keep abreast of new developments, how this should be done is not clear from the study outcomes. It is refreshing, however, to see an example of activities that do not work in an entirety. For practitioners, this leaves the question open of how to set up such a network to support this necessary community, and for policy personnel, questions of how the need for those supporting special education to share understandings, experiences and practices through their careers can be addressed. Taking practice forward, there are clear implications for local teacher training, as well as for regional and national policy focus in this respect. In terms of Figure 1, the study informs us of outcomes through the research and practice slices, but leaves important questions and implications for the policy slice.

Parsons (2015) offers a policy review and analysis, looking in depth at the ways that digital technologies might positively affect informed consent practices with children and young people in social research. The author focuses on the learners in this paper, across the age range, highlighting how technologies can now afford positive ways to bring forward and highlight learner voice more effectively, as well as to ensure informed consent is more ethically focused. While teachers are not the main focus of this paper, there are clearly implications for teachers in how they respond to and handle these new opportunities. The paper raises questions about whether our current ethical processes are always ethical (or whether they sometimes might be considered unethical), and whether they do

really achieve the purpose they are set out to do. Considering the legal element in these practices leads to questions as to whether ethics are now more focused on legal concerns than ethical concerns, how the two relate, and whether the 'old practice' of 'signing on the dotted line' has become a practice that ethics adopts without sufficient critical question. For practice, there is a clear need for teachers to consider how informed consent can be structured to ensure children and young people (including those with disabilities and communication needs) have a significant voice in social research, while for policy, reviewing the practice of informed consent to ensure children and young people have a significant voice in social research is a clearly vital need. Taking this practice forward, there are certainly implications for groups considering this issue at national and international levels as well as at local and agency policy focus levels. This paper again, in terms of Figure 1, informs us through the research and practice slices, but has vitally important messages and implications for the policy slice.

Burgstahler (2015) provides a review of practice and research concerned with the progress of developments that support engagement and access through online learning practices for university students with disabilities (particularly in terms of visual, auditory and motor disabilities). In this paper, the experience of the researcher, and the experiences of teachers in universities, are brought forward and examined in terms of the recent development of effective practice within an overall policy concern—for making online learning practices accessible for those with disabilities. The paper raises questions of what has been achieved in terms of supporting students with disabilities to engage with and use online environments over the past years, and what has failed. Overall, the author paints a fairly disappointing picture of university practices not moving towards wide-scale concern and implementation. If outcomes at this time are not as positive and wide-spread as had been hoped for, it is possible that moving forward might require new technological approaches to these issues, as well as considering further ways to influence practice and policy more widely. For policy, it is important that the current state of play is recognised, while for practice, it is important for teachers and those managing courses to identify what needs to be done, now and in the future. Taking this practice forward is likely to require a focus not just from the local university, but also at national policy focus levels, including discussions with technology providers and innovators. In terms of Figure 1, the review informs us through the research and practice slices, but again has important messages and implications for the policy slice (including particularly innovative technology policy).

Overall, the six papers in this special issue highlight the ways that researchers in this field have been actively engaged in supporting and drawing out findings from learners and teachers that have relevance not just for the practice and research slices, but also for the policy slice (illustrated in Figure 2).

These papers highlight our need for practice and policy to have appropriate and regular concern for inclusive technologies and learning, to accommodate and consider:

- In adult learning settings, how video production might support collaborative work and engagement for individuals with intellectual disabilities.

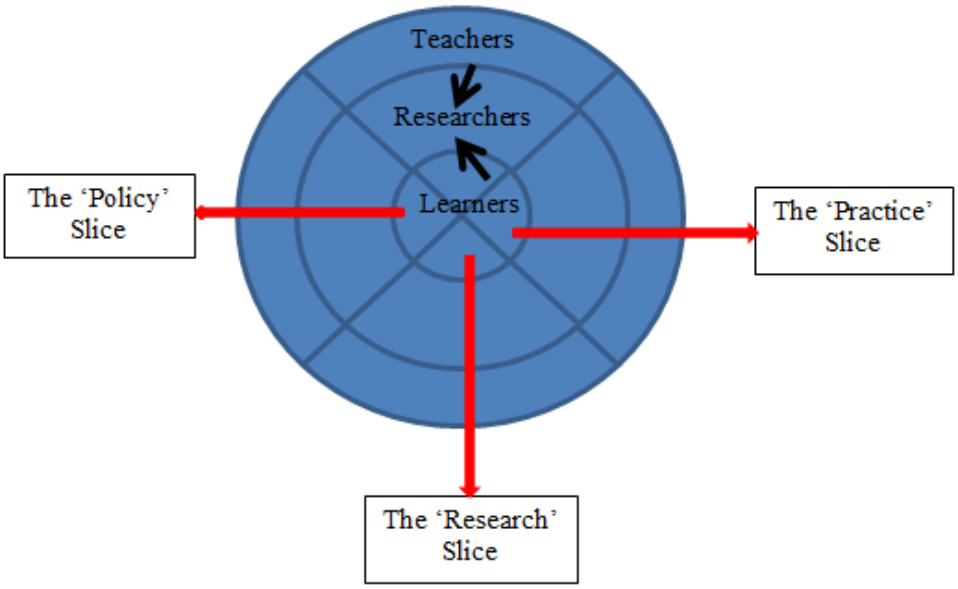

Figure 2. The approach taken by the researchers in this special issue.

- In universities and institutions of higher education, how online environments might support group work for individuals on the autistic spectrum, how mobile technologies and VLEs might support 'inclusive technical capital' approaches for individuals with disabilities, and how regular review of the provision of online learning practices (including innovative technology review) is required to ensure access for individuals with visual, auditory or motor disabilities.
- In compulsory school settings, how ongoing support for teachers of special education might be appropriately provided, and how technologies both challenge and can support ethical consent practices more effectively to enable learner voices for individuals, including those with disabilities and communication needs, to be heard.

4. Adding to Our Depth and Breadth of Knowledge

From a review of literature focusing on inclusive technology enhanced learning, I identified recently a list of major gaps in our research knowledge and understanding (Passey, 2013). The review suggested the need for us to 'understand more about certain groups of learners, as well as about certain ranges of educational digital technologies and their applications in the field of practice' (pp. 208-209). The list of gaps identified, included our need to have more evidence about:

- 'Impacts of different categories of digital technologies on long-term memorisation and the development of social and societal aspects of learning.'
- 'Uses, outcomes and impacts of project and after-school club activities involving digital technologies and software involving and supporting parents.'
- 'Outcomes and impacts for: learners with limited cognitive abilities or attributes engaged with online revision resources, online learner support, and project and after-school club activities;...for learners with challenging social attributes and abilities engaged with online learner support.'
- 'Ways parents and guardians, support workers and youth workers, counsellors and online tutors are interacting with learners across school sectors.'

While the focus of the review list was on the compulsory school sector, the evidence behind it nevertheless gathered findings from studies in other learning settings, including higher education and adult learning where applicable. The six papers presented in this special issue do provide us with a greater depth and breadth of knowledge in certain of these areas of gaps. They inform us about:

- The role of online environments in supporting group work with individuals on the autistic spectrum.
- The use of video production to support communication and engagement for those with intellectual disabilities.
- The role of mobile devices in supporting those with disabilities.

For this special issue, some key questions were listed that prospective authors might wish to address. The authors of this special issue have addressed these questions, in the following ways:

- How can digital technologies support inclusive approaches to learning? Authors have provided evidence of how this has been achieved in specific cases in university and adult learning settings.
- What is the current state of play with regard to research in this field? Authors have provided evidence from reviews of practice and research, in terms of university online learning provision, and ethical consent for learners in compulsory education settings.
- How is research looking at this issue, not just from a research perspective, but also from a practice and policy perspective? Authors have provided evidence that researchers in this field are actively involved in drawing data from learners and teachers, and focusing this in ways that can inform policy at a range of levels.
- What has been done to date, and what needs to be done next? Authors have provided evidence of progress in this field, and while their important contributions are acknowledged, it is clear that more remains to be done, if we are to support the wide range of individuals whose voices need to be brought out and heard, so that we can consider better how to be involved with and enhance their learning, assuring their social engagement.

I record my thanks and sincere appreciation to the authors of the papers contained in this special issue, as well as to the reviewers of those papers. Without these contributions, we would be all the less aware and less prepared for our future.

Conflict of Interests

The author declares no conflict of interests.

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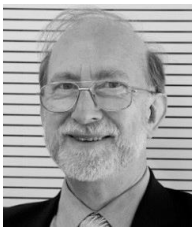
About the Author



Dr. Don Passey

Don Passey is Professor and Director of the Centre for Technology Enhanced Learning (researching 'developing inclusive uses of technologies for teaching and learning'), and Director of Studies for the Doctoral Programme in e-Research and Technology Enhanced Learning (with some 100 doctoral students studying worldwide). A long-standing member of the international federation for information processing (IFIP), he is vice-chair of the Technical Committee on education, and of a Working Group exploring information technology in education management.

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Article

A Black Swan in a Sea of White Noise: Using Technology-Enhanced Learning to Afford Educational Inclusivity for Learners with Asperger's Syndrome

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Abstract
Against a backdrop of increasingly vocation-focussed course provision within higher education, of widening participation initiatives intended to promote greater inclusion for learners affected by learning difficulties, and of moves towards greater use of social and collaborative forms of learning, this paper discusses the case of an undergraduate Computing student affected by Asperger's Syndrome (AS).While there is recognition in the literature of problems associated with face-to-face dialogue for persons affected by AS, there is a paucity of research both into the experience of students in higher education, and around the issue of participation in group-work activities increasingly found in creative aspects of computing. This paper highlights a tension between moves towards collaborative learning and UK disabilities legislation in relation to learners with AS. Employing a qualitative case-study methodology, the investigation revealed how a technology-enhanced learning intervention afforded an AS-diagnosed learner greater opportunities to participate in group-work in a higher education context. The findings suggest that not only can computer-mediated communications afford AS-diagnosed learners opportunities to participate meaningfully in group-work, but also that the learner demonstrated higher levels of collective-inclusive versus individual-exclusive phraseology than neurotypical peers, thereby challenging assumptions around participation in collaborative learning activities and assimilation of peer-feedback.

Keywords
Asperger's Syndrome; autistic spectrum; computer-mediated communication; collaborative learning; technology-enhanced learning

Issue
This article is part of the special issue "Inclusive Technologies and Learning", edited by Don Passey (Department of Educational Research, Lancaster University, UK).

1. Background and Context

The prevalence of an autistic spectrum condition within the UK is estimated at c.1% of the population (Baron-Cohen et al., 2009), and the incidence of students declaring an autistic spectrum disorder on entry to university is 1.1% (National Autistic Society, 2010). Within the cohort of students starting programmes of study at UK higher education institutions (UKHEIs) in the 2013–14 academic year, some 77,795 reported a disability on entry (HESA, 2015), of whom 2,415 students declared prior diagnosis of an autistic spectrum condition (ASC) at enrolment.

A Computing department at a UKHEI offering a range of degree programmes found that certain courses regularly attracted a higher than average proportion of learners declaring a known learning difficulty at the start of their studies; specifically, within the computer games cluster of courses, there was an established history of learners reporting a prior clinical diagnosis of an ASC such as Asperger's Syndrome (AS) at initial registration, with an incidence of between 3% to 5% of the

cohort being common.

Learners affected by AS typically experience problems with face-to-face interaction and are unable to read social cues (Attwood, 2000). Previous research has identified group-work as being particularly problematic for these learners (MacLeod & Green, 2009), however one objective of the computer games degree courses is to prepare learners to enter the games industry, and it is a stated requirement of the programme specification that students should work in small teams to develop a range of computer games.

This case-study formed a strand of a 12-month project which aimed to encourage the formation of a community of practice for learners studying on computer games pathways, using the *Mahara* e-portfolio system as a central focal point to facilitate a blended collaborative learning environment. Given the frequency of learners with AS in the participant group, this strand of that project aimed to address the special educational needs of these learners in relation to the role that they would play as collaborative learners. The findings of this study were therefore also intended to inform refinements to the *Mahara* e-portfolio system.

A significant factor impeding the educational success of learners with AS is an inability to recognise and respond to those social cues that make up much of face-to-face (F2F) verbal communications (Attwood, 2000). In recognition of the status of AS as a pervasive developmental disorder, the Special Educational Needs and Disability Act (HMSO, 2001), the Disabilities Discrimination Act (HMSO, 2005) and the Equality Act (HMSO, 2010) all require that learners affected by an ASC should be afforded the opportunity to undertake alternative forms of assessment, placing a duty of care on the institution to ensure that "disabled students are not placed at a substantial disadvantage in comparison with students who are not disabled" (HMSO, 2001, chapter 10). Where courses in subjects such as computer games seek to develop students' skills in group-work, there is an inherent tension between the pedagogical requirements of courses that seek to meet the needs of the profession for which learners are being prepared, and the legislative requirements designed to protect and assist students with disabilities such as AS.

With the *Mahara* e-portfolio system in place to facilitate collaborative group-work, this strand of the project therefore sought to transcend the problem above by exploring how computer-mediated communications (CMCs) might afford greater educational inclusivity and improved social opportunity to AS learners who would otherwise find themselves disadvantaged by the focus on collaborative styles of social learning.

2. Literature Review

Asperger's Syndrome, first identified by Hans Asperger in 1948, is located in the spectrum of autistic conditions and is characterised by a *triad of impairments* (Wing & Gould, 1979), comprised of problems with social interaction, communication and imagination (Attwood, 2000). While people affected by ASCs occupy all levels on the intelligence quotient scale, individuals with AS have an "overall IQ usually within the normal or above normal range" (Klin & Volkmar, 2000, p. 342) and are often highly aware of the difficulty they experience in communicating with others (Attwood, 2000; Benford, 2008). Being "unable to attribute mental states to others" (Benford, 2008, p. 32), individuals affected by AS will typically find F2F communication difficult, preferring to avoid eye contact and often responding to questions with very short, or even one-word, answers (Attwood, 2000).

A high sensory sensitivity, particularly to audio inputs (Attwood, 2000), can also make concentrating in noisy environments such as lecture theatres and studio-labs especially difficult, and coupled with the need to process and interpret the meaning of multiple voice inputs, AS-diagnosed students can be expected to find managing the requirement to understand and respond to the group dynamic in F2F contexts particularly problematic. Illustrative of the situation faced by many learners with AS, the case of Andrew, an academically capable undergraduate studying at a UKHEI, highlights the level of anxiety experienced by learners with AS when required to participate in group-work. In Andrew's case, despite holistic collaborative support being in place to help him cope with his studies, the pressure experienced when attempting to participate in F2F group-work ultimately led to this learner withdrawing from university altogether (MacLeod & Green, 2009).

While the affinity of persons diagnosed with an ASC for using computers is well documented (e.g. Attwood, 2000; Murray, 1997), research into the use of computer-mediated communications by this group is still relatively new (e.g. Gillespie-Lynch, Kapp, Shane-Simpson, Smith, & Hutman, 2014). One earlier investigation into the use of mobile phones by adolescents with AS found this group were significantly less likely to use the voice features of the technology than the text-messaging functionality, and would prefer to use the latter to communicate (Durkin, Whitehouse, Jaquet, Ziatas, & Walker, 2010); these findings echo those noted elsewhere by an observed preference in AS individuals for written rather than voice communications in social media (Benford, 2008; Burke, Kraut, & Williams, 2010).

There has been a proliferation of tools to promote and facilitate online collaborative working, and useful research has been undertaken in this area (e.g. An, Kim & Kim, 2008; Curtis & Lawson, 2001; McConnell, 2006). Although it has been noted that working collaboratively online can result in "missing social cues that can help one understand what is being communicated" (McConnell, 2006, p. 128), this loss is inverted for the AS-diagnosed learner, as "being more object focused

than people focused is clearly only a disability in an environment that expects everyone to be social" (Baron-Cohen, 2002, p. 491).

Against this background, the use of technology-enhanced learning (TEL) interventions specifically to facilitate participation in group-work by learners with AS appeared to be an under-researched area. While there is evidence of some success in a single-case case-study of a 7-year old boy with autism using CMCs to interact with two classmates in a school situation (Lewis, Trushell, & Woods, 2005), the significant differences in age and of disabilities support requirements between the schoolboy and university undergraduates make any comparisons contentious, and it therefore appeared that there was scope for further research in this area within a higher education context.

2.1. Research Question

In light of the gap in the literature identified above, the following research question was formulated:

> How might a technology-enhanced learning intervention afford an AS-diagnosed learner in higher education greater opportunity to participate in group-work?

3. Methodology, Methods and Research Design

3.1. Theoretical Lens and Methodological Approach

This study is underpinned by an epistemological stance founded in the pragmatist tradition (Dewey, 1944). Located between the epistemological poles occupied by interpretivism and positivism, the pragmatist position is broadly consistent with case-study methodology (Saunders, Lewis, & Thornhill, 2009), and this adoption of a pragmatist epistemology provided a basis from which to consider perspectives and predictions emerging through qualitative and/or quantitative approaches to data collection and analysis, initially by facilitating the collection of data using various methods and from a variety of sources, and later through highlighting a range of further research requiring work using both approaches.

Further, this epistemological position is supported by an ontological stance which embraced work from Bakunin (1916), Goodman (1962, 1964) and Illich (1970, 1971) that sought to foster the development of inclusive communities of learners; to this end, the theoretical framework against which the investigation was conducted can be viewed through the lens of an exploration of opportunities for digital inclusion, rather than with the objective of identifying where technologies could be made accessible (Seale, 2014). Finally, through being rooted in an approach to practice that actively sought to collapse teacher-student hierarchy (Bakunin, 1916; McDowell, 2010; Suissa, 2006), this investigation promoted a teacher-student relationship which remained uncomplicated by those issues of social hierarchy identified as giving rise to confusion and anxiety in AS-diagnosed persons (Attwood, 2000; Baron-Cohen, 2008; Higgins, Kocha, Boughfman, & Vierstra, 2008).

3.2. Characteristics of the Case-Study

With the freedom to draw on methods and sources afforded by the adoption of a pragmatist epistemology, the investigation assumed a primarily qualitative approach to case-study, focusing on a single case of an undergraduate student diagnosed with Asperger's Syndrome working on a computer game development project in a group with three other students. None of these three students had made any previous declaration of a disability; while acknowledging that the absence of a declaration did not necessarily exclude the possibility that one or more of these students may have been affected by an undiagnosed or undeclared disability, neither the researcher's in-class observations nor the subsequent expert witness accounts suggested that these students displayed any behavioural patterns associated with AS, and the three students are therefore described as neurotypical throughout this study.

Framed as a first investigative iteration within a larger teaching and learning project, this case-study combined both exploratory and explanatory characteristics (Yin, 1993), insofar as it attempted both to determine whether a causal link existed between the use of a TEL intervention and successful participation in group-work by an AS-diagnosed student, and, if so, to investigate why this might be the case. Further to this, as the case itself was of primary interest for the purposes of assisting an individual affected by AS, it is an intrinsic case-study, however situated against the background of the larger project, it can also be viewed as an instrumental case-study, as the research was conducted with a view to gaining understanding of a broader picture (Stake, 1995).

An important criticism of case-study methodology is that of an inability to generalise from the findings. In contrast to a quantitative study, which might be expected to generate statistical data regarding the outcomes of an intervention, a single-case case-study generates data which is necessarily highly specific to that case, and without multiple cases available to facilitate data source triangulation, or multiple researchers to facilitate investigator triangulation, there is a possibility that a single researcher investigating a single case will provide only a narrow and subjective interpretation (Denzin, 1989). Stake counters this criticism, proposing that "naturalistic generalisation" (1995, p. 85) can emerge from a single-case case-study in the form of an intuitive generalisation made by the reader from their interpretation of the data presented by the researcher,

wherein the reader's experience bears a correlative approximation to the account presented by the researcher.

A further argument for the strength of the single-case case-study approach was derived from Popper's proposal that an observation of a single black swan falsifies the proposition 'all swans are white' (Popper, 1959), thereby imbuing the case with "general significance and stimulat[ing] further investigations" (Flyvbjerg, 2006, p. 228). Against this background, generalisations based on this investigation into the case of a single AS-diagnosed individual whose patterns of behaviour did not match those predicted by the literature and the expert witnesses were validated.

3.3. Case Selection

Selection of the case was determined by the availability and willingness to participate of both an AS-diagnosed undergraduate, to whom we refer here as Alex (name changed to preserve confidentiality), and other members of Alex's game development group; access to this group arose as the researcher was the module leader for the game development studio class, and had worked with the cohort in the previous academic year.

3.4. Sources of Evidence

Of Yin's (2003) six admissible sources of evidence in a case-study, four are used here: documentation, in the form of expert witness accounts; participant observation, of the interactions between the group members in a F2F context; direct observation, of the online interactions between them; and interviews, in the form of email interviews undertaken with the four learners. The two sources of evidence not used in this case-study included archival records and physical artefacts, neither of which was manifest in any form within the scope of the investigation.

3.5. Data Collection Procedures and Analysis Design

As the four participants formed a single group working on a game development project, the three neurotypical-participants acted as a control group, allowing the researcher to compare and contrast Alex's responses with those of the neurotypical learners, thereby providing a source of evidence with which to triangulate the case, and to strengthen the internal validity of the case-study.

As a single case was investigated within this group of students, the unit of analysis employed was that of the individual. Expert witness accounts were generated through a series of open-ended interviews with three ASC professionals, both informing the strategy for the development of the case-study, and leading to a series of predictions (see Table 1) against which the findings would later be analysed. Both offline and online activities and interactions of the four participants were observed before proceeding to individual email interviews.

Data collection proceeded according to the following schedule:

1. First open-ended interview with Lecturer in Psychology whose specialism is in AS
2. Email interview with Alex's Disabilities Support worker, with follow-up questions
3. In-class observations of interaction between the four members of the group
4. Observation of interactions between group members within the e-portfolio system
5. Second open-ended interview with Lecturer in Psychology specialising in AS
6. Email interview with each student-participant, with follow-up questions
7. Final open-ended interviews with expert witnesses.

Expert witness accounts gathered during phases 1–2 helped to generate the series of predictions which informed the observational perspectives employed in phases 3 and 4, and a discussion of these observations with the expert witness in phase 5 helped to finalise the approach to the email interviews conducted in phase 6. The data collected in phases 3 and 4 was analysed by employing a combination of pattern-matching against the predictions, with both constant comparative (Glaser & Strauss, 1967) and direct interpretation (Stake, 1995) techniques. Results were triangulated with the data returned from phase 6, which was analysed using the same strategy. Finally, rival interpretations of the findings were sought from the expert witnesses in phase 7 to help strengthen construct validity.

3.5.1. Ethical Approval Process

A two-stage ethical approval process was completed prior to the commencement of the study. As an investigation in which data would be collected from and about student participants, it was first necessary to gain general ethical approval before undertaking any data collection activities. Given that the focus of the case-study involved contact with an individual categorised as 'vulnerable', a second, higher level of ethical approval was subsequently sought in which it was necessary to confirm how the project satisfied four key ethical principles of non-maleficence, beneficence, autonomy and justice. This second stage required any potential power imbalances or dependent relationships between researcher and participants to be outlined, for assurances to be given that Alex's status as an AS-diagnosed individual would not be explicitly divulged to his peers, and that all research instruments used would be designed to avoid indirect disclosure of this information.

In order to meet the requirements of the Data Protection Act (HMSO, 1998), it was necessary to confirm that the data would be stored securely, that all data would be anonymised, and that any participant wishing to see the data could make a subject access request of any data held on them.

3.5.2. Participant Consent

Student-participants were presented with a summary of the project and an explanation of how the data would be used, and informed of their right to withdraw their consent in a form that they were requested to sign before interviews could take place. In order to respect the confidentiality of Alex's diagnosis, two sentences referring to AS were removed from the consent documentation presented to the control-participants.

3.6. Observations and Interviews

Adopting an "unstructured" approach to observation (Cohen, Manion, & Morrison, 2007, p. 397), the researcher conducted non-interventionist observations while running studio-sessions with the student-participants, primarily as direct-observer but occasionally as participant-observer. Observations were formalised immediately following studio sessions to help ensure authenticity and richness of data.

A range of literature (e.g. Attwood, 2000; Baron-Cohen, 2008; Benford, 2008) suggested that F2F interviews might not be an ideal approach to collecting data from an AS-diagnosed participant. Following the second consultation with the AS-specialist expert witness, and in line with the approach taken in Benford's (2008) study on internet use and autism, the researcher made the decision to conduct email interviews, such that interview questions were emailed to the four participants as a Microsoft Word document, with interview prompts replaced by follow-up questions.

A significant consideration in reaching this decision was that using a written form of interview meant that time pressures were eliminated from the process, allowing answers to the questions to be constructed at a pace, and to a level of detail, with which Alex felt comfortable. While one possible disadvantage was that there would be a delay in the arrival of any follow-up questions, the email interview strategy allowed all participants to retain a record of their responses, and their attention was refocused by placing these questions in the follow-up email immediately after the original responses. This also made it possible to analyse any significant differences in the written styles of the four participants, and thereby to directly address one of the predictions arising from the review of the literature and subsequent contact with the three expert witnesses.

3.7. Analysis and Validity: Triangulation of Data

Triangulation of the data broadly followed Denzin's (1989) model of methodological triangulation, wherein a range of data collection methods are applied—one followed by another—in order to ensure consistency of evidence obtained, thereby testing the validity of the predictions mentioned above. The researcher attempted a synthesis of Denzin's model with Yin's 'detective' approach (Yin, 2003); by referring the evidence arising back to the 'expert witness', the professional-participants were invited to offer rival interpretations (Yin, 2003) to help strengthen internal validity.

While the phrase *triangulation* implies the coordination of three lines of enquiry, this study used four sources of evidence, starting first with expert witness evidence from three separate parties, then F2F observation of in-class interactions within the group, followed by observation of online activity, and finally the email interview process. As each line of enquiry uncovered new data, this informed how subsequent lines of enquiry should progress in order to focus ever closer on the case.

The case-study was conducted within a relatively short time-frame, and the volume of data generated through the email interview process was sufficiently manageable to enable the researcher to proceed with analysis of the written responses of the student-participants using a hand-coding strategy. Focusing primarily on the use of collective versus individual phraseology in responses, the researcher was able to engage in triangulation with the predictions directly from the response texts employing the "constant comparative method" (Glaser & Strauss, 1967, p. 101).

4. Findings and Discussion

It was initially noted from the observations made in the F2F studio-laboratory setting that Alex appeared to be finding the experience uncomfortable, and was playing only a limited role within the group; this might have been interpreted as suggesting that Alex would not cope with group-work, thereby confirming one of the predictions (see P1 in Table 1). An alternative perspective was that simply playing even a limited role indicated a significant degree of success on Alex's part, and this clearly contrasted with the experience of Andrew, the undergraduate student whose case was described by MacLeod and Green (2009).

Subsequent observation of the group's online activity however, revealed that Alex was not only communicating with other group members via the blogging and discussion forum features, but had taken the lead in getting the group's online activities underway, as indicated by Alex's creation of the first discussion forum area in which the opening post was:

> Alex: *"I guess we should probably pitch ideas and things here?"*

Further evidence found in the e-portfolio system indicated that Alex had posted ideas of how to take the project forward, had left feedback on others' ideas, such as *"Hey, that's great!"*, and had uploaded concept artwork and other materials to which feedback was requested from other members of the group, asking *"What do you think?"*.

This cluster of observations ran contrary to a key prediction (P6) of how Alex might be expected to respond to feedback from peers (Benford, 2008; Twachtman-Cullen, 1998; National Autistic Society, 2010), and when this evidence was presented for rival interpretation, the expert witnesses confirmed this particular behaviour as highly unusual, leading one to suggest that this could be of great potential significance to the AS-research community, and worthy of further investigation.

A comparative analysis of the use of collective-inclusive phraseology in responses to the first email interview question, "Please describe how you have used *Mahara* in the…module", suggested that Alex appeared to value the facilitation of group-work afforded by the intervention, in common with the neurotypical-participants (NP):

> Alex: "*I've used it to keep in touch with other members of the group, and share work and information regarding our project*".

> NP 3: *"I have used Mahara to upload work I have done so that the rest of the team could access it, I have also used it to talk to the other members of the group and find out what we are all doing."*

Table 1. Illustrating the predictions, sources of evidence analysed, and correlation between predictions and evidence.

Predictions	Source of Evidence	Pattern-Match or Correlation of Sources
P1. Alex will be unable to participate meaningfully in group work	Literature Review, Expert Witnesses, F2F Observation, Observation of Online Activity, Email Interviews	**Negative** – according to literature and expert witnesses, Alex should have been unable to cope with group work, however observations and email interviews contradict this.
P2. Alex will experience difficulties dealing with social cues in F2F group situations	Literature Review, Expert Witnesses, F2F Observation	**Positive** – according to literature and expert witnesses, Alex should experience difficulty in dealing with social cues, and observations of Alex in F2F situations confirmed this.
P3. Alex's written word will be more eloquently expressed than spoken word	Literature Review, Expert Witnesses, F2F Observation, Observation of Online Activity, Email Interviews	**Positive** – all sources confirm that Alex demonstrates greater eloquence in written communications than in spoken and F2F situations.
P4. Alex will display anxiety and nervousness in F2F group situations	Literature Review, Expert Witnesses, F2F Observation	**Neutral** – Alex initially displayed high levels of nervous behaviour in F2F situations, as predicted by the literature and expert witnesses, however later F2F observations suggested improvement in this area, with signs of diminishing anxiety and increasing confidence in participation.
P5. Alex will not take the initiative in group-work	Literature Review, Expert Witnesses, F2F Observation, Observation of Online Activity, Email Interviews	**Negative** – according to the literature and expert witnesses, Alex should not take a lead in F2F group-work, however online and email sources indicate that the student has done so in non-F2F contexts, initiating new discussion threads and posting ideas for consideration by other group members
P6. Alex will not engage in the process of offering and requesting feedback from other group members	Expert Witnesses, F2F Observation, Observation of Online Activity	**Negative** – expert witness evidence suggests feedback is particularly difficult for learners with AS, however F2F observations indicate some success in overcoming this, and online observations highlight pro-activity in both offering feedback and requesting it.

While these responses indicate a commonality between the experience of Alex and that of the neurotypical-participants, the former's use of collective-inclusive syntax ran contrary to two important predictions (P1 and P5).

An analysis of the frequency of collective-inclusive versus individual-exclusive phraseology used in responses to the question, "Please describe how using *Mahara* has affected the way you have approached your work in the…module", suggested that Alex had engaged with and felt a part of the group, as indicated by the response:

> Alex: "*It's helped **us** to share files more frequently and easily than **we** could have otherwise done, without it, **we'd** probably have to send large emails or pass around pen drives all the time to keep **everyone** up to date, whereas with Mahara **we** can get the files to **each other** and update them a lot easier.*" (author's emphasis)

By contrast, the neurotypical-participants made greater use of individual-exclusive phraseology in their responses to the same question, as illustrated below:

> NP 1: *"It has had a fairly significant effect. Having to blog every week both refreshes the memory of what has been previously written and makes me think "What have **I** done this week and what will **I** do next week?"*

> NP 2: *"The main effect of using Mahara is that it alleviates some of the pressure of the course by reducing the volume of written work we have to do, which **I** have always considered to be one of **my** weaknesses."*

The findings above were derived from a case-study which has examined a single case of an AS-diagnosed undergraduate student. While it is recognised that a diagnosis implies certain common characteristics, it should be noted that each AS-diagnosed person is an individual with their own learning preferences, and that there can be no one-size-fits-all intervention which acts as a panacea (Twachtman-Cullen, 1998).

4.1. Further Research

The findings of this study would be strengthened further, and the validity of the single-case extended, if this research could be repeated with multiple cases, encompassing AS-diagnosed students at a range of institutions, and the research conducted by multiple researchers, thereby enabling alternative interpretations to be sought. Further to this, adopting a mixed methods approach and incorporating a quantitative longitudinal study designed to measure the impact of the intervention on academic achievement might also enhance the usability of these findings.

5. Conclusions

This investigation examined a key tension between pedagogy and legislation in the context of students with Asperger's Syndrome, and explored a TEL-based solution to the problem of enabling students with an ASC diagnosis to participate in group-work and to engage in collaborative learning. Although this investigation has built upon and extended the reach of previous research in overlapping fields, approaching the problem by introducing a TEL intervention appears to break new ground in this area.

The findings of the research suggested that by enabling group-work to take place both offline and online through the use of CMC tools such as e-portfolio systems which are commonly used in TEL settings, students with an AS diagnosis might be afforded greater opportunity to play an integral role as part of a team working on a group project as part of a course of study within higher education. As a result, academically-capable learners who might otherwise have found themselves unable to complete a course of study might be facilitated opportunities to work alongside neurotypical colleagues, and enabled both to more completely fulfil their potential, and to make the transition from study environment to workplace.

While this intervention appears to have application for the development of guidance for professionals working with individuals diagnosed with AS, and to inform best practice within the HE sector as an inclusive strategy to transcend the tension between contemporary pedagogical practice and current legislative requirements, the implications for the wider world of work through embracing this approach have the potential to dwarf those of universities and colleges. As industry and commerce embrace social learning and online collaborative working practices, it is possible that a TEL intervention could enable unemployed and underemployed AS-diagnosed individuals to use their unique talents and special expertise to become increasingly economically productive, and to experience greater inclusivity within society as a whole.

Conflict of Interests

The author declares no conflict of interest.

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Article

A Collaborative Action Research about Making Self-Advocacy Videos with People with Intellectual Disabilities

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Abstract
This article presents the results of a collaborative action research conducted with people living with intellectual disabilities (ID) who were going through a community integration process. To be successfully integrated into a community, they need to develop basic life skills as much as they need to learn to use mobile technologies for authentic interactions (Davidson, 2012) and to be self-advocates online (Davidson, 2009a). This study used the Capability Approach pioneered by Sen (1992) and Nussbaum (2000), which focusses on what people can do rather than on their deficiencies. I recruited a group of eight people with ID who wished to set goals, engage in developing new capabilities, share their goals and act as models for others with ID who want to learn to live on their own. In this article, I examine the process of developing self-advocacy videos with mobile technologies using the Capability Approach and I analyze the inventory of capabilities collected through this study. I provide recommendations for intervention through mobile technologies with the long term-goal of helping people with ID to become contributing citizens. I discuss the innovative action research methodology I used to help people with ID become self-advocates and take control of the messages they give through producing their own digital resources.

Keywords
Capability Approach; collaborative action research; community integration process; intellectual disability; mobile technology; self-advocacy videos

Issue
This article is part of the special issue "Inclusive Technologies and Learning", edited by Don Passey (Department of Educational Research, Lancaster University, UK).

1. Introduction

People with intellectual disabilities (ID) have always faced substantial daily challenges. Some of these challenges are related to the labeling of their condition, which is attributed to them by the very science that should serve them. People with ID live with their label and it takes over their lives, but very often they don't understand why they have been attributed this label (Davidson, 2009a). Other challenges are related to their difficulty with being autonomous, taking daily life responsibilities and making decisions for themselves (Brown & Percy, 2007). This is partly why, traditionally, people with ID were placed in institutions. Unfortunately, in these institutions, many were abused (Boulanger, Wieszmann, & Wolbert, 2010).

The United Nations Convention on the Rights of Persons with Disabilities (United Nations, 2006) marked an international paradigm shift in terms of how people with various disabilities should be treated with equality and included as fully-fledged members of society. At present, this convention is challenging for Asian, African and Latin American countries, because "there is no clear plan for improving the condition of the population with ID, though some aspects such as education have been recently addressed by a number

of countries" (Memari & Hafizi, 2015, p. 39). Some countries, such as Canada, have been at the forefront of inclusive policies with regards to the human rights of people with ID by ratifying the United Nations Convention on the Rights of Persons with Disabilities and by taking steps towards inclusive practices and better services for people with ID among other populations traditionally excluded from equal social participation (Canadian Association for Community Living, 2011; Council of Canadians with Disabilities, 2010).

In 2009, the province of Ontario, Canada closed the last remaining government-operated institutions where people with ID lived, and very few institutions remain in other Canadian provinces. Since then, some people with ID have been successfully living on their own and are being supported by community services or non-profit organizations. One such Canadian organization is LiveWorkPlay, based in Ottawa, Ontario. LiveWorkPlay's mission is: "Helping the community welcome people with intellectual disabilities to live, work, and play as valued citizens" (LiveWorkPlay, n.d.). To support this mission, everyone involved with LiveWorkPlay works with a core value: "People with intellectual disabilities are valuable contributors to the diversity of our community and to the human family" (LiveWorkPlay, n.d.).

While the context in Canada differs from other countries, the deinstitutionalization movement has freed people with ID from confinement, but the problems are far from over because the multifaceted quest for autonomy involves living independently (Canadian Association for Community Living, 2011; Lenk, 2006), having access to paid work (Canadian Association for Community Living, 2011; Davidson, 2009b) and taking part in a society that has adopted digital technology and where much of the information is accessible online and much of the interactions happen online (Corona, Hannum, & Davidson, 2014; Davidson, 2012).

Living autonomously commands several additional functionings, namely being able to sustain oneself in an economy where the cost of living constantly increases due to rapidly rising inflation, accessing goods online, being able to navigate governmental and paragovernmental services online through digital technology/mobile technology interfaces, and being able to engage in a workforce in which technology is pervasive. Unfortunately, people with ID do not have many positive role models to follow. In the current conjecture, people without ID create resources for people with ID to follow.

In order to address this multifaceted challenge, the imperatives of social justice require educators to develop new approaches in education with the population with ID. The *primary objective* of this study was to help people with ID to use mobile technologies to develop educational materials—that is self-advocacy videos that would allow them to share their authentic voice about the most significant accomplishments in their lives. A *secondary objective* was to study participants' authentic voices about the challenges and benefits that emerge when people with ID engage with mobile technologies while producing and sharing these videos.

2. Literature Review

This literature review provides an overview of the use of video-based interventions and the use of mobile technologies with people living with ID. The body of literature covers the use of digital technology to help people living with ID ranges from using specific devices to compensate for some sensory disabilities, to producing a variety of video-based interventions (VBI), to using technology as an aid to develop specific skills through a variety of pedagogical techniques. The literature we present covers VBI and mobile technologies for people with ID.

2.1. Video-Based Interventions for People with ID

When used in an educational context, video has been proven an effective tool to provide opportunities for learners who need to practice and repeat tasks before accomplishing them (Ogilvie, 2011). A substantial body of literature suggests that technologies can help improve learning for people who live with ID. Over the past decade, many researchers have studied the potential of video based intervention such as video prompting, video modeling, video self-modeling, computer-based video instruction and video priming, to help people with ID gain the autonomous and functional skills that they need to be fully integrated into society. These skills include, but are not limited to, making a purchase in a fast food restaurant (Mechling, Pridgen, & Cronin, 2005), reading grocery aisle signs and locating items (Mechling, Gast, & Langone, 2002), using public bus transportation (Mechling & O'Brien, 2010), developing purchasing skills (Ayres, Langone, Boon, & Norman, 2006), developing cooking skills (Mechling, Gast, & Fields, 2008), developing cleaning skills (Cannella-Malone, Brooks, & Tullis, 2013), developing employment skills (Goh, 2010; Mechling & Ortega-Hurndon, 2007; Van Laarhoven, Johnson, Van Laarhoven-Myers, Grider, & Grider, 2009), performing tasks with multiple steps (Mechling & Ortega-Hurndon, 2007) and learning to use mobile technologies (Hammond, Whatley, Ayres, & Gast, 2010).

In a review of empirical literature, Mechling (2008) points out that much of the research efforts using video have demonstrated that step-by-step instruction has a positive impact on the functional skills of people with ID. In addition, recent research has demonstrated that instructional video and video prompting tend to improve trainer behavior (Damen, Kef, Worm, Janssen,

& Schuengel, 2011; van Vonderen, Duker, & Didden, 2010; van Vonderen, de Swart, & Didden, 2010). Improving trainer behavior contributes to providing better pedagogical interventions for people with ID. Many of these researchers also suggest that as technology advances, it is becoming easier to use and more accessible, and people with ID are becoming more familiar with it. This is why VBI is considered such a sensible option when working with populations with ID.

Over the past decade, I have worked with populations with ID to help them speak up for themselves (Davidson, Leblanc, Leno, Clément, Godbout, Moldoveannu, Payeur, & Turcotte, 2004; Leblanc, et al., 2008; Davidson, 2009a, 2009b) and develop what they call "self-advocacy videos" (Corona et al., 2014; Davidson, 2009c; Davidson, Smith, & Naffi Abou Khalil, 2011). Typically, these videos are co-created and co-edited and participants make their own decisions as to which message they want to send, what they want the video to look like and where they want it disseminated. In general, most participants like to have their video posted on YouTube, with the option to co-moderate the comments, and they share the hyperlink on their Facebook timeline. They like to show what they are capable of doing to their community and read comments that either show an appreciation for what they do or applaud them for providing an inspiring message for people with ID.

2.2. Mobile Technologies for People with ID

In the past five years, researchers have been interested in the use of mobile technologies with special and underserved populations. In 2010, the Rehabilitation Engineering Research Center on Communication Enhancement revealed that there is a need to conduct research that will explore the efficacy of mobile technologies such as iPods and iPads. At that time, many small-scale initiatives were being conducted in schools and with service providers, and there was a need to understand how to better use these technologies to help people living with ID.

Since then, many studies using mobile technologies with people with ID have been conducted worldwide. A systematic review conducted by an international team has identified fifteen studies using Apple products (iPods, iPads and iPhones) in teaching programs for people with ID (Kagohara et al., 2013). According to their analysis, the results are largely positive in terms of the potential of these technologies to help people with ID develop better communication skills, engage in leisure activities, and develop employment skills and life transitioning skills. Their systematic review concluded that these mobile devices are mostly used for two purposes: delivering instructions through video; and teaching people with ID to operate the devices.

One recent study concluded that using instructional videos in which participants with ID performed user-interface tasks helped them use iPods correctly (Hammond et al., 2010). Another study concluded that using iPhones to send video captions when participants were lost was an effective strategy to help them find their way back home (Purrazzella & Mechling, 2013). Similarly, Kelley, Test and Cooke (2013) showed that the use of picture prompts with iPods for pedestrian navigation had a positive effect on travel route completion for people with ID (Kelley et al., 2013). A study has suggested that the combination of some forms of VBI, such as video modeling with iPods, has proven to be a useful strategy to teach communication skills (van der Meer et al., 2011) to people with ID. Another similar study has suggested that video modeling with audio and iPods was an effective tool to teach adults with ID to use automated teller machines (Scott, Collins, Knight, & Kleinert, 2013). Notably, all of these studies focussed on the step-by-step approach to instruction and the classic approach to creating VBI for people with ID.

In one recent study I conducted with people with ID (Davidson, 2012), I used classic VBI, such as video prompting and video priming with iPods, to help participants develop functional and independent life skills. The videos were created in-house to meet the needs of the participants as stated by their intervenors, a process that I validated in an earlier study (Davidson et al., 2011). After using the videos for a period of ten weeks, I conducted a focus group during which most of the participants deemed the videos to be useful, and made suggestions for improvement. When I asked them in which of the areas of needs they would like to improve in the future, they were mostly interested in learning how to use the iPods for entertainment purposes instead of using the iPods to develop functional skills.

This is why some researchers invite caution when using mobile technologies (Arthanat, Curtin, & Knotak, 2013; Selwyn, 2015)—they suggest evaluating mobile technologies critically before adopting them, and to avoid using them because they are trendy. Nonetheless, in the context of research with populations living with ID, Kagohara et al. (2013) mention that mobile devices have become socially accepted and they are less stigmatizing than traditional assistive technologies used by people with ID, which constitutes a good argument to exploit them with underserved populations.

One possible avenue to avoid the pitfalls related to using mobile technologies is to position the participants in the role of the producers of knowledge, rather than in the role of the consumers of knowledge. This partly justifies the underlying objectives of this study, which were to help people with ID produce educational resources in the format of self-advocacy videos in which they share their authentic voices about the most significant accomplishments in their lives, and to study how participants voice the challenges and benefits that emerge when people with ID engage with mobile technologies while producing and sharing these videos.

2.3. Capability Approach

In this study, I adopted the Capability Approach pioneered by Sen (1992) and Nussbaum (2000). The Capability Approach focuses on what people can do rather than on their deficiencies. Developed by Amartya Sen (1992) and Martha Nussbaum (2000), the Capability Approach provides a valuable framework for thinking about pedagogical interventions and research with people with ID. This approach, which has been used in several research domains such as education, social sciences and psychology, is characterized as a framework by which we can "focus on what people are effectively able to do and to be" (Robeyns, 2005). This can be contrasted against both a "deficit model" which emphasizes the lacks from which people suffer, and a "social model" which tends to locate disability exclusively in the structure of the social environment (Terzi, 2005).

A central distinction in Sen's (1992) approach is between functionings and capabilities. Functionings, for Sen, are a fundamental category; they are the "beings and doings constitutive of a person's being"—examples of functionings would include being joyful (a being), or travelling to work on the bus (a doing) (Sen, 1992, p. 39). Capabilities, however, are individuals' potential to act in certain ways—in other words, capability is the power and freedom to enact functionings. The fundamental premise of Sen's Capability Approach is that, insofar as it is possible, one should aim toward the equalization of the capabilities of all individuals. This aim towards the equalization of capability applies equally to people living in poverty and to people with ID. Notably, the agenda for the development of capability should be chosen democratically in consultation with the people (e.g. people with ID) who are wishing to develop their capabilities (Terzi, 2005, p. 209).

This framework encompasses several central ideas about freedom of action and choice. According to the Capability Approach, having the possibility to *choose* what one can do as opposed to doing *only* what one can do is a fundamental freedom that we should focus on in studies on disability. This agency is difficult to develop since people with ID tend to face some challenges in converting resources—that is educational or material, into functionings. In the face of these challenges, the Capability Approach poses a normative question: How should educational resources be structured and delivered such that the capabilities of people with ID are equalized with others? In the case of people with ID, this equality of capability is a "regulative ideal"—we are not under the illusion that perfect equality in this regard is going to be brought about. Yet, insofar as it is possible to close the capability gap, it is worth working toward this outcome.

The study that I conducted was closely linked to the Capability Approach in a variety of ways. First and foremost, although I collected data about how people with ID engage with mobile technology, the study also aimed toward social transformation—specifically, it aimed to help people with ID develop and share their own capabilities. Second, in accordance with the democratic demands of the Capability Approach, participants identified relevant capabilities for development. The collaborative action research design, described in the next section, allowed participants both to identify relevant capabilities, and to develop those capabilities. Third, I rejected both the deficit model and the social model of disability. Although both of these models highlight the importance of the situation faced by people with ID, I worked with the premise that the most informative way to consider the situation was in terms of developing freedoms "to be" and "to do" with the help of mobile technologies, rather than merely locating deficits in the person or in the social environment and using VBI to help bridge the skills gap. The production of self-advocacy videos, in which people with ID speak up about successes in their lives with the help of tablets, was consistent with freedoms "to be" and "to do". Henceforth, because I adopted the Capability Approach with mobile technologies, it required a new approach to producing VBI for this study. Instead of analyzing participants' needs, identifying a knowledge base, breaking it down in steps, and packaging the information in the format of videos to be used to fill knowledge and skills gaps, I used iPads to let participants self-film, and engaged them in a collaborative video creation process.

3. Methodology

In keeping with the Capability Approach, the data were collected through a three-stage action research process during which participants used mobile technologies to produce self-advocacy videos to share their dreams and to speak about the accomplishments that were relevant to their situations. We recruited eight people living with ID for a purposive sampling. Two females and six males who strived to live on their own, secure paid employment or become integrated in the community were recruited through face-to-face events such as the LiveWorkPlay annual general meeting and through connecting online in social networking platforms. The participants recruited for this study were similar to participants I worked with in past studies and were representative of the population of people living with mild and moderate intellectual disabilities.

I used an iterative action research methodology, which was comprised of three steps: a planning phase, an action phase, and an evaluation/reflection phase. During the analysis/planning phase, I gathered preliminary data through informal interviews to help me identify what participants wanted to voice in their self-advocacy videos. The purpose of this step was to work with participants to identify a set of capabilities they wished to discuss either because they were anticipat-

ing the development of the underlying functionings or because they wanted to share their functionings to highlight their capabilities.

The action phase was two-fold. First, I showed participants how to self-film on iPads and they were able to make draft recordings to say whatever they wanted to share about their functionings. Second, we collaboratively produced self-advocacy videos using iPads according to the perspective the participant chose. I then validated the content with participants by viewing the videos with them and making necessary corrections. The decision to use iPads was informed by the fact that for a minimal investment, these tablets have embedded high definition camera lenses that provide 1080p full high definition video stabilisation, the native video editing software is effective, the transfer of video onto a laptop computer is easily done, and participants were not intimidated by the technology because it is so commonly used. Moreover, an iPad mounted on a tabletop tripod is not as invasive as a professional video camera mounted on a full-sized tripod.

To prepare for the evaluation/reflection phase, I published the videos on YouTube because this video-sharing website features playback capabilities from any platform (Microsoft Windows, Apple operating system and Linux) in a good quality format (H.264), the settings can be public, unlisted or private according to the participants' decision, comments can be moderated before being posted, and videos can be embedded into Facebook, which was used by all our participants. I created a YouTube channel specifically designed for the study, which allowed me to share the videos with individual participants, and allowed them to use a private hyperlink to show it to people they trusted, which helped inform their decision about the privacy settings they wanted. This is how videos were disseminated through various channels that belong to the community of people living with ID, where people could contribute comments or read comments. I conducted a focus group with participants to ask them if they were satisfied with their self-advocacy videos, what their perception of the online comments were, and if they thought these videos could be used as pedagogical resources to help others either develop capabilities and underlying functioning or understand more of what they were capable. I considered it important to ask these questions during a focus group for several reasons: 1) participants would be able to view each other's videos collectively; 2) participants would benefit from hearing the testimonial of the person who was the co-producer of the video; 3) participants would be able to provide their reactions to the video, which consists of peer validation of the content; and 4) participants would be inspired by the accomplishments of others.

Elements of co-production were present throughout the three phases of this action research. During the analysis/planning phase, participants were entirely responsible for the decision process about the topic of their videos. During the action phase, participants had time to experiment with self-filming using iPads and were given the opportunity to decide on the best approach to shoot their video footage. We watched the footage together and decided which segments were most important and how they might be presented to communicate the message efficiently. Video montages were completed in my laboratory and the participants were given YouTube hyperlinks for personal viewing, and for sharing with people they trusted if they wished to get another person's opinion. The people who had the hyperlink were able to post comments on YouTube, which provided a form of validation to the participants prior to the focus group where they received their peers' feedback. The participants were also able to make changes after the focus group, and to validate these changes prior to posting their final videos on YouTube.

3.1. Description of Procedures and Data Analysis

The data from the three phases were transcribed and analyzed using open-coding and axial coding, as suggested by Strauss and Corbin (1990), to find emergent themes. I used qualitative analysis software that allows coding and retrieving data directly from text and other sources of multimedia data such as video recordings, and I annotated the sequences of the video with particular verbatim.

The focus groups in the evaluation/reflection phase involved participants in data collection, and the analysis and interpretation of the data, a participatory approach suggested by Chevalier and Buckles (2009) that is congruent with the democratic emphasis of the Capability Approach. Such focus groups were deemed successful with this population several times (Davidson, 2009a, 2009b, 2010; 2012; Davidson et al., 2004; Davidson et al., 2011; Leblanc et al., 2008). One of the projects I conducted with participants from LiveWorkPlay has been identified as the only project of its kind in Canada by a group of researchers who published a meta-synthesis of action research involving people living with ID worldwide (Stack & McDonald, 2014). According to Stack and McDonald (2014), very few projects of this kind are classified as high on the continuum of shared power, but they are worth conducting because "they reflect the value of including people with disabilities in matters that affect them and generate benefits for people with disabilities and for research" (p. 83).

Some participants wished to reveal their real identity, while other participants preferred to keep their anonymity, which is why some participants are referred to by their real name, while others are referred to with a participant number. To be consistent with the Capability Approach, which focuses on developing functioning, I deemed that the scope of the audience of the self-advocacy videos was not an issue. I considered

that allowing participants to be self-advocates and talk about what they were able to do was a functioning worthy of mentioning without having to post it publicly. If the videos were posted publicly, it is because it is part of the culture at LiveWorkPlay to post participants' achievements. Some are posted within private networks, while others are posted publicly on their personal Facebook page. Some are featured in public events and in the media.

While the analysis shows what each participant has done individually for each phase of this action research, the focus group data were aggregated to present as a whole in order to protect the anonymity of participants who did not wish to be identified. The hyperlinks to videos are provided for only those participants who wished to reveal their identity. Again, to be consistent with the Capability Approach, I considered that being able to judge what could be posted publicly in social media, what should be kept private, and the varying degrees of public versus private life were important functionings that participants had to develop. While the study did not revolve around the issue of public versus private information, we discussed it at length to make sure participants understood the stakes and were able to make the decisions themselves. The LiveWorkPlay employees were helpful in that regard.

4. Findings

Findings are presented following the three steps of the action research I conducted. First, I examine the process of developing self-advocacy videos with mobile technologies using the Capability Approach in the planning phase. Second, I describe the action phase, which provides an analysis of the inventory of functionings and capabilities collected through the self-advocacy videos. Finally, I report on the data generated about the capabilities through the evaluation/reflection phase.

4.1. Planning Phase: Initial Interviews

The planning phase was done through initial interviews where I met with the participants to discuss functionings or capabilities they wanted to focus on in their videos. Most participants were excited to share a wide range of activities and events that were going on in their lives. The aggregated results of initial interviews are presented to give a sense of the wealth of functionings participants wished to share with the world and their capabilities in terms of political engagement, competitive sports, doing art and having paid jobs.

4.1.1. Political Engagement

Two of the eight participants were engaged politically in advocating for the rights and the needs of people with ID. Cooper was active in local/regional politics in trying to speak up for affordable housing in the city of Ottawa. He mentioned: "My number one [priority] is affordable housing. If there's a meeting with Paul Dewar or the City of Ottawa, I'm in for that for sure."

Participant 2 was active in local and provincial politics and she was involved in several self-advocacy movements including being President of People First [city], then being President of People First [province], being on the executive of the Disabled Women's Network, being a member of the [province] Council of Persons with Disabilities, and being on the Inclusive Design Committee of the Human Rights Museum in Manitoba. When I interviewed her, she was heading to a conference in Washington DC. She explained: "the purpose of the conference is based on the Article 19 of the UN Convention on the Rights of Persons with Disabilities on living in the community and there's going to be people from all over the world. I love to network with other people. I'm looking forward to networking with other people and stuff. The theme of the conference is Achieving Inclusion Across the Globe." During the interview, she mentioned that she had spoken in several academic contexts including the Global College at the University of Winnipeg, the Red River College in Winnipeg and the University of Manitoba. In addition, she revealed: "I co-authored a chapter in a book. I even had the privilege of being co-director of a movie!"

4.1.2. Competitive Sports

Three of the eight participants were competing in sports. During the initial interview, participant 5 mentioned: "I'm in Ottawa Special Olympics here, and I'm in swimming. Yes! And I'm in soccer also. Ottawa soccer team with Special Olympics." Competitive sports led him to travel for international competitions. He was proud to say: "We competed in Perth (England) this summer. Yes! We just did a bronze this year against the team I used to play on, yes." As far as his preferences go, he thought highly of both sports: "My favorite sport? I'm gonna say both [laughter]. It's hard to choose. Soccer is for summer and swimming is in the Fall-Winter sports."

Participant 3 was also involved in a competitive swimming team and he often travelled for competitions: "I've taken the bus trip to New Hampshire, the bus trip for the cruise. A long time ago, I went to Sand Piper by plane. The Nationals in Manitoba was by plane. Sometimes I take the bus to the Provincials. It's a coach, but this one I last went was by Via Rail, but there was a CP [Canadian Pacific] strike so I had to take the bus." While talking about his swimming schedule, he mentioned that he kept track of the details through online communication with the organizers of the swimming team and with his friends: "My friend just emailed me. If I click on this email, you can see that I emailed him. He did get my email. Next Friday there

will be no cafeteria at the YMCA. It will be closed because of the holiday and that means that he and I are going to eat elsewhere before our workout."

Participant 1 mentioned receiving the Duke of Edinburgh's Award for a variety of physical accomplishments: "I did work for three years to get the award. I did physical like I did gym at the Y, I did workouts, ran on the treadmill and it was a good experience and it helps you with your social skills and giving good to the community." When explaining his interest for physical activity, he stated: "I don't play sports. I kind of do, but like looking to try some sports just for a change. Like kickboxing. I'm looking to do some pursuit in that. I haven't tried it. Because…just for something new. A new physical challenge."

4.1.3. Doing Art

Two of the eight participants found pleasure in doing art. Caroline, who had a lot of experience with drawing and painting, volunteered in a senior home. She explained: "I was not teaching them, but I was just giving them company. I did flowers with them like paper flowers and I drew with someone else. Yeah I enjoyed their company. Yeah. We laughed and had fun." With regards to drawing, Caroline stated: "[I do art] quite often. I have these markers that I use. It relaxes me. [My ideas] just come up. I love colors. I didn't color that in yet." She mentioned she liked doing digital pictures on her phone: "Well, I do a drawing and I take a picture on my smartphone and I show people on Facebook the drawings." She showed me how she did it: "Open my phone. I go to my apps. I'll go on Facebook. I'm looking through my phone. I go into my pictures. I go to photo then it says upload, choose from gallery. I go there and I post it." When I asked what motivated her to post pictures on Facebook she responded: "It makes me feel good. It makes other people happy. They put 'Oh it's nice!' They put thumbs up. Things like that."

Participant 4 described similar sentiments with regards to his art: "It's fun. It's relaxing, you know. It gives you more energy. You relax doing a brush stroke. In Chinese brushing my art teacher is Heater McDonald." He explained: "I've been also doing art with Debra for fifteen years. I enjoy doing that 'cause I love doing it. She taught me good steps and wonderful steps and she's a wonderful artist. She teaches it."

4.1.4. Having Paid Jobs

Five of the eight participants had a paid job, which they thought was playing a very important function in having a fulfilling life. Cooper, Ryan, Participant 3, Participant 4 and Participant 5 all had paid jobs that they were very serious about. Participant 4 worked at the Canadian Mortgage Housing Corporation (CMHC): "I work for CMHC eighteen or seventeen years ago. I'm feeling really proud to go to work. Makes me happy again. I feel great about myself. I'm glad I'm returning to work on November 23rd. Where I work at CMHC, I do photocopies and I deliver the mail and I feel great about it. I could share one thing is that I'm really proud of my career award." Cooper worked in a credit card company's mailing room, but he was so busy with life that he didn't think it was such a big deal. He mentioned that work had been part of his routine for years and that it was something he could handle without any problem. As for Ryan, he was really happy to be employed at The Works. He explained: "I've worked in other places before, but this is the first job that they know about my disability and they accept me for who I am." Participant 5 also worked at The Works, but he had another job. He said: "I have two jobs. First I work at the Barrhaven Manor in Barrhaven and I'm housekeeping. It's a retirement home living. Yes. The Works is a gourmet burger joint in Barrhaven. I work there on Tuesdays and Thursdays. I've worked there since August 8th 2011." When I asked him how he felt about his two jobs, he declared: "I love my two jobs. They keep me busy. I've been working at the Manor on Monday, Wednesday, Friday and the other…before I went to The Works my days off were Tuesday and Thursday, so I had too much time on my hands at home resting so that's why I need to work—to keep busy." Participant 3 also worked at The Works. When talking about his job he said: "I really did a good job at my job at The Works. I did such a good job! They like having me there! I clean there. This is my third year. I've been getting really good at it." When I asked him why he liked it, he declared: "It has really good pay since you get to work overtime on public holidays. Also they help me with my music. They arrange music so I can get the work done quicker. They have something that's run by a computer satellite. Yeah because changing compact discs takes too long so they figured this playlist helps me get the work done faster."

From the participants' viewpoints there were so many exciting things happening in their lives that it was challenging for them to find the one capability that would be the focus of their self-advocacy video. The fact that these participants were already involved in a social integration process explains the variety of activities they were involved in. The capabilities they mentioned were intertwined with several functionings. The fact that all the capabilities that were mentioned by participants when thinking about self-advocacy videos fell into four categories, namely political engagement, competitive sports, doing art and having paid jobs, speaks to the importance of such functionings in their lives.

4.2. Action Phase: Filming of Capabilities

During the filming sessions, participants had to make a decision with regards to the focus of their video. They

were aware that they would create the video footage with iPads. Some decided to self-film by putting the iPad on the table, but most didn't like the contre-plongée viewpoint it created. They preferred to set up the iPad on a piece of furniture or a chair where they could either talk to it or film their profile as they did something, whether it was having a discussion with me or perfoming an action such as playing guitar or showing their art. Some participants asked me to hold the iPad and film them. The following section lists the self-advocacy videos that participants created, and analyzes the underlying functionings and capabilities displayed by the participants.

Participant 1 wanted to do a video to talk about the Duke of Edingburgh Award that he had received. He self-filmed with the iPad and explained that he had worked hard to get this award and was proud of what he did, which seemed to be the main capability in his video: "I did workouts on the treadmill, I did community service….It helps you with your social skills and giving good to the community." Participant 1 didn't have time to complete his video, but he sent us some pictures of the award ceremony to add to the video, which is a form of digital functioning.

We filmed the video with Participant 2 remotely through Skype, which didn't involve the use of an iPad on her part. She talked at length about her involvement in various organizations. She had just returned from a conference in Washington DC: "We arrived Wednesday night and then Thursday morning we started the conference and there was a pre-conference for self-advocates so there were over one hundred self-advocates from thirty-five different countries across the world. I heard there were nine hundred people at the conference." She mentioned that, while at the conference, she had worked on a project and interviewed several people and hadn't been able to do much sightseeing. When talking about her political implication, Participant 2 explained: "A couple weeks ago, I got the privilege of meeting some MPs (Members of Parliament). About the cutbacks. The government cutbacks to the funding and about hiring people with intellectual disabilities."

When Participant 3 filmed his video, he had just moved into his new condominium and was excited to talk about his technological set-up and explain how he communicated with friends. To do his video, he asked someone to hold the iPad and film while he was talking. He explained how technology kept his home safe, how he used various websites to communicate with people, how he could fax documents directly to the Ontario Disability Support Program from his home, and how he connected a variety of devices for entertainment that could be remotely controlled.

Participant 4 talked about a variety of functionings in his video. In the first part of the video, he self-filmed with an iPad to talk about his work at the Canadian Mortgage and Housing Corporation. He said: "I feel great about it!" He wanted to share the career award he had just received. In the first minute of the video, we see his index reaching for the home button on the iPad to turn the recording off, a segment he thought of removing, but he later decided to keep. This "recording mistake" informed his decision about setting-up the iPad on a different angle and discussing a different topic when Project Capabilities went to his house to continue the recording. He displayed all of his work around the house and spoke confidently about the various media he uses and about the fact that he sold some pieces. He said: "It gives more energy, you relax and you are doing the brushstroke." As an artist, he revealed his creative process, which starts from drawing a picture in his notebook and painting a matching scene. He said: "The story is that I started drawing this one [pointing at a picture of a sunset] and it matches this one [pointing at a painting]. This is part of my plan, I draw it first and then I paint it." When asked about the meaning of his art, he smiled, crossed his arms over his chest and declared: "It feels good to do it. It feels good inside to do it. Yeah, I really have a passion to do this."

In the beginning of his video, Participant 5 self-filmed with the iPad and talked about a variety of functionings. He stated: "I would like to show my guitar, and see how I've been playing." In the second part of the video, he placed two iPads, one for the profile and one frontal, so that he could show others how he played. At the end of the video he said: "I love playing guitar because my passion is music."

Cooper decided to create a two-part video: Part 1 covered independent living: https://www.youtube.com/watch?v=Vj38MK2DlcY; Part 2 covered community: https://www.youtube.com/watch?v=bDqnyUcQZDU. In the video about independent living, Cooper self-filmed with an iPad to talk about who he was and why he was able to live on his own. He explained that he loved staying active, but insisted on talking about more important issues such as affordable housing in the City of Ottawa. He clearly stated that the biggest problem was to get people out of their parents' houses and into their own apartments. He said: "A lot of people are scared of living on their own, but they shouldn't be scared of living on their own." In the first part, he clearly stated five independent living tips: 1) Plan your meals once a week; 2) Keep a calendar; 3) Keep a budget; 4) Use a cleaning schedule; and 5) Don't be afraid to ask for help! In the second part of his video, Cooper self-filmed with an iPad and insisted on the value of community: "Community? Being…being part of community means a lot to me. A lot to me and community means, like just being…being with everybody and not being on my own."

For Caroline, art was always central to her life. Her video was a montage of various footage that had been taken over years: https://www.youtube.com/watch?v=

t5lIuY55VU0. What she added was an explanation that she spent time with elderly people to draw with them. She said that she did this to keep them company. She also asked the interviewer to hold the iPad to film her while she showed the process she used to share the digital drawings she created on her mobile telephone and on her tablet with her social network.

Ryan invited us to his workplace and asked us to film him with the iPads: https://www.youtube.com/watch?v=LevahXnP_4s. He spoke at length about his job: "I wanted to work at The Works actually and I saw they were opening one in Barrhaven. Matt and Joe came over to my house. He's an old job coach that we had and he came over and told me about The Works and there might be a position and he didn't want to tell me for sure just in case and then a few weeks later Jen called me and told me I had a job interview so I came here for the interview. I met with Dave and after I met with Dave we sat and talked and he gave me five days a week to start out with. I worked five days for a few months and then I found out that five is a little too much so I started working four days and then four was a little too much so I'm working three days and it's a great fit. I work three hours a day. From eight until eleven. Monday, Wednesday and Friday."

During the action phase, each participant had to find a way to create video footage about an important message they wanted to share. Given that they were sharing their capabilities naturally, without a written script, they had to find ways to be comfortable with the iPad as a recording device. Each participant asked for a treatment that made him or her feel comfortable. They spoke at length about their capabilities, which involved a variety of intertwined functionings. One participant insisted on participating remotely, because she felt comfortable with using Skype and because she lived far from Ottawa at the moment we conducted the study.

Notably, all participants focused on providing enough information about their capabilities and none was intimidated by the use of the technology. Another important salient point across participants is that while the capabilities they shared fell into various categories, namely receiving an award, being involved in various organizations, living independently, doing art, or having a paid job, there was nothing unusual about these capabilities compared to what brings life satisfaction to people living in the broader community. This is perhaps an indicator of how socially integrated the participants were. What was extraordinary, however, was how incredibly confident they felt about their capabilities.

4.3. Evaluation/Reflection Phase: Focus Group and Online Comments

During the focus group, participants saw the complete draft of their edited video. They were asked to comment about their own video and then the other participants were invited to join in a discussion. Five of the eight participants were present. Four participants were happy about their videos. One participant expressed his pride: "It's a video about living on my own. It's pretty good right?" Another participant was really enthusiastic about his video: "Well for me it's more interesting and hum…it's a really interesting story. My whole life, my own life. I've been through so much and that's why I love doing this and I have a passion for it and it feels great to do it….I don't want to change anything, it feels great!" A third participant said: "It feels pretty good to watch myself. I thought it was amazing." A fourth participant said: "It feels good. I think it's good."

When talking about Participant 3's video, one participant said: "I think it's cool that he has a fax machine. He can fax his own stuff." Another participant said: "The message is that he can live on his own. He can do his own things at home. Without his parents."

When talking about Ryan's video, one participant said: "I think it was good because it inspires me to get a job myself. It makes me feel like I won't give up. It makes me feel good and like to not give up on getting a job." Ryan responded: "And there's jobs out there!"

When talking about a video made by Participant 5, one participant said: "That's my favourite video! I like music too. I play the recorder…for fifteen years." Other participants said it was nice to hear him play his guitar.

While Cooper's video on independent living was playing, one participant declared: "That's powerful! You can do whatever you want. Just like Participant 4's video! Wow! That's a nice apartment or house." When asked for whom the message was powerful, the participant responded: "To the community. To us. To LiveWorkPlay." One participant added: "Well I was thinking more to people with disabilities. Or people that have been told they will never live on their own. This gives hope. And to do things. Like, I liked his calendar idea." Another participant approved: "Yeah his calendar idea was really great! It was a really good idea to keep a cleaning schedule." One participant explained: "It also gives you a powerful message like saying you can be on your own and not move in a residence, or not give up. Because sometimes I feel like giving up and going to a group home like where I have my own apartment, but I go for meals downstairs and stuff like that. But that gives a message that I can cook on my own."

Caroline criticized her video when she first saw it: "I made mistakes on it Ann-Louise. I don't talk loud. It's the way I talk. I don't know. I'm being silly maybe." When I turned the conversation to how others felt about the videos, everyone said they really liked the videos. When talking about Caroline's video, one participant said: "I think it's great!" Another participant said: "High five!" Caroline then explained her feelings: "I was disappointed that my video was not longer." She said she had more to offer, such as showing how she

uses her tablet to draw. She was given the opportunity to film more footage and to add that part to her video. She was thrilled to do it and we spoke at length about what it should look like. The interviewer edited the video with her on the spot and she immediately shared it on Facebook.

In sum, the participants perceived the focus group as a celebration of their achievements. Most participants were happy to view their video publicly and to talk about why the video was important for them. Those who were less happy about their video simply wanted to improve the content to give a more powerful message—a more representative account of how well they were doing. The group conversation was inspiring in all perspectives: for each participant (who received a validation of their video by their peers), for the other participants (who were inspired by their peers' videos), and for the group (who felt that collectively, they were on the right track).

Following the discussion, the participants decided whether they wanted their videos to be public. The videos were posted on a YouTube channel and shared with the participants online. The reactions of the community to the videos were overwhelmingly positive: the videos created a feeling of pride and hope not only within the specific LiveWorkPlay community, but also within the broader community of people living with ID.

5. Discussion

In this study, I approached the production of educational materials for people with ID from a different perspective than that reported in the literature of video-based interventions. The Capability Approach I adopted, which aimed to document functionings and capabilities, put the participants in the role of co-producers of videos and producers of local knowledge structures emerging from their community and their residential integration process. On the one hand, participants had difficulty in deciding what to focus on in their videos because capabilities involve a lot of functionings and many functionings are important. On the other hand, the functionings participants revealed all had overarching capabilities they wished to share with the community:

- For Participant 1, obtaining an award was a culminating point that showed him that he could reach his objectives if he worked hard every day and didn't get discouraged.
- For Participant 2, who had a busy life filled with many activities, her capacity to be a self-advocate seemed the main capability she was proud of.
- For Participant 3, technology allowed him to be fully functional, to communicate with others and to entertain himself, which were all part of living on his own.
- For Participant 4, having a good life was doing things that brought him happiness.
- For Participant 5, there were many functional aspects of his life, but the one that made him feel better was his passion for music.
- For Cooper, a community was an enabler of independent living, and independent living was easier when someone lived in interdependence with the community.
- For Caroline, creating art made her feel good, but being able to show it to her friends through technology and get comments also created positive feelings and feelings of validation.
- For Ryan, the variety of functionings related to having a job were also related to being able to live on his own and pay his bills, which was connected to having a more fulfilling life.

My findings are in line with Sen's (1992) and Nussbaum's (2000) work on the Capability Approach because they show how choosing what one can do, instead of doing only what one can do, creates freedoms in the form of capabilities. Working with this framework means that one will look not only at a person's functioning (activities, achievements), but also at his/her freedoms in terms of capabilities. Co-producing these self-advocacy videos with people with ID would not have been possible if they had not been actively involved in a process of social and community integration. At the same time, these videos were enablers of more capabilities by helping participants realize what they had already accomplished (through the process of developing positive messages for others) and by allowing others to be inspired by what they had accomplished.

Creating videos with the Capability Approach in mind required a shift in terms of who was the producer of knowledge, which significantly distanced this study from the literature on VBI. The body of literature concerned with using VBI with people with ID and the researchers who have been producing and studying the impact of videos that are accessible on mobile technologies deserve a lot of merit. There is certainly a population that needs these types of studies about the development of functional skills, as pointed out by Ogilvie (2011), Mechling (2008), and Hammond et al. (2010). The results of this study shows, however, that when involved in a process of community and residential integration, people with ID are able to reveal their own functionings and capabilities, which helps generate positive feelings, and can serve as inspiration for others with ID.

Seeing oneself on a video sometimes causes self-conscious reactions such as not liking one's own appearance or not liking one's own voice. This is why collaboratively producing the videos and validating them with a group of peers were both important aspects of

this study. Participants had a chance to see the footage and the edited videos and to re-do every step of the production if they were not satisfied. It was also comforting for the participants to know that their peers liked their video before they shared it online. Such collaboration in a shared power perspective did require more time and effort, but yielded better outcomes in terms of generating benefits for the community with ID.

With respect to the use of iPads, my findings align with several studies of people with ID that point to the potential of learning with mobile technologies (Kagohara et al., 2013). However, my findings differ from most studies because I used mobile technologies as a production tool instead of using them as a tool for delivering instructions or for learning to operate the device. The iPads were useful because they allowed the participants to take part in the production of the videos and to self-film, which was sometimes coupled with other footage. When participants self-filmed, I noticed that upon pressing the red button (the record button), they were ready to take a stand and speak up. This showed in the posture they adopted and in the fact that most of them took a deep breath before pressing the red button. iPads were used for this study because of their ease of use, but we could have used any other device with a front camera that allows self-filming.

6. Conclusions

This study revealed several benefits and challenges that emerge when people with ID engage with mobile technologies as co-producers of videos about the functionings and capabilities that underlie their community and residential integration process. There is no doubt that the three-step collaborative action research approach used in this study improved the relevance of the educational materials produced. The collective message that participants gave was clearly one of being able to lead satisfying lives and feel good about living, working and playing on a daily basis. Their other message was that when they see their peers succeed, it inspires them. One way of achieving this was through seeing self-advocacy videos related to functionings and capabilities created by their peers. This study provided insight into an innovative action research methodology that helped people with ID become self-advocates and take control of the messages they wanted to give by producing their own resources. With powerful mobile technologies so readily available and accessible, people with ID can and should produce their own educational resources.

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Conflict of Interests

The author declares no conflict of interests.

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Article

Developing Inclusive Technical Capital beyond the Disabled Students' Allowance in England

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Abstract
The Disabled Students Allowance (DSA) is a government grant for students aged 18 years and over in English Higher Education. Amongst other things, this grant supports the provision of traditional assistive technologies. In April 2014, the UK's Minister for Universities, Science and Cities proposed cuts to the DSA. Although a later announcement delayed these cuts until the academic year 2016−2017, a number of universities are already preparing alternative means to support disabled students. In this article, it is argued that cuts to the DSA will potentially reduce the cultural and technical capitals of students with disabilities and lessen social inclusion in Higher Education. In particular, less support will potentially lead to a reduction in the development of study skills. As a counter weight, this article proposes a new model of inclusive technical capital. This model originates in Bourdieu's theory of cultural capital and habitus. The proposed model supports the use of native apps and settings in ubiquitous mainstream mobile technologies. It also espouses the use of m-learning for the passive inclusion of students with disabilities. This article also presents the early results of a project on the use of mobile technologies at the London School of Economics and Canterbury Christ Church University. This project found that students with disabilities and their lecturers already used mobile technologies alongside or instead of customized traditional assistive technologies. The project also found that students preferred not to attend, or found it difficult to attend, separate study skills courses using mobile technologies. However, they were more likely to access m-learning tutorial materials on Learning Management Systems. The study concludes that mobile technologies have the potential to develop a number of study skills that are at risk after cuts to the DSA. However, their use in this regard needs further research and support from universities.

Keywords
assistive technology; cultural capital; disability; exclusion; inclusion; inclusive technology; m-learning; mobile technical capital; smartphones; tablets; technology

Issue
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1. Introduction

This article examines the potential effects of the removal of the Disabled Students Allowance (DSA) by the United Kingdom government from students in Higher Education (HE) in England. It focuses on the possibility of the diminution of vital technical capital in disabled students, and the effects that this might have on the development of essential study skills. The article uses Yardi's (2010) model of technical capital—i.e. the skills in the use of and knowledge on modern technologies possessed by individuals—and its effects on exclusion. This is a techno-sociological adaptation of Bourdieu's (2010) model of cultural capital. That is it applies Bourdieu's original model designed to social and cultural knowledge to delineate social status to different levels of technological knowledge to delineate educational and social status. Yardi's model was chosen as it was designed to promote equality of opportunity through access to technical development through education, and other forms of knowledge and skill development.

To counter balance the possible effects of diminution of technical capital in disabled students, this article introduces a model of inclusive technical capital. This model develops the argument that knowledge of digital technologies can assist social inclusion of disabled people, as such knowledge can help their education and employment status. This model is based on the philosophy and use of assistive features and applications (apps) in contemporary mainstream technologies. In this context, it proposes the use of mobile smartphones and tablets by disabled students as tools to develop inclusive technical capital. Such technologies, it is argued, are also becoming ubiquitous for disabled students and non-disabled students in daily life worldwide. Therefore, it is argued that inclusive technical capital can potentially increase inclusion in other social and cultural spheres, as it increases social status and supports financial independence.

In order to test its hypothesis, this article continues by providing the findings of a pilot project. This project was designed to provide training and support for disabled students in two UK HE institutions: the London School of Economics and Political Science (LSE) and Canterbury Christ Church University (CCCU). This training was designed using an adapted version of grounded theory, termed grounded methodology (Hayhoe, 2012a). Although this model and the pilot project were based in English institutions, it is argued that their findings have international relevance. Many other developed countries have similar equality legislation to the UK, such as the Americans with Disabilities Act (ADA) which was introduced in 1990. Many other countries are also finding their funding squeezed, or have to provide support through private means. Thus, the model developed in this article is also designed to be used in parallel models of training in Higher Education settings other than the UK.

This article is necessary as the skills that are required to access information, data and knowledge through technologies are vital for providing social inclusion in mainstream culture. Technology can also provide tertiary skills, such as communication, literacy and access to social benefits. Thus, a lack of access to accessible technologies places disabled people at a disadvantage and less able to access education, training, benefits, support, social status and democratic representation. In addition, despite the increasing importance of ubiquitous mobile devices, little evaluation has been conducted on their use by disabled students (Hayhoe, 2013, 2015a, 2015b). This paper therefore defines a need for the investigation and evaluation of effective mobile technology use during class, lecture, seminar and individual study sessions. In doing so, it also assesses whether such technologies have an advantage over customised traditional accessible technologies, such as custom zoom devices and adapted keyboards.

This article is split into the following five sections. The first section defines the research methodology, data collection methods and the stages of analysis employed in the study. This section also defines some of the key terms used in the analysis of the data. The second section analyses the introduction and development of the DSA, and theorises possible problems that may occur when it is withdrawn. The third section develops the model of inclusive technical capital, and its implementation through the use of mobile technologies as tools of inclusion and access to education. This section also introduces a hypothesis about its implementation. The fourth section tests this hypothesis through the final stages of the evaluation of a study skills course at the LSE and CCCU, designed to support disabled students. The fifth section presents conclusions and recommendations for further research and the design of systems, pedagogy and support.

2. Research Methodology and Data Collection

2.1. Methodology

The methodology employed during this study was an adaptation of Grounded Theory (GT) (Glaser & Strauss, 1967), termed Grounded Methodology (GM) (Hayhoe, 2012a). GM was previously developed to assess cultural inclusion of disabled students in mainstream and separate settings using the three coding phases of GT: Open Coding, Axial Coding and Selective Coding. Open Coding in GM is associated with identifying categories of behaviour, identity, objects or environments defined by the research. For example, in previous research on literature and the use of mobile technologies by disabled students learning environments were classified according to individual impairments (Hayhoe, 2013). Axial Coding in GM studies identify links between indi-

vidual variables, such as gender, ethnicity or educational level, associated with the classifications identified in the Open Coding. At the end of the Axial Coding a hypothesis is made. During Selective Coding, evidence is gathered to test this hypothesis.

GM absorbed the technical elements of constantly comparing GT data and refined the methodology as an ongoing process of analysis, design and activity in the design of pedagogy. As with GT, in GM all discussions information, literature and theory were also regarded as data. Thus it was felt that this flexible approach to data collection and pedagogical design would suit the study of a potential pedagogical model. In the implementation of this previous model, it was also observed that the methodology allowed problem solving strategies to evolve in response to restricted resources.

Unlike GT, in previous iterations of GM hypotheses and theories were not induced. Furthermore, although GT is usually associated with purely qualitative studies, GM is more accommodating to mixed analyses of qualitative and quantitative data. The core of the methodology uses three phases of study, as with GT, through which data is analysed to a point at which a hypothesis can be formed and then selectively tested. The analysis is cyclical, as the selective testing of the hypothesis feeds into the initial stage of a further study if needed.

A further difference of GM and GT was its treatment of data collection as narratives developed by the researcher in order to state an original problem (Hayhoe, 2012a). Thus, Open Coding was analogous to identifying the problems to be narrated, and the identification of significant events effecting the research environment. Thus, initial data gathering for Open Coding can involve selecting a representative sample of subjects and their social contexts. Axial coding is analogous to the author developing their own plots of the narrative, and examining its evolution. It is also the development of a framework of analysis. At the end of the Axial Coding, a hypothesis is developed that will be tested in the Selective Coding. Finally, in a single cycle of research selective coding is analogous to choosing the meta-narratives that put the sub-plots together to form a complete narrative and test a hypothesis. Therefore, selective coding often involves reinvestigating a new sample or selectively sampling according to interactions with others subjects in order to test a hypothesis.

2.2. Data Collection Methods

In this study, Open and Axial coding phases consisted of literature searches, using a model developed by the lead investigation in a similar study (Hayhoe, 2013). The analysis of this literature is presented in the following two sections. The Open Coding focused on data related to the structure of and research on the DSA. It investigated the nature and problems encountered with the introduction of the DSA, and research related to uptake and the success of the DSA. The Axial Coding phase selected and developed a model of analysis of possible solutions. These used a social rather than a medical approach, as both CCCU and the LSE stated in their policies on support for disabled students, that they supported the social model of disability (CCCU, 2014; LSE, 2015).

The Selective Coding phase initially evaluated the assistive features of Apple's and Android's Operating Systems (OSs) and a number of free note taking apps (for comprehensive results of this evaluation, see Hayhoe, 2015b). These findings were taken into a survey of students at the LSE and CCCU self-identifying themselves as being disabled. This survey was supported by a quantitative and qualitative on-line survey of teaching staff at both institutions, using a Qualtrics survey platform—the quantitative questions elicited multiple choices, which were recorded on a Microsoft (MS) Excel spreadsheet. The questionnaire and the courses that followed were conducted in accordance with the British Educational Research Association's (BERA, 2004) guidelines on ethical research, and were passed by CCCU's Faculty of Education's Ethics Committee. These guidelines included providing full informed consent to the participants and promising full anonymity. It was also acknowledged that both the LSE and CCCU funded the project, and their students and staff provided the data. Therefore, there may have been a potential conflict of interest. The questions forming the surveys are listed in Table 1.

During this stage an initial survey of eighteen self-identifying disabled students at the LSE and CCCU was conducted. These and a number of students were invited to participate in the survey through the relevant officers at the LSE and CCCU charged with supporting disabled students—exact numbers invited were not recorded, as the confidential relationship between support officers and the students invited was respected by those conducting the study. As this study was focussed on the DSA, only those students who would be potentially affected by the withdrawal of the grant were invited to participate. These students were identified by the learning support departments at both universities, as these departments were the first point of contact by disabled students. In addition, as this study focussed solely on the potential effects of the withdrawal of the DSA through the social model of disability, it was decided not to ask students about their specific disabilities or the strength of their disabilities. This point was emphasised recently by Oliver (2013), who emphasised disabled people should be evaluated according to their exclusion rather than the physical effects of their impairment.

Thirty four teaching staff who were aware of disabled students in their teaching groups at both universities were also surveyed. All teaching staff at both institutions were invited to participate in this study, via emails from departmental administrators and officers providing support to disabled students. In addition, the

survey was also advertised through all-staff newsletters at the LSE and CCCU. Unfortunately, as with the students invited to participate few took up the invitation. As only few students and staff responded, the findings were not statistically significant, and so no detailed analysis was conducted on these data sets. However, their answers were consistent enough to produce guidelines for the development of support and course development, and had a supporting role in the analysis. Discussions were also conducted between key personnel at both universities. This included those working with neuro-diverse students (mostly those working with learning disabilities such as dyslexia and dyspraxia), physical and sensory disabilities and learning technologies.

Table 1. Questions posed to students and teachers participating in initial surveys at the LSE and CCCU.

Teacher Questionnaire	Student Questionnaire
Q1 Are you aware of disabled students (such as visual or hearing impairment, physical impairment in limbs) or neuro-diversity (such as dyslexia, dyspraxia or dyscalculia) in your teaching groups? If yes, could you please name the disabilities or neurodiversities.	Q1 Which of the following smartphones or tablets do you own—you may choose more than one: (a) iPhone (b) Samsung Galaxy Smartphone (e.g. S5/S5) (c) iPad (d) Android tablet (e) Windows tablet (f) Other (g) I do not own one.
Q2 Do disabled students use the following specialist devices to access your materials or lectures: (a) Brailers (b) Hearing aids (c) Magnification devices (d) Hearing loops (e) None of these.	Q2 Do you use your device to study or to help you in the following activities—you may choose more than one: (a) Taking notes by myself (b) Taking notes in lectures (c) Sound recording a lecture (d) Video recording a lecture (e) Accessing lecture notes (f) Seeing or zooming into a whiteboard or presentation (g) Seeing or zooming into far away writing or graphics (h) Accessing recorded lectures (i) Communicating with your lecturers or fellow students about work (j) Communicating with your lecturers or fellow students socially (k) Researching information on the web.
Q3 Do you find difficulties using specialist devices in your lectures/tutorials? If yes, please state briefly what problems you have encountered?	Q3 Have you used or do you use the following specialist devices—you may choose more than one: (a) Brailler (b) Hearing aid (c) Magnification device (d) Mobility device, such as wheelchair (e) None of the Above.
Q4 Do any of your disabled or neuro-diverse students use mobile devices, such as smart phones or tablets (e.g. iPhone, Samsung Galaxy, iPad, Kindle) in your class to, for example, record your lecture, or enlarge text?	Q4 Do you tell your lecturer(s) that you use your device?
Q5 Do your disabled or neuro-diverse students ask permission to use their smart phones or tablets during lectures or tutorials?	Q5 Are your lecturers/tutors aware of your specialist device?
Q6 What do they record or read using their smart phone or tablet?	Q6 If the same function of your specialist device was available through your tablet or mobile telephone, which would you prefer to use?
Q7 Do you prefer it if students DO NOT record your lectures/tutorials?	Q7 Do you find your specialist device helpful or unhelpful when studying or attending lectures—please also briefly say how?
Q8 What materials are available to your students AFTER lectures?	
Q9 What materials are available to your students BEFORE or DURING lectures?	
Q10 If your students express a preference, do they prefer electronic or paper materials?	

3. Open Coding—An Analysis of Literature on the DSA

The Open Coding was initially focussed on the two questions: (1) *What issues led to the initial introduction of the DSA?* and (2) *Could these issues be re-imposed given the withdrawal of the DSA?* In an analysis of question 1, Riddell, Tinklin and Wilson (2004) discussed a significant expansion of UK HE from the mid-1980s onwards. This expansion also saw a growth in the number of disabled students attending universities, and therefore a growth in their potential development of cultural capital. However, the expansion of HE raised issues of access to facilities and support for disabled students, which had hitherto received little consideration.

In a survey of institutions' support of disabled students, Riddell (1998) observed that expansion often had a detrimental effect on students' well-being in this early era. This was the result of little consideration being given to the practical and social aspects of access to facilities by the management of universities, polytechnics and colleges. These problems were exacerbated from the start of expansion, as responsibility for support was devolved to universities, polytechnics and colleges by British government ministries. Consequently, little expertise existed in individual institutions.

Riddell also noted that disabled students were at greater risk of leaving their courses prematurely than their non-disabled counterparts in this early period of expansion. This was in part explicable as instructional technologies in this period were becoming increasingly pervasive in HE, yet were based on traditional platforms (Reiser, 2001; Reiser & Dempsey, 2011). These platforms were not designed with accessibility in mind and little thought was given to making their interfaces available through a range of media (Hayhoe, 2014b). Therefore it could be argued that this expansion posed a risk to the development and accumulation of technical capital by disabled students whilst at university, polytechnic or college.

After the election of a New Labour government in 1997, a number of initiatives were developed. These were designed to expand access to HE in the UK, and included the provision of support to those from low income households and under-represented social groups. These included disabled students (Riddell, Tinklin, & Wilson, 2005). In 1999, the Higher Education Funding Councils (HEFC) for England also published a report addressing issues surrounding access for disabled students (HEFCE/HEFCW, 1999)—in Wales, England, Northern Ireland and Scotland HE was and is funded and administered separately. The report developed recommendations for providing support and retention, and provided more coherent, homogeneous national standards of access.

In a later study of HE in England and Scotland, Riddell et al. (2004) found that institutions were increasingly developing policies to support disabled students (in the context of this study see, for example, CCCU, 2014; LSE, 2015). These policies included policies for providing access to the built environment and teaching—despite this more coherent approach, however, a gap was observed between policy and practice. In particular, many HE institutions made access the sole responsibility of relatively small support services rather than attempting to initiate whole institutional changes. Riddell et al. (2004) also observed that students found it difficult to accept a disabled identity or admit their disability at university, as they felt this would affect their intellectual identity. This made it difficult to identify their needs and provide support services. Furthermore, Riddell et al. (2004) observed that disabled students often found it difficult to socialise with and integrate themselves into the cultural life of their peers. This led to further pressures on students' well-being and social inclusion.

Viney (2009) observed that it was within this social and cultural environment that the DSA was first introduced into UK HE institutions in the early 1990s. This introduction came under the stewardship of the then Conservative government, during the early period of HE expansion. The DSA was and is a government grant for students who are normally resident in UK and in HE, and was administered by the various student finance agencies in the UK.

The DSA was designed only for students who studied on taught courses that were equivalent to degrees, or on courses that fed into degrees—undergraduate and postgraduate, vocational and academic. Its specification also included vocational undergraduate courses that were considered to be lower than normal honours degrees—such as Higher National Certificate/Diplomas and certain forms of General National Vocational Qualification. This provision also included foundation degrees—two year degrees which did not include an honours element—as well as full bachelors and taught postgraduate degrees. In order to claim the DSA, students have to fulfil the legal definition of disability, which is currently defined by the 2010 Equalities Act thus:

> You're disabled under the Equality Act 2010 if you have a physical or mental impairment that has a 'substantial' and 'long-term' negative effect on your ability to do normal daily activities….What 'substantial' and 'long-term' mean: 'Substantial' is more than minor or trivial e.g. it takes much longer than it usually would to complete a daily task like getting dressed. 'Long-term' means 12 months or more e.g. a breathing condition that develops as a result of a lung infection. (HM Government, 2014)

The DSA was designed only to provide non-medical support. It was particularly intended to finance the following four categories of support for disabled students (Stevens, 2013):

Specialist equipment allowance. This category was for the purchase of specialist equipment or software that was above and beyond what a non-disabled student would need to conduct their studies. This could include specialist assistive technologies, such as Brailers or specialist software, if these had not been provided previously. However, for certain forms of disability where students' impairments were better served by mainstream technologies, DSAs could be used to buy a laptop or PC—although this was only where the student could not normally afford a computer or had a low specification devise. This feature of the DSA was designed to support writing and research for writing.

Non-medical helper's allowance. This category paid for the employment of non-medical, educational support specialists. Outside of educational institutions, specialists were provided by health or social security agencies. Examples of specialists allowed under the DSA were sign language interpreters to support deaf students, and note takers and specialist tutors for students with dyslexia and dyspraxia. This category also included specialists who provided mobility support for those who used wheelchairs.

Travel costs. This category covered the expenditure of bus and taxi fares of students who had physical difficulties travelling to and from their institutions by what was considered to be normal means. This expenditure included the cost of specialist taxi or bus services for students who used wheelchairs or crutches, or who had forms of palsy.

General and other expenditure allowance. This category included incidental expenditure that was not included in the other three categories. Examples of this expenditure included photocopying notes for students with learning difficulties, and the photocopying enlargement of materials for students with low vision.

In relation to an analysis of question 2, a report by the UK's National Audit Office (2007) observed that disabled students as a whole obtained greater success on degree courses if they received the DSA. In particular, it was found that retention figures were significantly higher for students receiving the grant. Similarly, a report by the National Association of Disability Professionals (NADP) also observed that a significant increase in the number of HE disabled students was at least in part due to the uptake of the DSA (Viney, 2009). Furthermore, it was found that the introduction of the DSA also led to an increase in students declaring previously hidden disabilities—numbers of students declaring learning difficulties, mental health issues and multiple disabilities had especially increased since the introduction of the grant. However, it was unknown whether this increase was due to a genuine rise in numbers, more diagnoses or the increase in those who were willing to admit to having a disability—i.e. whether there was a cultural shift in understanding disabilities due to a criticism of the deficit model of disability.

However, other studies suggested that the ability to attain resources is premised largely on factors unrelated to students' disabilities. Research also suggested that the DSA was not always successful in targeting students who arguably needed it most. For example, Tinklin, Riddell and Wilson (2004) discovered that many disabled students were still reluctant to declare their disabilities. Often it was felt that for students to identify themselves as such would not fit their cultural persona—although it was observed that students were more likely to declare certain forms of what were felt to be more socially acceptable disabilities, such as dyslexia. Tinklin et al. (2004) also observed that because students had to apply for the DSA at the beginning of their courses, they were disadvantaged in this essential transitional period.

A later study by the same authors suggested that there was an improvement in the management of access in HE after the election of New Labour in 1997 (Riddell et al., 2005). However, despite initiatives to provide more equitable access, students who benefitted most were male, middle class and dyslexic—social class was largely felt to influence their decision to declare their disability. Therefore, they benefitted most from the DSA. Riddell (1998) also criticised the previous liberal management of support for disabled students. She found that it was often based on the individual good will of academic staff and managers, without substantial resourcing from the institutions themselves.

Given this analysis of the two questions that were the focus of Open Coding, the manner in which the proposal to reduce the DSA was analysed in order to identify the timeframe of a potential solution to its withdrawal. On the 7th April 2014, the UK's Minister for Universities, Science and Cities proposed cuts to the DSA, starting in the academic year beginning September 2015 (Clark, 2014). After this period, student welfare would again be the responsibility of individual universities and colleges, who were also legally liable for continued inclusion. This decision received significant criticism from the national Students Union (Morgan, 2014). They argued that cuts to the grant were against current thinking on inclusion in HE.

After a change of minister and representations from university management and student groups, the original decision to repeal the DSA was postponed for a further 12 months. This move was designed to provide universities and colleges with extra time to prepare their responses to the changes and design inclusive practices.

In a ministerial statement of the 12th September 2014, the then new minister of state, Clarke, made the following statement in mitigation of his decision:

> I am determined to ensure that a university education is open to everyone who can benefit, including disabled people. Where disabled students need support, they will have it—whether from universities discharging their statutory duty or through the Disabled Students' Allowances, which I have decided to retain [for 2015−2016]. (Clarke, 2014, p. 2)

In analysis of the Open Coding as a whole, it was observed that the DSA had some impact where students self-identified as being disabled, and where resources were provided as a result of the DSA. Thus it was decided that the Axial Coding should identify a solution based on social inclusion over physical or learning impairment, again in accordance with the social model of disability. In addition, it was felt that support should focus on socially accessible and inclusive technological solutions for overcoming the withdrawal of technologies purchased with the DSA. This potentially gave rise to a model of inclusion that would allow a greater number of students than those currently claiming the DSA, who were largely middle class. The following section discusses the resulting model of inclusive technical capital in part response to the proposed cuts to the DSA. This model was based on a theory of inclusion based on class and technology, that of Cultural Capital (Bourdieu, 2010). The resulting model proposes that existing and increasingly ubiquitous mobile technologies may at least play a part in counteracting any subsequent, potential exclusion.

4. Axial Coding—An Analysis of Technical Capital

The Axial Coding was focused on a question, *What social model can lead to greater social and cultural inclusion in HE, and possibly negate increased financial and physical capital?* It was decided to found this model on Bourdieu's model of social and cultural capital as a foundation, as for Bourdieu (2010) capital was multifarious and not just financial. Beyond traditional Marxist approaches to capital accumulation (Marx, 2011), Bourdieu argued that it was not just material wealth that caused division between humans. For Bourdieu, accumulation also included social and cultural capitals, such as access to education, artistic tastes, accent and language. These comprised a complex yet subtle societal distinction. For Bourdieu, a person could be financially poor, but if he or she had accepted tastes and pronunciation they could be regarded as having high social and cultural status.

Bourdieu (1990) also ascertained that social and cultural capitals were acquired through agencies such as the family, peer groups and institutions more than financial capital. Moreover, unlike financial capital and material accumulation, social and cultural capitals were unlikely to change or be lost during life course. They were therefore more secure capitals for those that possessed them. Bourdieu described the process of accumulating these intangible capitals as the internalisation of subconscious habits. He named this concept habitus and defined it as the "principles which generate and organise practices." (Bourdieu, 1990, p. 53)

In the context of health analysis and psychological learning behaviour, habitus has been defined as being internalized traditions that lead to cultural practices (Lizardo, 2004; Swartz, 2002). Habitus can thus be regarded as deep seated, internalized structures of cognitive understanding beyond more formal systems of language—i.e. it is our unspoken codes. This approach seems particularly relevant to an analysis of inclusion in the education of disabled students. As habitus precedes the learning objectives of formal education (Swartz, 2002), lacking habitus of basic study skills—such as note taking, developing graphics, structuring writing and conducting web searches—can potentially exclude students from educational success. For example, Hayhoe's (2014a) case studies on blind people's use of the Internet to search for art works observed that lack of success led to negative social identity. This in turn led them to believe that they could not or had little capacity to learn through this medium. Similarly, cultural capital also comprises the accumulation of conscious knowledge on the prevailing culture. This includes knowledge on the use of and access to prevailing technologies (Bourdieu, 2010).

The habitus of study skills can also lead to the development of cultural capital in other aspects of education too. This can be said to reinforce this habitus in more traditional forms of learning and develop the social identity of a student as one who can learn (Hayhoe, 2014a). This process thus becomes cyclical. For example, knowledge on the use of technology can be defined as cultural capital. For students who are visually impaired or dyslexic, for example, technology may allow them to develop the habitus of accessing audio format books. This in turn can make a visually impaired or dyslexic student develop cultural capital, such as knowledge from the contents of the book. This process becomes a recurring practice, and allows the student to develop the identity of a knowledgeable and successful student. This fulfilment continues to develop technical capital in order to reinforce a habituated social identity, and the principles of learning.

Bourdieu's discussion on different forms of capital has been criticised by theorists for being too rigid, deterministic, and lacking social evolution (Alexander, 1995; Chaney, 1996). Furthermore, Lamont (1992) argued that Bourdieu's general observations were too subjective and full of generalisations. Similarly, Fowler (1999) noted that many writers found his views par-

ticularly Franco-centric. He also argued that Bourdieu overlooked the irony of members of the middle class aping the habitus of the working classes by, for example, erroneously deriding high culture. However, Seale, Georgeson, Mamas and Swain (2015) and Seale (2013) find that forms of capital can often support social inclusion through education in technological skills—often referred to as digital capital. Bourdieu (2010) argued that it was through such forms of education that the practice of studying individual fields of education can become part of the viewer's social identity. This academic social identity was subsequently referred to as a field of study or knowledge, which resulted in further development of habitus and cultural capital. This in turn demonstrated the practice of a person applying their cultural capital within a given epistemological field. Bourdieu formulated this process in the generation of action or practice as follows:

> [(habitus)(capital)] + field = practice (Bourdieu, 2010, p. 95)

Taking inspiration from Bourdieu's theory of cultural capital, Yardi defines technical capital as: "the availability of technical resources in a network, and the mobilization of these resources in ways that can positively impact access to information and upward mobility." (Yardi, 2010, p. 1). Technical capital is thus used as an instrument to analyse social network interactions, and the ability of people to function and develop cultural inclusion. This use of capital also increases the potential development of further capitals, such as social and financial capitals. This is due to the ability to work online, allowing users to access certain forms of education, apply for certain types of employment and talk with people who may further their social status. For example, Brock, Kvasny and Hales (2010) found that the use of on-line social forums designed specifically for black women enabled its users to culturally empower themselves. This form of communication, they argued, would have otherwise been unavailable to them without technical capital.

This analysis led to two questions: (1) *Can the DSA increase the technical capital of disabled students?* and (2) *If it can, what could possibly happen when the DSA is removed?* In relation to question 1, inclusive technical capital was redefined in the analysis in relation to both Yardi's (2010) model of technical capital and Bourdieu's (2010) notion of cultural capital and habitus. It was defined as, practice using inclusive mainstream technologies to promote inclusion in forms of social, cultural and financial capitals through enabled habitus in education and training (Hayhoe, 2015a). A further outcome of inclusive technical capital was that it attempted to find alternatives to custom built traditional assistive technologies. In the context of inclusive technical capital, assistive technologies are defined according to Seale's broad definition of assistive technology that encompasses e-learning:

> [Assistive technology is] a subset of e-learning and specifically defined as any tool that supports and enables disabled learners to engage in the learning process and complete the learning tasks associated with this process. (Seale, 2014, p. 8)

Hayhoe (2014b, 2015b) argues that customised traditional assistive technologies, such as hearing aids and separate electronic magnifiers, do not promote inclusion for three primary reasons. Firstly, it is argued that they identify and draw attention to disabled students in educational environments. Secondly, it is found that they socially and culturally separate and exclude people with disabilities from those who are able bodied in other mainstream environments. This separation is similar to the mechanism by which students were sent to isolated environments up until the latter decades of the Twentieth Century (Hayhoe, in press). Thirdly, it is argued that some customised traditional assistive technologies, such as Braillers or technologies related to mobility, provide reasons not to include disabled students in mainstream education. This is due to the highly specialised nature of the skills needed to use these technologies and to train disabled students. For example, it is argued that this separation necessitates students' removal from lessons in order to provide separate training (Hayhoe, 2014b).

It can be argued that inclusive technical capital is applicable to students' use of new forms of mainstream settings and apps that have been embedded in modern tablet devices. Therefore, these devices lend themselves to redefinition as inclusive technologies—i.e. mainstream technologies that can be used by people with disabilities with little or no adaptation (Hayhoe, 2014b). These devices are powerful tools of social inclusion, have inclusive applications in educational settings, and are often used by students to create and share information (Hayhoe, 2013).

In relation to question 2, modern accessible digital technologies have helped to make literature, communication and knowledge available to disabled students (Baga, 2012; Chen, 2012; Gkatzidou & Pearson, 2009). In addition, software has overcome barriers to education through, for example, the audio description of books, re-colouring of text on screen, and representation of sound as text (Hayhoe, 2012b, 2014b). However, Hayhoe (2014b) also argues that such technologies have seen a paradigm shift, inevitably leading to a contemporary philosophy of inclusive technology. This has transformed systems' design to focus on accessible systems that are virtually indistinguishable from their mainstream counterparts. Examples cited of this technology are Apple's iOS, which claims superior accessible features blended into mainstream apps and func-

tions (Apple, 2015) and Google's Android OS.

This led the Axial Coding to develop a hypothesis based on two social issues. The first issue was that of reducing a need for traditional assistive technologies and the need for large amounts of financial capital. The reason for this decision was that traditional assistive technologies were not only expensive and thus financially prohibitive. This potentially decreased exclusion based on socio-economic class. Secondly, it was decided to develop a hypothesis based on the cost effective development of study skills used at the LSE and CCCU, based on existing resources and personnel. This potentially increased cultural capital through skills that were easily accessible to HE students as a whole. Eventually, the hypothesis formed for the selective coding phase of the project was:

> Students would find a course developing general study skills useful. A model based on three primary study skills—note taking, recording of lectures and mind mapping—currently used in these universities using technologies that many of them already own would be most useful. Students would also want to learn these skills by attending discrete study skills sessions once every two weeks, during lunch time, in order to lessen their need to make their disabilities known to non-disabled students. In addition, students would want to access materials online to support their sessions.

5. Selective Coding—The Development of a Course to Support Self-Identifying Disabled Students

The Selective Coding began with an initial analysis of apps and accessibility settings in the two most popular mobile operating systems, Apple's iOS and Google's Android OS—as stated previously a detailed analysis of this section of the study has been published in detail elsewhere (Hayhoe, 2015b). This evaluation observed that mobile technologies' accessible functions and apps were generally separated according to media and gestures. This was not apparently an issue with regards to the development of traditional technical capital and study skills.

Furthermore, as devices did not necessarily reveal the true identity of the user, they also allowed students to keep their disability anonymous and develop a socially and culturally ambiguous identity. These skills would thus allow the user to create, manage and swap information in a number of different formats with people of similar educational backgrounds. However, this could only occur if knowledge of their use was available. Therefore, it was thought that mobile technologies were potentially more useful as tools to establish inclusive technical capital if support was also provided. This appeared to support the notion that study skills should be based on sound recordings, visual enhancement and the physical access to mobile devices. It was felt that this reframing of traditional skills socially excluded disabled students with a number of strengths and types of disabilities. Thus, using these devices would be in compliance with the social model of disability, and thus the policies of CCCU and the LSE.

For example, iOS and Android allowed for text enlargement, colour reversal and saving and changing video files in order to increase their quality. It was therefore concluded that they had the potential to include disabled students in mainstream HE settings, where recording and researching didactic information was necessary. However, these observations were also unbalanced as a number of settings and functions in different devices varied significantly. It was felt that the quality and function of the technology in particular could also affect inclusion. For example, Android's native facilities allowed for audio recording, and organizing and sharing audio files whereas iOS's did not. Similarly, iOS had native apps that allowed for photo-negative images, time-lapse recordings and custom gestures. These functions were not available in Android. Therefore, it was concluded that specialists with knowledge of both systems could help attend to the most efficient usage.

The survey of staff showed that a strong engagement with disabled students and their customised traditional assistive technologies were needed. For example, 23 out of 34 teaching staff knew that they taught disabled students. Similarly, 19 of 34 teaching staff also stated that they had no problem using customised traditional assistive technologies, with only 6 expressing difficulties. Of the majority of traditional assistive devices seen by staff, 27 of the 34 were related to hearing impairments, and 7 teaching staff were related to visual impairments.

The staff survey also demonstrated that there was a noticeable shift by disabled students to the use of mobile technologies in order to develop study skills. For example, 31 staff members stated that disabled students used mobile devices. In this group, 26 teaching staff found that students asked permission at least some of the time to use these devices. There was also a positive response to this use, with 24 of teaching staff not objecting to recordings by students during lectures—although an additional 8 teaching staff stated that it depended on context.

The survey's results also indicated that there was a balance between disabled students using mobile devices to access existing materials and those to create their own notes. In particular, where disabled students used mobile devices in lectures and seminars 8 of 34 teaching staff stated that they were recording their own notes. Students participating in the course also appeared to be emphatic in their preference for mobile devices. In the initial survey, all students stated that they used mobile devices, with 8 disabled students us-

ing iOS devices, 5 using Android, 2 using Windows and 4 using other systems. Similarly, when asked if a function were available through a mobile device and through a customised traditional assistive device which would they prefer to use, all students stated that they would prefer using the mobile device. On the implementation of their own mobile devices, students most often used them to access, research and communicate information and materials from lectures. Recording was the least significant use of these technologies.

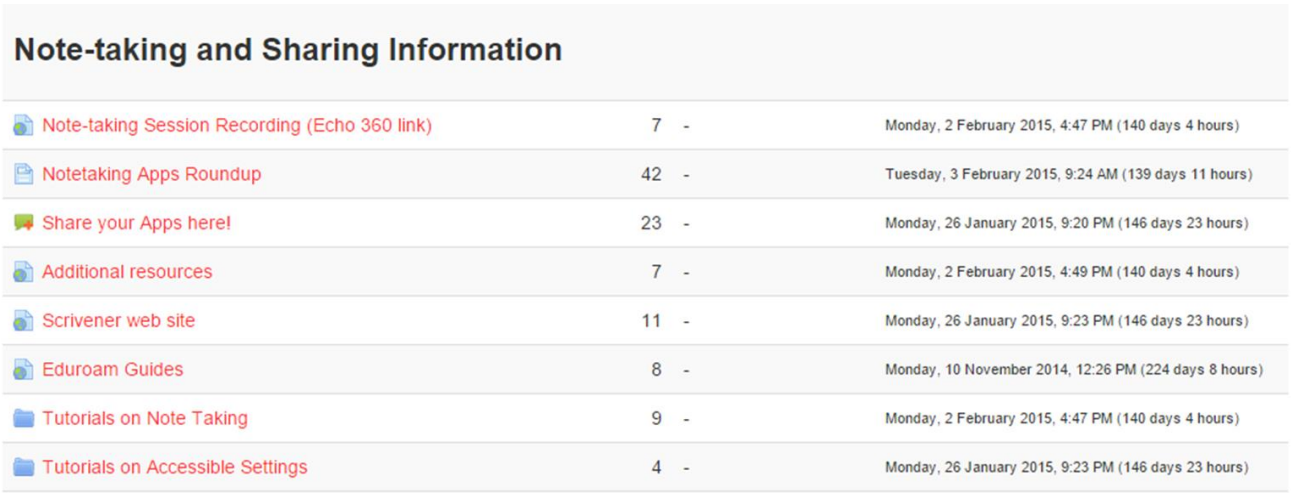
It was felt that the initial survey showed that the students and staff who responded preferred to use mobile technologies as inclusive devices. Similarly, conversations between stakeholders at the LSE and CCCU suggested that students would like a course based on study skills involving mobile technologies. It was also felt that students would prefer discrete sessions on specific study topics as a means of support. The discourse of staff in the meetings suggested that the most useful study skills were: accessing mobile settings, note taking, mind mapping and recording information.

The implementation of the course design was in two parts. The first part was a number of sessions run at the LSE and CCCU from October 2014 to January 2015. The second part of this phase was the uploading of teaching materials, tutorials and videos of the sessions on the LSE's Learning Management System (LMS)—although only LSE students could access this material. This was based on a Moodle platform. The third part of this phase was an evaluation by the students of the course, a measure of students' attendance and downloads on the LMS. Unfortunately, only 3 students participated in the evaluation—all were from the LSE. Therefore, their findings were insignificant and eventually not counted in the measurement of the hypothesis.

The observations of the course and the statistics that were recorded provided a relatively clear picture of preferences. At the LSE, 24 students registered on the LMS. Of these students, all but 2 accessed the materials independently. Materials were also accessed after the course and evaluation had finished. An example page of these statistics is shown in Figure 1. Conversely, attendance of classes was small and fluctuated at both institutions. During the note-taking, 10 students attended at the LSE and 5 students attended at CCCU. During the mind-mapping session, 6 took part at CCCU but only 1 attended at the LSE—although this could partially be explained by the emphasis on the use of mind-mapping in the extensive use of coursework at CCCU. Finally, during the video and sound recording session, 2 students attended at the LSE and 4 attended at CCCU.

Discourse from the students recorded during and after the sessions suggested that they did not attend at the LSE and CCCU for different reasons. At CCCU, where students had lower entry requirements and were more likely to be of British origin, students were happier to admit their disabilities—most students had dyslexia. Their stated reasons for not attending all sessions were that they clashed with lectures and that sessions were in a different location from their normal teaching campus. Conversely, students at the LSE, who were more likely to have higher entry requirements and to be international students, were less likely to discuss their disabilities. Of those that did, most again had dyslexia. One student at the LSE fed-back that she felt that separate sessions were patronising to her as a disabled student.

There was evidence to suggest that disabled students at the LSE preferred to access materials via an LMS rather than attend a separate course for students with similar educational needs. Statistics on access to the LSE's LMS also appeared to show a more varied image of preferences for training when they could access the training material independently. The most hit link was that on note–taking apps. In all three session pages, video recordings (Echo-360 recordings) of sessions were also on average more popular than the MS PowerPoint tutorials.



Note-taking and Sharing Information

Note-taking Session Recording (Echo 360 link)	7	-	Monday, 2 February 2015, 4:47 PM (140 days 4 hours)
Notetaking Apps Roundup	42	-	Tuesday, 3 February 2015, 9:24 AM (139 days 11 hours)
Share your Apps here!	23	-	Monday, 26 January 2015, 9:20 PM (146 days 23 hours)
Additional resources	7	-	Monday, 2 February 2015, 4:49 PM (140 days 4 hours)
Scrivener web site	11	-	Monday, 26 January 2015, 9:23 PM (146 days 23 hours)
Eduroam Guides	8	-	Monday, 10 November 2014, 12:26 PM (224 days 8 hours)
Tutorials on Note Taking	9	-	Monday, 2 February 2015, 4:47 PM (140 days 4 hours)
Tutorials on Accessible Settings	4	-	Monday, 26 January 2015, 9:23 PM (146 days 23 hours)

Figure 1. Example breakdown of statistics showing downloads of note taking materials.

The findings from the selective coding phase did not support certain elements of the hypothesis—although it should be emphasised that the numbers participating in the survey and the courses were so small that findings were not wholly reliable. Students did not attend the separate face-to-face sessions in large numbers, suggesting that their preference was not for separate support. This meant that there was little impact on the disabled student body's use of technology passed on through such support, and little impact on inclusive technical capital. Nevertheless, there was greater access of materials on the LMS, and downloads of the tutorials that were offered. These were also accessed at different times and in greater numbers. Furthermore, only 2 students did not access materials. Thus, it can be suggested that more anonymous sources of support and information are more likely to develop inclusive technical capital in future iterations of this project.

6. Conclusion

Technical capital is applicable to disabled students. Students with physical impairments and learning disabilities can find it difficult to access knowledge, but technologies can assist in reversing this problem. The proposed changes to the UK's DSA will undoubtedly threaten the development of technical capital, as it will reduce disabled students' access to technologies that assist study skills—for example, recording lectures to replay and study independently. Consequently, HE institutions are currently in a precarious position as providers of support for disabled students, and need to develop a coherent strategy. The development of inclusive technical capital for disabled students is also important in the development of social, cultural and financial capitals. Thus, cuts to the DSA may have consequences beyond HE.

One possible technical solution to cuts to the DSA is the use of ubiquitous technologies, particularly those that are increasingly used by disabled students. Mobile devices have come a long way in helping reduce technical exclusion, as their price has reduced significantly in recent years, and their interfaces are relatively easy to use. Furthermore, their developers are making significant progress in making popular mobile systems inclusive learning devices for disabled students. In addition, it has been found that new uses of existing apps and improvements to interface quality can provide significant improvements to accessibility.

The project reported in this article has made an attempt to co-ordinate an approach and theory of inclusion beyond customised traditional assistive technologies. Although the findings are not conclusive, largely because of the small sample involved, some findings provide pointers for future research, development for support and social inclusion. In particular, it would seem that students in this project preferred using mainstream mobile devices over traditional separate assistive technologies given the choice to do so. However, in common with students in previous studies of HE, disabled students were occasionally reluctant to identify themselves as having impairments. It was also difficult to time sessions to allow all to attend, therefore flexibility seemed necessary. This makes providing support for disabled students particularly challenging in HE. This would at least in part explain why students at the LSE were happier to join and access the LMS relatively anonymously rather than attend face-to-face sessions.

However, this model of inclusive technical capital needs further evaluation as a tool of design and support. For example, for practice to be enhanced, the environment of learning and habits/habitus that are developed at university need further identification. This would make its approach more sophisticated and identify individual students' needs. It also needs to develop a broad, culturally diverse body of theory in order to provide a co-ordinated response to the social exclusion of disabled students. Findings from the early evaluation of settings and literature in the open coding found that modern mobile devices can help in the useful development of inclusive technical capital. However, disabled students and those that support them must evaluate systems according to individual impairments and educational needs. They must also judge which functions are important given their personal context and environments.

Consequently, the most popular mobile operating systems still need to develop their functions in co-operation with all educational institutions and disabled students. Developers also need to standardise mainstream native apps and hardware for people with disabilities. In short, there needs to be an increasingly universal approach to design and inclusion. Furthermore, larger manufacturers need to make their mobile devices more affordable in order to evaluate their potential as tools of inclusion and cultural diversity. Only then will inclusive technical capital be attainable by the masses, and social inclusion become truly meritocratic.

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Conflict of Interests

The authors declare no conflict of interests.

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Article

How Pedagogy 2.0 Can Foster Teacher Preparation and Community Building in Special Education

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Abstract
This paper describes how one teacher educator used action research methodology to investigate the feasibility of using Web 2.0 technology to build a virtual professional learning community (PLC) in special education to support the preparation of highly qualified special education teachers. Study participants included 218 pre-service and in-service teachers who joined the virtual PLC over a four-year period. Data were collected using two Web 2.0 tools, wiki and Ning, and analyzed to evaluate the degree to which the virtual community met the essential characteristics of a PLC. The results showed that 200 of the 218 graduate students who joined the PLC as graduate students continued their membership after graduation but participated in community work as observers only, rarely if ever contributing anything to community growth and development. The implication of the results are discussed with respect to the importance of preparing teachers for service in today's modern 21st Century academically diverse, inclusive learning communities.

Keywords
pedagogy; professional learning communities; special education; teacher education; technology

Issue
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1. How Pedagogy 2.0 Can Foster Teacher Preparation and Community Building in Special Education

The mastery of pedagogy is of critical importance in the development of quality special education teachers (Blanton, Sindelar, & Correa, 2006), but the pedagogy learned in pre-service preparation will not take root in practice without ample opportunities to engage in a wide variety of course related field experiences and induction support during the first few years of teaching (Kozleski, Mainzer, & Deshler, 2000; National Council for the Accreditation of Teachers [NCATE], 2008). Field experiences and induction support play a vital role in the formation of quality teachers because both provide authentic opportunities to observe and practice what is known and being learned about the practice under the collaborative supervision and mentorship of teacher educators and experienced practitioners (e.g., Rosenberg, O'Shea, & O'Shea, 2006). When teachers with wide ranging levels of expertise engage in dialogue from inside the practice, the foundation is laid for the emergence of a professional learning community (PLC) that has the capacity to promote discovery and continuing professional growth for all involved (Billingsley, 2004). Work becomes the linchpin that connects research to practice.

The participation of teacher educators in school-based PLCs represents no small challenge for it requires them to step out of the safety of their own classrooms and into the realities of schooling (Bay & Parker-Katz, 2009) where the veracity of theory and research will surely be questioned and tested (O'Shea, Hammitte, Mainzer, & Crutchfield, 2000). Moreover, many schools employ only a few special education teachers at best and sometimes just one or two, which means it may be necessary to build multiple partner-

ships at widely scattered schools to satisfy students' field experience needs (e.g., Epanchin & Colucci, 2002; Jenkins, Pateman, & Black, 2002). This solution, however, is impractical in terms of time, travel, and institutional resources available for partnership building in the field (Conderman, Morin, & Stephens, 2005) but may also explain why many special education personnel preparation programs are disconnected from the realities of schooling, lack an organized approach toward linking pedagogy with practice, and have produced little research on the benefits of field experiences and induction support (Billingsley, 2004; Boyer, 2005; Jones, 2009; Sindelar, Brownell, & Billingsley, 2010). This paper reports the results of an action research project conducted to explore the feasibility of using Web 2.0 technology to design a virtual PLC to support the practice of special education and facilitate collaboration among teacher educators and aspiring, novice, and veteran special educators.

2. The Challenges to Community Building Field Experience and Pre-Service Preparation

Aspiring special educators cannot be adequately prepared for service without extensive opportunities to observe and practice with experienced general and special education teachers in a variety of educational settings that embrace the prevailing philosophy of inclusion (Blanton et al., 2006; Conderman et al., 2005; Epanchin & Colucci, 2002; Jenkins et al., 2002; Klingner, Lefwich, van Garderen, & Hernandez, 2004; NCATE, 2008). Some teacher education programs develop professional development schools to meet students' field experience needs (Klingner et al., 2004), but this approach does not offer the variety of experiences needed to be adequately prepared for service (Epanchin & Colucci, 2002; Jenkins et al., 2002). Others programs provide an office of field experiences that assigns students to schools and employs clinical instructors to supervise fieldwork (Cochran-Smith et al., 2012). This model, however, can result in a lack of quality control because there is no assurance that the practices observed in the field will match the pedagogy taught during personnel preparation (Epanchin & Colucci, 2002; Prater & Sileo, 2002, 2004).

Prater and Sileo (2004) conducted research on the use of clinical instructors to oversee field experiences in special education. They found that the average rate of observation was once every 46.5 hours for course related fieldwork and once for every 70.3 hours for student teaching. These results suggest that most of the responsibility for field experience supervision falls upon cooperating teachers who may or may not be adequately prepared for the task. The results also revealed that only 3% of responding teacher education programs required cooperating teachers to participate in any kind of professional development prior to supervision or to have more than one to three years of classroom experience. Thus, many aspiring special educators may be learning the practice from teachers who are not adequately prepared to serve as cooperating teachers and, as a result, may enter the field lacking the knowledge, practical experiences, and background needed to assume a competent practice (Bay & Parker-Katz, 2009; Billingsley, 2004).

The best method for ensuring a good match between the pedagogy taught in pre-service education and that which is modeled in the field is for teacher educators to develop field sites and supervise their own course-related field experiences (Epanchin & Colucci, 2002). This model is sometimes practiced with the help of a clinical experiences staff person and sometimes not (Prater & Sileo, 2002, 2004). Since most schools employ only a few special education teachers at best and perhaps as many as half of those are either novices in their first few years of teaching or out-of-field aspiring special educators (e.g., Boe & Cook, 2006), it can be very difficult to find enough quality field sites to meet every student's needs (Epanchin & Colucci, 2002; Jenkins et al., 2002). Moreover, research on teacher attrition in special education has consistently shown that the number of teaching vacancies that occur each year far outstrips the number of newly qualified graduates prepared to occupy those positions and that many of those who leave their classrooms each year are seasoned veterans (McLeskey & Billingsley, 2008).

3. Induction Support for Novice Special Educators

The chronic shortage of experienced special educators also affects the availability of induction support for novices in their first few years of teaching. Smith and Ingersoll (2004) found that only about 1% of beginning teachers receive any kind of induction support and estimated that the turnover rate among those who do not receive induction support at about 41%. Smith and Ingersoll also found that the largest reduction in turnover was associated with induction support that engaged novices into collaborative networks with more experienced peers. There is no doubt that isolation and a lack of access to professional development have an adverse affect on the retention of novice special educators (Kozleski et al., 2000), even those who are among the most competent graduates (Cochran-Smith et al., 2012; Jones, 2009; Smith & Ingersoll, 2004). On the other hand, novice special educators have a much higher probability of becoming tomorrow's veteran teachers if given access to a comprehensive, well-designed induction support program that engages them in collaborative networks with more experienced peers (Billingsley, 2004; Carr & Evans, 2006; Little & King, 2008). Yet, few programs have been developed that specifically address the induction of novice special educators into the profession (Boyer, 2005).

4. Developing a Collaborative Culture of Learning

Teacher isolation and lack of access to quality professional development highlight the need for building supportive networks among special educators at every level of practice (Boe & Cook, 2006), for it seems impossible to imagine how anyone can practice the pedagogy of inclusion and experience isolation at the same time (Hardman, 2012). Formal and informal networking breaks down isolation and facilitates continuing professional development by creating authentic forums for collaboratively thinking through problems with practice from inside the practice itself (Billingsley, 2004; McLeskey & Waldron, 2000; Smith & Ingersoll, 2004). Every special educator, pre-service to seasoned veteran, needs liberal access to (a) formal and informal networks of support (Smith & Ingersoll, 2004) and (b) quality professional development that is tightly focused on mastering the evidence-based practices (EBPs) that are known to bring about the most significant and meaningful changes in student learning (Billingsley, 2004; Kozleski et al., 2000). Professional learning communities (PLCs) can provide both (McLeskey & Waldron, 2000), but are difficult to realize in special education because the potential collaborators are usually distributed across multiple school sites (Hardman, 2012).

Special education is a student-centered practice that requires teachers to frame and re-frame their professional development needs as they critically reflect on their work and generate knowledge and beliefs about content, pedagogy, and the learning characteristics of the their students (Leko & Brownell, 2009; McKenzi, 2009). They must be "active and resourceful in seeking to understand how language, culture, and familial backgrounds interact with exceptional conditions to impact an individual's academic and social abilities, attitudes, values, interests, and career options" across all content areas, ages, and ability levels (NCATE, 2008, p. 73). This means that they must be as skillful at collaboration as they are at teaching (Blanton et al., 2006; Conderman et al., 2005). They must also claim active membership in not one but two PLCs, one with their school-based general education colleagues and another with their discipline-based special education colleagues (Leko & Brownell, 2009; McKenzi, 2009). Yet, the art of collaboration is difficult if not impossible to master in isolation or without access to quality professional development that is specifically designed to meet the needs of a student-centered practice (Billingsley, 2004; NCATE, 2008; Sindelar et al., 2010).

The challenges associated with community building in special education are only surface indicators of what appears to be a much larger problem; that is, isolation and limited access to quality professional development as teacher candidates matriculate through and exit their personnel preparation programs and assume their roles as teachers. Solutions may lie in easy to use and readily available Web 2.0 technology, a category of Internet tools that are particularly well suited for the purpose of community building (Hardman, 2012, 2014; Sindelar et al., 2010). Web 2.0 refers to the second generation of the Internet that differs from the original concept of the Internet as a one-way delivery of information by allowing users to move beyond passively absorbing whatever is posted on the Internet to actively participating in the creation of Web content (Schrum & Levin, 2009).

It is also important to note that PLC development is not well researched or understood because PLCs tend to be school-based and develop informally (McLaughlin & Talbert, 2006). Schlager and Fusco (2003) conducted a comprehensive review of the literature to identify the essential characteristics of PLCs but also described how each one might be enhanced using Web 2.0 technology to support community building. Given that Web 2.0 is made up of a collection of empty databases until individuals interact with them, its capacity for data collection presents new possibilities for research on PLC growth and development (Hardman, 2011, 2012). Thus, the purpose of the present study was to use Web 2.0 technology to design a virtual PLC and to observe its growth and development using action research methodology to analyze data collected from the community's websites. More specifically, data were collected and analyzed to address the following question: Can Web 2.0 technology be used to design a Web-based PLC that engages teacher educators and aspiring, novice, and veteran special educators in a collaborative effort to provide quality field experiences, induction support, and continuing professional development in the practice of special education?

5. Method

Action research is a type of applied research conducted for the purpose of finding solutions to problems teachers meet within their own practice (Dane, 2011; Leedy & Ormrod, 2016). It typically originates with an idea or a specific focus of interest and empowers practitioners as problem solvers by providing timely, targeted, pragmatic research procedures (Krathwohl, 2009) for improving the overall quality, impact, and rationality of the practice (Gall, Gall, & Borg, 2007). Problems related to practice are usually complex problems that cannot be resolved with a single action but require a succession of strategies that are implemented over time (Krathwohl, 2009). Action research is well suited for that purpose because it is self-reflective and cyclical in nature. Once the problem is identified, an implementation plan is developed. Data are then collected and analyzed through successive cycles of reflection, action, and evaluation with each cycle providing a better understanding of the problem as modifications are made to the implementation plan as indicated by the analysis (Gall et al., 2007).

6. Setting and Participants

This action research project was conducted at a moderately sized, private university (approximately 25,000 students) located in a large Midwestern metropolitan area. Approximately 1,500 graduate and undergraduate students were enrolled in the University's School of Education, working toward degrees in early childhood education, elementary and secondary education, physical education, bilingual/bicultural education, reading, and special education. Student teaching internships were managed through the Office of Field Experiences and Student Teaching and no formal induction support was offered beyond graduation. Placement assistance for field experiences was provided upon request but in most cases, it was the student's responsibility to find a field site where the cooperating teacher had a minimum of three years experience and was certified in the field in which he or she was teaching.

The idea for the study emerged when a teacher educator in special education attempted to integrate professional development in the Strategic Instruction Model (SIM, University of Kansas Center for Research on Learning, UK-CRL, n.d.) into her special education graduate level coursework. Neither she nor her students were able to find sufficient numbers of cooperating teachers who knew the model at all or well enough to supervise fieldwork. This prompted the teacher educator and a few of her graduate level pre-service educators to form the Strategic Instruction Network (SIN) for the purpose of developing a network of alumni who had begun their professional development in SIM as students and wished to continue after graduation by supervising fieldwork. Anticipating the many problems associated with delivering professional development at multiple schools simultaneously, the teacher educator solicited advice from a technology consultant in designing a virtual PLC using a wiki (www.pbworks.com) to provide a repository for professional development content and a Ning (www.ning.com) to support social networking.

Over the next four years, 116 pre-service elementary/special educators, 77 in-service special education teachers, and 25 general educators enrolled in the teacher educator's special education graduate level methods courses joined the SIN-PLC (N=218). Table 1 details the number of student participants who joined SIN by year and program of study. The pre-service educators were required to complete 15 field experience hours per course and the in-service teachers 10 hours per course. The in-service teachers could also complete their fieldwork assignments at their schools but this option that was not available to the pre-service teacher candidates. The pre-service program was developed for career changers pursuing dual certification in special and elementary education. Finding field sites was more difficult for this group because they were not teachers and had few or no school contacts. They were also sometimes enrolled in as many as three methods course during a quarter term, meaning that they were required to complete a total of 45 field experience hours in a short 10 week time period.

7. Data Collection and Analysis

Similar to school-based PLCs, the SIN-PLC was envisioned to be a democratically managed community that placed almost total control for community growth and development in the hands of its membership using Web 2.0 software to encourage communication, collaboration, experimentation, and innovation (Hardman, 2012). Action research typically employs the use of data collection procedures that are simple and unobtrusive in order to minimize interruptions to the practice (Krathwohl, 2009). Wiki (www.pbworks.com) and Ning (www.ning.com) provided the basic infrastructure for the virtual PLC but also supplied the data sources through which community development could be unobtrusively observed. Observing and describing community development also requires a framework to guide data collection and analysis. Schlager and Fusco's essential characteristics of community development (2003) provided the framework that guided data collection and analysis. The eight essential characteristic of community development are identified and briefly defined along with the corresponding data source(s) for each one as the results of the analysis are described below.

8. Results

8.1. The Practice

The practice lies at the heart of community work. Virtual PLCs use technology to support the engagement of every community member in the practice as opposed to addressing the individual roles of each member in isolation (Schlager & Fusco, 2003). The SIN-PLC was initiated

Table 1. Number of student participants by program and year.

Program	Year 1 2008/09	Year 2 2009/10	Year 3 2010/11	Year 4 2011/2012	Total
Pre-Service (Elementary/Special Education Teachers)	30	25	30	31	116
In-Service (Special Education Teachers)		24	33	20	77
In-Service (General Education Teachers)		15	0	10	25
Total	30	64	63	61	218

for the purpose of providing professional development in SIM's *Learning Strategies Curriculum* and *Content Enhancement Routines* (UK-CRL). Learning strategies define a set of skills students learn and use to acquire information from the printed word, organize and memorize information, solve math problems, express information in writing, and develop community building social skills. Content enhancement routines are instruction focused and direct *teachers* in ways to adapt and present critical content in a "learner-friendly" format to help students identify, organize, comprehend, and recall important information.

The SIN-Wiki provided a collaboratively built repository for professional development content in SIM (UK-CRL). The FrontPage of the wiki featured a Navigator bar down the right side of the page that worked like a table of contents and included folders for the *Content Enhancement Routines* and *Learning Strategies* learned in class. The Navigator bar also included *Sandbox* folders to provide a space where groups could collaboratively develop multimedia projects to share with the membership upon completion. Quick links located above the Navigator bar allowed users to create new folders or pages as needed, upload files they wished to link to existing pages, access their account information, or contact help. An editable SideBar was located below the Navigator with links to the *PBworks User Manual*, a *Wiki Tutorial*, and the SIN-Ning (Hardman, 2011, 2012, 2014).

The file upload page facilitated the organization and management of the wiki pages and folders and recorded the file name, format, and the date the file or page was last changed. As users interacted with the professional development content, the wiki's versioning capability created page histories that recorded any changes made to a page, the person who made the change, a description of the change, and the time and date the change was made. Users could also edit pages and revert to an earlier version if they wished. Wiki software also created Adobe formatted files of documents and pages that could be downloaded for personal use by anyone in the community. The teacher educator served as the wiki administrator and had access to a list of users that included a photograph, the date of the user's first and last visited to the wiki, the user's email address, and page view count (see Hardman, 2011, 2012, 2014, for a more detailed description of the SIN-Wiki).

The SIN-Ning provided a private social networking website. The Main Page included information about the purpose of the network, how to get started, a list of members and special interest groups, upcoming events, and a link to the SIN-Wiki. Each member was given a My Page when the account was created that could be personalized by selecting a theme and appearance from a wide variety of choices. Tabs located at the top of every page facilitated the website navigation and included tabs for the Main Page, Invite, My Page, Members, Forums, Events, Groups, Chat, and Videos. Users could also communicate with others within the community using their SIN-Ning email or by creating or contributing to a discussion on one of the special interest group pages. In addition, users could post upcoming events, initiate special interest groups, upload or link professional development content, share links to other websites, or blog about their professional growth and teaching experiences. The website also offered a directory of over 100 Apps that could be added to My Page as needed to enhance communication, productivity, collaboration, and knowledge generation (see Hardman, 2011, 2012, 2014, for a more detailed description of the SIN-Ning).

The original project implementation plan included a technology consultant to provide training and support for the teacher educator and her students, but the technology consultant became ill during the planning stage and was unable to continue. This left the teacher educator, who had no experience in website development, to design and administer both websites with little support from technology. Since neither website required expertise in website building to develop, this seemingly unfortunate turn of events proved to be asset rather than a liability because it allowed expertise in technology to emerge from within the community (Hardman, in press). When technology experts assume total responsibility for managing a virtual PLC, the membership tends to rely on those consultants to resolve any and all technology related problems (Farooq, Schank, Harris, Fusco, & Schlager, 2007). This creates an overwhelming burden for the few who assume total responsibility for the management of the community websites but more importantly, defeats the purpose of developing a democratically managed PLC (Hardman, in press).

8.2. Social Networks

Formal and informal social networks lay the foundation upon which PLCs are built (Schlager & Fusco, 2003). Ning software facilitated networking by allowing the membership to build smaller networks within the PLC by friending others, creating or joining special interest groups, or initiating and participating in forums and discussions within the community at large or special interest groups. The Really Simple Syndication (RSS) feeds supported networking by notifying each member via email when a comment was made on the member's My Page, a discussion post was made on the member's group page, or an event was posted be anyone in the community. The teacher educator modeled how the special interest groups could be used to enhance social networking by creating group pages for each of the strategies and teaching routines presented in face-to-face workshops during class. For each group created, she also initiated the first discussion and invited students to respond to that discussion or to initiate other discussions about the practice as needed (Hardman, 2012).

Table 2 lists the special interest groups that were

created along with the date the professional development content was delivered and the date each group was last visited. These results show that the number of members who joined a group (N=112) was far less than the number of SIN-Ning users at the time the data were collected (N=156). It is also important to note that the number of group participants does not represent discrete units of measurement in that some of the members joined more than one group. The groups with the most members were learning strategies that were to be implemented at a field site and those with the least members had no fieldwork requirement. The teacher educator created all of the groups as professional development content was delivered in class with one exception. A high school English teacher created the *Possible Selves* (UK-CRL) group to facilitate fieldwork at his school. His group was the most active of all the groups and his My Page accumulated the greatest number of friends with a total of 24. A few of the graduate students had 5 to 10 friends, but the majority had only 2 or less and rarely if ever made any comments on friends' pages, including the English teacher's My Page (Hardman, 2012).

8.3. Learning Processes

PLCs promote learning as a social activity that occurs in the context of work. New and less skilled members are inducted into the profession through dialogue about practice with more experienced colleagues (Schlager & Fusco, 2003). The SIN-Wiki provided the software needed to engage the membership in collaboratively tailoring the professional development content presented in class to meet their specific instructional needs as well as the needs of the community at large. For example, a student implementing one of the sentence writing strategies in a fifth grade inclusive general education classroom might modify and use the professional development content differently than would a student implementing the same strategy in a ninth grade special education resource room. All of the graduate students were assigned writer status when they created a wiki account, which granted access to the wiki's Edit tab. The Edit tab transformed the wiki into a group managed multimedia composition system that allowed users to edit pages, create pages, and upload a variety of content including documents, images, slides shows, and videos. RSS feeds further enhanced the wiki's collaborative functionality by notifying users via email when changes were made to any part of the wiki, summarizing the changes made, providing the date and time they were made, and identifying the person who made them.

The teacher educator prepared the graduate students to collaboratively engage in the creation and design of group projects by making small group assignments that were to be completed in the wiki's *Sandbox* folder. For example, after learning how to create class wide and individualized behavior management plans in class, small groups of four were then assigned to use what they had learned to develop behavior management plans on the SIN-Wiki. Each group was required to create a group folder in the wiki *Sandbox* and to use it to develop the plan asynchronously over a three-week period. Detailed instructions were provided on the wiki about what the plan was to include, but no class time was provided to work on the project face to face. Before beginning any work on the behavior management plan, the group was instructed to develop a team charter using the form depicted in Figure 1. They were to post the charter in the group folder and each group member was required to contribute at least five substantive revisions to or comments about the project to ensure that everyone participated in the development of the project.

Table 2. SIN-Ning groups by date last visited and number of members.

Group Name	Date Content Presented	Date Last Visited (m-d-y)	Number of Members
Question Exploration Routine	5-11	5-13-11	1
Concept Mastery	5-11	5-13-11	1
Classroom Management	2-11	2-20-11	3
Organizing Together	2-11	2-3-11	1
Course Organizer	2-11	2-3-11	2
Unit Organizer	2-11	8-14-11	1
Possible Selves	1-11	3-2-11	34
SCORE	1-11	2-16-11	12
Fundamentals in Sentence Writing	9-10	2-14-11	24
Proficiency in Sentence Writing	9-10	2-14-11	16
Word ID	9-09	10-14-09	17
Total			112

Note: some may be members of more than one group and the PI is a member of every group. Adapted from Hardman (2012). Copyright by the *Journal of Special Education Technology*.

Team Charter **Group Name**	
Team	(list names and contact information)
Timeline	● **Kickoff**: (start date) ● **Project Manager Assigns Tasks/Milestones and Due Dates:** ● **Project Due Date:** ● **Celebration**:
Team Charter	● **Team Member Skill Inventory** (Areas individual members can contribute/want to develop. Assign a role for each group member and define the duties associated with the assigned role. One person should be assigned the role of Project Manager.) ● **Learning Team Goals** (May include project assignment goals, group process goals, quality level goals, etc.) ● **Ground Rules** (Meeting schedule, locations, attendance expectations, agenda, assignment completion, communication methods, etc.)
Tasks/Milestones for Project Completion	(Describe how the assignment will be completed by the due date. List each task the person responsible, and the date by which the task should be completed)

Figure 1. Team charter.

Upon completion of the project, the team charters, page histories, page comments, and the project itself provided data sources for assessing the role each group member played in contributing to the team effort as well as what the students learned about creating behavior management plan. RSS feeds also allowed the teacher educator to view the project as it was developed and redirect the team effort as problems and misunderstandings emerged. For example, when the groups were assigned to create a class wide behavior management plan, the team charters indicated that two groups were proposing the use of a jigsaw approach. This meant that each group member would complete a part of the project (class description, rules, reinforcement plan, and monitoring system) in isolation without consultation from any of the other group members. A group technology expert would then collect and upload each part to form the whole when it was due. RSS feeds allowed the teacher educator to intervene in the execution of this faulty plan and redirect the group into using a more collaborative approach that involved everyone in all parts of project development.

8.4. Community Reproduction and Evolution

PLCs give voice to every community member in selecting and designing their own learning experiences as the community grows, evolves, and reproduces its membership (Schlager & Fusco, 2003). The SIN-PLC promoted this democratic model of professional development by giving equal voice to everyone in selecting and designing professional development content to meet individual needs. Members could develop or choose to participate in a special interest group on the Ning, share or select professional development events to attend from the Events calendar, develop or select professional development content archived on the wiki or Ning My Pages, and much more using the wide variety of over 100 Apps available on the Ning, such as file sharing apps, blogging apps, communication apps, Facebook, Linkedin, Delicious, YouTube, Vimeo. For example, the membership used the YouTube and Vimeo apps to publish group produced teaching videos that were videotaped during class and shared on the SIN-Ning.

Over the course of time, the teacher educator posted a total of 10 events to announce state and national level professional development conferences and provided registration information with the event posting. Since there was little or no response to these Event postings at first, she began using the *Network Broadcast* function to boost event postings with a network wide email. As a result, 26 SIN-Ning users attended the

broadcasted event, 19 of whom were current students who earned bonus points for attending but 6 were program alumni and one was a former student who had not yet graduated from the program. The high school English teacher also used the Events calendar to promote a field experience orientation meeting to be held at his school for interested pre-service educators. The event was well attended by 15 students who wanted to experience teaching in an inner city, alternative high school for students at high risk for drop out.

The SIN-Wiki recorded a profile on every user that recorded the number of page views per user and the first and last date the user entered the wiki. The page number views are presented in Figure 2 and show that a majority of the wiki users viewed the pages and files created on the wiki between 0 to 10 times (n = 87) over a short period of time that coincided with the dates at which the professional development content was presented in class and assignments were made to be completed on the wiki. Even though the data also show that 77 participants viewed the pages at a much greater rate (11−200 times), most of those page views also occurred as a result of course assignments. Data collected on the first and last visit to the SIN Wiki showed that only 24 of the 218 users revisited the wiki after the course was completed but prior to graduation, presumably to retrieve artifacts created during the course to include in their professional portfolios, submit with job applications, or reuse in their own classrooms. In one case, a graduate student in the special education for teachers program reported to the teacher educator that she implemented a science lesson plan in her first grade classroom that was prepared by a group of pre-service graduate students and posted on the SIN-Wiki as a group project.

8.5. History and Culture

PLCs develop and continually reproduce their cultural artifacts, norms, and values over time (Schlager & Fusco, 2003). Supporting the induction of new members into the history and culture of the practice from within the community was of particular importance in preparing the pre-service graduate students for practice and provided the impetus for the developing the project in the beginning. In fact, it was in collaboration with a group of pre-service educators that the idea for the project originated. They were the ones who stood to gain the most from the project because they had no experience teaching and had few or no inside connections to schools. The in-service and pre-service graduate students were enrolled in the same methods courses, but they were in different sections of those courses, which made arranging mentoring opportunities between the two groups difficult. The SIN-PLC filled that need by creating a virtual space where the two groups of teachers, in-service and pre-service, could meet and work collaboratively in the production and reproduction of the community's artifacts, norms, and values.

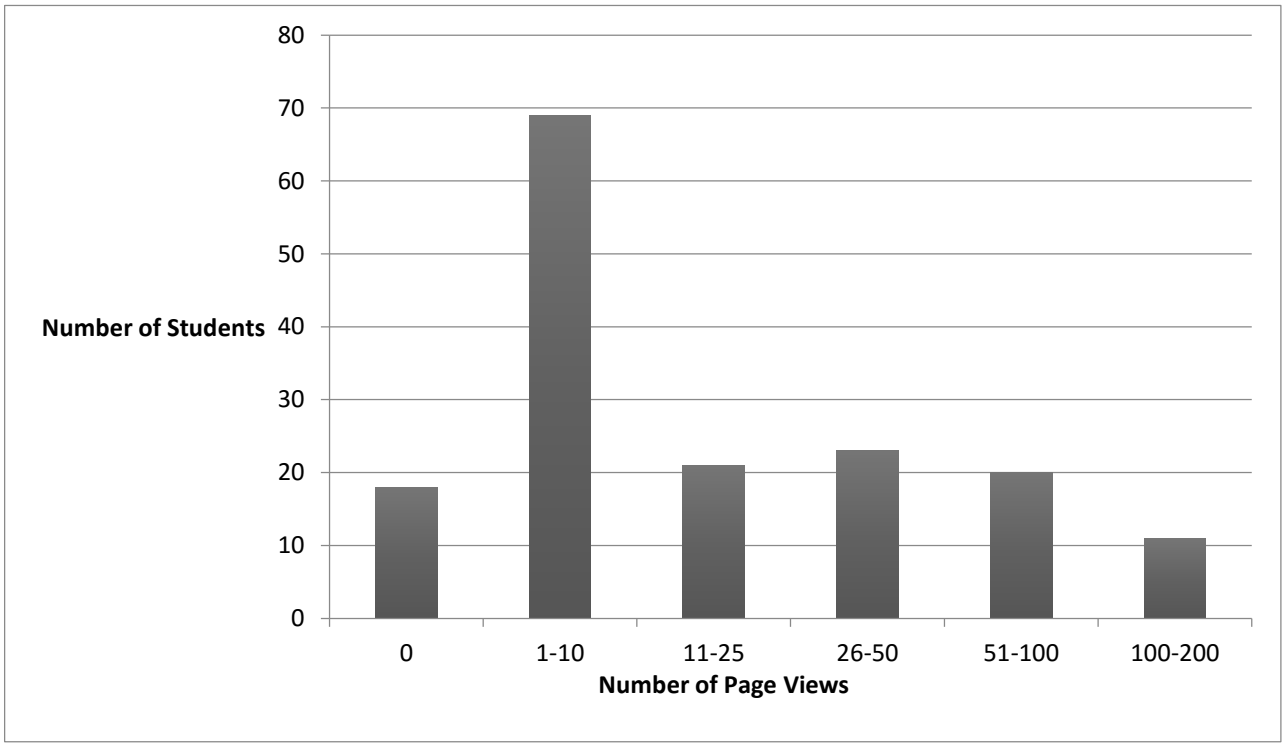

Figure 2. Number of page views per student. Note: these data were collected two years after the project ended at which time there were only 169 of the 198 program alumni who remained members of the SIN-PLC.

Since the involvement of the high school English teacher resulted in increased level of social networking (see Table 2, *Possible Selves*), the teacher educator created a *Making Connections* discussion board within one of the SIN-Ning special interest groups. She then required her 29 pre-service educators and 10 general education teachers enrolled in an online special education endorsement program to join the group and use the discussion board to introduce themselves to the group, describe their classrooms if they were teachers or their teaching interests if they were pre-service educators, and to post their contact information if they were looking for or could provide a field site at which to implement a strategy or routine. This assignment was followed up with a *Message Broadcast* to all SIN-Ning users inviting them to visit the group discussion board and consider supervising fieldwork for one or more pre-service educators. Within a two-week time period, all of the 29 pre-service educators were able to secure a field placement, with a vast majority finding a cooperating teacher through the SIN-Ning (Hardman, 2012).

8.6. Tools, Artifacts, and Places

Communication, productivity, collaboration, and knowledge generation depend on the production, reuse, and refinement of community's tools, artifacts, and places (Schlager & Fusco, 2003). As the community interacted with the professional development content, the practice, and each other, the SIN websites offered a variety of Web tools and a great deal of versatility with respect to the production, reuse and refinement of community artifacts. As the teacher educator presented professional development content in class, she made assignments that were to be completed on the SIN-Wiki and Ning to familiarize the community with the ways in which wiki and Ning might be used to collaboratively engage in the creation of professional development content to share with others in the community.

As a result of this effort, the teacher educator and her students created 607 files and 206 pages of professional development content on the SIN-Wiki and developed 44 teaching demonstration videos and 131 reflection blogs to share with the community on the SIN-Ning. Yet data collected from the wiki databases showed that no one returned to the wiki after the completion of course assignments to produce or refine artifacts. Moreover, data collected on the first and last visit to the SIN-Wiki and additions to members' SIN-Ning My Pages showed that no one produced, edited, shared or reused anything on either website after graduation or used either website to facilitate collaboration, communication, or professional networking.

8.7. Leaders and Contributors

A central aspect of community development is the emergence of leaders and contributors from within the community (Schlager & Fusco, 2003). In a democratically managed, virtual PLC, every member must also be equipped with the technical capabilities needed to take on a leadership role when needed and make meaningful contributions to community development. Leaders and contributors are needed to (a) identify important issues upon which to focus community work; (b) plan and facilitate community events; (c) link with others in the community and promote communication among members who have similar interests; and (d) negotiate the boundaries between the community and the school by ensuring community access to necessary resources (McLaughlin & Talbert, 2006).

Barab, Makinster, and Scheckler (2003) identified four levels of membership in virtual PLCs; *observers* who visit the site but do not contribute content or participate in online discussions, *active members* who engage in discussions but do not contribute professional development content, *contributing members* who pose questions for discussion on community forums and share content in the form of videos and other artifacts associated with teaching, and *bounded group members* who join the PLC as a part of a collective experience such as a teacher education class, professional development workshop, or similar experiences.

The majority of the SIN-PLC membership joined as bonded group members during graduate school and were pre-service teachers (n=116) seeking an initial licensure in elementary and special education. The remaining members were in-service special (n=77) and general educators (n=25) and were already a part of the school community to varying degrees of involvement. In the beginning, the teacher educator who initiated the project expected to assume sole responsibility for leading the community and contributing most of the professional development content, but she also used the community websites as tools to prepare the membership with the technical capabilities needed to become actively engaged leaders and contributors in a virtual PLC (Hardman, 2012). In spite of those efforts, data collected from both websites indicated that a majority of the SIN-PLC membership participated in community work as observers only. They did not produce any professional development content on the wiki or comment on any of the content developed unless they were directed to do so. They also did not use the SIN-Ning to share any of the artifacts or projects they developed on the wiki, create or respond to any discussion posts unless assigned, or volunteer to comment on contributions made by others (Hardman, 2012).

8.8. Membership Identity and Multiplicity

As leaders and contributors emerge from within the community, membership identity and multiplicity evolves over time as the membership uses technology

to build and manage their professional identities, find and collaborate with others according to their similar interests, and function in multiple roles from beginner to accomplished practitioner (Schlager & Fusco, 2003). Since the SIN-PLC began with only 30 pre-service teacher candidates, membership identity and multiplicity was a primary focus in the first few years of development (Hardman, 2012). The SIN-Ning My Page provided the venue for developing a professional identity, finding and building collaborative relationships with others, and functioning in multiple roles from beginner to accomplished practitioner. Ning users began the process of developing a professional identity when they joined the network by posting a profile on My Page that included the following information; current teaching status (in-service or pre-service teacher, general or special educator), contact information, grades taught or grades interested in teaching, number of years teaching, and the strategies or routines known and those they wished to learn.

Over the next four years, 218 pre-service and in-service special and general educators joined the network and all but 20 continued after graduation. The membership was increasing rapidly; however, most of them were novices with only one to three years of teaching experience at best. Nevertheless, it was expected that program graduates would update their My Page profiles and share their accomplishments as they completed their graduate studies and moved out into the field to begin their careers as teachers. Data collected from the SIN-Ning indicated that this did not happen. In reality, no one updated My Page after first joining the network, which made it difficult to determine what any of the participants had accomplished since graduation or who was teaching and where and who was not (Hardman, 2012).

8.9. Preparing Special Educators to Lead 21st Century Learning Communities

This study was conducted to develop a virtual professional learning community (PLC) to provide quality field experiences, induction support, and continuing professional development in the practice of special education. Successes were realized in the creation of a network of alumni to support the provision of field experiences for pre-service educators, but the capacity of the network to provide induction support and continuing professional development was still evolving when the project was terminated four years after it began. The results showed that over the course of the four-year project, the community grew in numbers, from 30 pre-service graduate students to 218, with only 20 students choosing not to continue beyond graduation. Numbers, however, do not tell the whole story.

Both PLCs and Web 2.0 technology require an understanding of teaching and learning as a highly active, socially engaging endeavor. It is a simple formula for effectiveness. One has to *do* something in order to *get* something. It became clear early on in the project that a majority of the membership was not favorably disposed toward actively engaging in their own learning or willing to do anything beyond meeting the course requirements as assigned by the instructor. It was as if they viewed teaching and learning much like the original concept of the Internet, a one-way street defined by passive consumption. The results of this study indicate that, for the most part, the membership either did not know how or did not see the importance of becoming active contributors, leaders, and collaborators in creating knowledge and building the community's collective knowledge base.

This outcome was concerning indeed, because we know that passive engagement in one's own professional development will not produce the level of pedagogical expertise required to address the widely varying instructional needs of students with disabilities across all subject areas, disability categories, grade and ability levels, and educational settings (Hardman, 2012, in press). Of even greater concern is what a passive approach toward learning may say about how teachers will view their own students as learners (Hardman, 2012, 2014). To maximize student achievement in an inclusive, academically diverse classroom, the classroom itself must function as a community of learners that is designed to promote the active engagement of every student in experiencing the joy of learning.

The fact that so many of the graduate students remained a part of the community beyond graduation indicates that perhaps they wanted to be a part of a professional learning community or they would have cancelled their memberships upon completion of the course. The more likely explanation for their collective lack of engagement in community work may be attributed to little or no experience learning in the context of community. When community wide broadcasts were used to invite the membership to professional development events and recruit in-service teachers to supervise fieldwork, the membership responded to the call. These results provided evidence of a willingness among program alumni to engage at a deeper level of involvement in community work when they are presented with a variety of ways in which to participate. For example, program alumni could be invited to serve as advisors to student groups in the completion of course-related assignments, help students produce teaching demonstration videos, comment on student blogs about their teaching experiences, participate in online discussions, present at in addition to attending professional development conferences, or serve as an editor, administrator, or technology consultant on the community websites.

The results also indicate that unfamiliarity with emerging technologies as well as a general unwilling-

ness to experiment with or learn how to use technology to support teaching and learning also contributed to the community's preference for passive as opposed to active engagement in community work. This was a paradoxical outcome indeed, given that the very idea that was intended to facilitate community development may have played a significant role in limiting it (Hardman, 2012, 2014). Nevertheless, it is unrealistic in this day and age to expect teachers to embark upon a journey of lifelong learning, or to lead their students down that path with them, unaided by technology. Knowing how to use technology to support teaching and learning is no longer optional as it once was. It is mandatory (Hardman, in press).

The use of technology to support teaching and learning in today's academically diverse inclusive classrooms is widespread. Technology has always played an important role in the education of students with disabilities. Recent research provides abundant evidence that technology is and will continue to play a more prominent role in 21st Century inclusive classrooms (Hardman, in press). For example, special educators are using Web 2.0 to differentiate instruction in mathematics (Bouck & Meyer, 2012), writing (Jones, 2012; Olthouse & Miller, 2012), and to create video models to teach the generalization of new skills (Carnahan, Basham, Christman, & Hollingshead, 2012). They use wikis, blogs, vlogs, and social networks to support group planning and collaboration (Charles & Dickens, 2012); Web-based software to design and conduct curriculum based assessment and to manage data collection and analysis (Goo, Watt, Park, & Hosp, 2012); and Webquests, gaming, cloud computing, Apps, and the flipped classroom to enhance the differentiation of instruction (Bender, 2012).

It is also important to note that most if not all of the graduate students who participated in this project as well as the teacher education who conceived it were *digital immigrants* who remember a time when there was no Internet or personal computers, but that is not the case with the students they will teach (Schrum & Levin, 2009). Today's students are tech savvy *digital natives* who have never known life without Internet, cell phones, video games, on-demand videos, portable computing devices; gaming, and Apps to fit every need. They are socially engaged, tuned-in, powered-up, and purposefully adept at customizing media to suit their learning needs. They are also young, inexperienced, and lacking in the judgment needed to responsibly assume their roles as 21st Century digital citizens (Hardman, 2012). They will need tech savvy teachers to nurture and guide their development.

Technology is now and will continue in the future to transform teaching and learning in ways that have not yet been imagined (Bender; 2012; Ludlow, 2012; Schrum & Levin, 2009). The vast amount of technology available is daunting and the learning curve will be steep for many of us. Nevertheless, we must embrace these modern technologies in order to prepare teachers to become leaders and contributors in today's classrooms. Unfortunately, many of today's schools, including schools of education, restrict or prohibit access to the Internet, social media, or the use of mobile computing devices when instead, these innovative tools for learning should become an integral part of instruction. For example, the SIN-PLC was terminated after four years because the revenues generated by enrollment dropped. Technology initiatives were among the first to be eliminated from the budget. Schools of education cannot prepare teachers for service in the 21st Century learning communities if technology is perceived as a luxury as opposed to a necessity (Hardman, in press).

The transformation of passive observers into active participants in a vibrant community of learners begins with a radical change in how we prepare teachers for service (Hardman, in press). The International Society for Technology in Education (ISTE, 2007, 2008) has developed National Educational Technology Standards for Teachers (NETS-T, 2008) and Students (NETS-S, 2007) as a guide for the integration of technology into teaching and learning. Table 3 shows how the two sets of standards are aligned in a way that prepares teachers to learn about, model and apply technology in the design, implementation, and assessment of their students' learning experiences. For example, the *Teaching, Learning, and the Curriculum* standard requires teachers to know how to "implement curriculum plans that include methods and strategies for applying technology to maximize student learning" is aligned with the student standard for *Creativity and Innovation* requiring students to, "demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology."

Teaching *and* learning are and will continue to be social activities that occur in the context of community. Therefore, it seems unrealistic to expect teachers to understand the importance of community building in their own classrooms if they are not also actively participating in a learning community to nourish their own professional development needs (Grossman, Wineburg, & Woolworth, 2001). It would also be unrealistic to expect teachers to embark upon a journey of active engagement in lifelong learning unaided by technology. Web-based PLCs may not only provide a solution to the isolation and lack of access to continuing professional development common to the practice of special education but may also provide an authentic training ground for preparing teachers to become active participants in their own learning and transformational leaders in today's modern 21st Century academically diverse, inclusive classrooms (Hardman, in press).

Table 3. Comparison of ISTE NETS-T and NETS-S.

Teachers	*Students*
Teaching, Learning, and the Curriculum: Teachers implement curriculum plans that include methods and strategies for applying technology to maximize student learning	**Creativity and Innovation:** Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.
Engage in Professional Growth and Leadership: Teachers continuously improve their professional practice, model lifelong learning, and exhibit leadership in their school and professional community by promoting and demonstrating the effective use of digital tools and resources.	**Communication and Collaboration:** Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
Assessment and Evaluation: Teachers apply technology to facilitate a variety of effective assessment and evaluation strategies.	**Research and Information Fluency:**Students apply digital tools to gather, evaluate, and use information.
Technology Operations and Concepts: Teachers demonstrate a sound understanding of technology operations and concepts.	**Technology Operations and Concepts--**Students demonstrate a sound understanding of technology concepts, systems, and operations.
Productivity and Professional Practice: Teachers use technology to enhance their productivity and professional practice.	**Critical Thinking, Problem Solving, and Decision Making:** Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
Social, Ethical, Legal, and Human Issues: Teachers understand the social, ethical, legal, and human issues surrounding the use of technology in PK–12 schools and apply that understanding in practice.	**Digital Citizenship:** Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.

Note: Reprinted from Hardman (in press). Copyright by IGI Global.

Conflict of Interests

The author declares no conflict of interests.

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Article

The Potential of Digital Technologies for Transforming Informed Consent Practices with Children and Young People in Social Research

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Abstract
How children and young people understand and exercise their autonomy, engagement and decision-making is fundamental to learning how to become active and engaged citizens, and to be socially included. Digital technologies are increasingly an integral part of children's everyday lives and, therefore, valuable tools for supporting social inclusion. This paper discusses how digital technologies might positively support autonomy, engagement and decision-making through the lens of informed consent practices within social research. Current research practices are dominated by paper-based methods for obtaining informed consent which could be exclusionary for children and young people generally, and children with additional learning and support needs in particular. Digital technologies (laptops, PCs, tablet devices, smartphones) offer the potential to support accessibility and understanding of ideas and activities, as well as engagement with and autonomy in decision-making and participation. This paper explores this potential as well as the challenges that researchers may face in this context.

Keywords
children; digital technologies; ethics; informed consent; participation; voice; young people

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1. Introduction

Children's cultural worlds (at least in developed Western countries) are changing at a rapid pace, reflecting and responding to technological advancements in personal and mobile computing (Rideout, Foehr, & Roberts, 2010). Children and young people's access to information, social communication and interaction, as well as play and creativity are being transformed through increasing access to digital technologies (laptops and PCs, tablet devices and smartphones). For example, in a wide-ranging report from Ofcom (2014a) detailing UK children and adults' confidence with, and use of, digital technologies in their everyday lives, research showed that 14−15 year olds had the highest levels of technological knowledge and confidence in digital technologies across all of the age-groups surveyed. The report also highlighted that 6-year-old children are as confident as 45-year-olds in their use of technology. Moreover, children are more enthusiastic about, and reliant upon, technologies than adults, showing greater knowledge and awareness about technologies and advocating for their use amongst their friends. Notably, in a conclusion from the press release from Ofcom to accompany the report, it was highlighted that: 'As a result of growing up in the digital age, 12−15 year olds are developing fundamentally different communication habits than older generations' (Ofcom, 2014b).

Such fundamentally different communication habits have important implications for social research, and social researchers, who aim to promote social inclusion by seeking and understanding children's views and ex-

periences. As Farrell (2005; p. 177) reminds us: 'real-world research…acknowledges the reality of children's everyday lives'. In this context, then, real-world research into the reality of children's everyday lives must include consideration of the important roles that digital technologies may or may not play (Parsons & Abbott, 2013). Fundamental to respecting children's rights to have their voices heard in decisions that affect them (UNCRC, 1989, Article 12) is also their right to 'share information *in any way they choose*, including by talking, drawing or writing' (UNCRC, 1989, Article 13; my emphasis). With the strengthened role of children (and parents') participation in decision-making in the revised Special Educational Needs and Disability Code of Practice in England (Department for Education/Department of Health, 2015), it is very timely to consider *how* such decision-making can be meaningful and authentic, especially for children who may access literacy and communication in different ways.

This paper considers the potential of digital technologies for supporting these rights in the context of decision-making about research participation, especially when the potential research participants are children and young people with additional learning and communication needs. If children and young people are to be included in important social research that values and promotes their views, experiences and preferences then children first need to be supported to understand and access information about what their research participation means, so that they can learn to exercise their autonomy i.e. to give their informed consent. It is argued here that paper-based methods for communicating with children and young people about research may be exclusionary or inaccessible for some children and young people, and that there is potential for researchers to support understanding, engagement and participation of children and young people through utilising the positive affordances of digital technologies. The paper first considers the current state-of-play with regard to gaining children's informed consent for university-based research participation and the guidance available for researchers in this context. This is followed by discussion of some of the proposed positive features, or affordances, of digital technologies for supporting the accessibility of information, as well as children and young people's motivation, competence and autonomy with respect to research decision-making and participation. The cautions and challenges inherent in the application of digital technologies to this field are then discussed, followed by conclusions that point towards the need for participatory design approaches with children and young people to gain their views and ideas.

2. Informed Consent with Children and Young People in Social Research

Informed consent in research is one of the fundamental principles of good ethical practice for researchers across all disciplines. In social research, the Economic and Social Research Council's Framework for Research Ethics (ESRC, FRE) (2015; p. 29) provides detailed guidance about ethics review and governance at universities in the UK, and defines informed consent for research participation as:

> 'giving sufficient information about the research and ensuring that there is no explicit or implicit coercion…so that prospective participants can make an informed and free decision on their possible involvement.'

Typically, at least within universities in the UK, the 'giving of sufficient information' is managed by writing information sheets that summarise key aspects of the project, such as what participation entails, the voluntary nature of participation, and how data are stored. The 'informed and free decision' made by participants is then usually recorded by a signature on a written consent form so that an audit trail about non-coerced involvement is established. The argument is that such processes protect the participant, the researcher and the institutions involved. Guidelines such as those by the ESRC (2015) also set minimum required standards that should be met in this regard (e.g. the topics and questions that should be addressed in a participant information sheet). However, the extent to which such processes do in fact provide 'sufficient information' so that the decisions of participants are 'informed and free' is highly contested. For example, concerns have been raised about the cultural and social assumptions embedded in paper-based communication and signed forms (White & Fitzgerald, 2010). Hamid (2010) describes his research in rural Bangladesh, where participants with limited literacy were sent a 'participant information package' (p. 265) and asked to sign a written consent form for their children's participation (processes designed according to the expectations of the institutional research ethics committee). Although signatures were obtained and the consent forms returned, Hamid (2010) confesses that it is difficult to know who signed the forms and whether participants comprehended what was involved.

In addition, some authors have questioned whether participation information sheets really tell people what they need or want to know about research participation, not least because the wording of information sheets may frame research studies in ways that may be off-putting to research participants (Brooks, te Riele, & Maguire, 2014). Indeed, Macfarlane (2009) argues that such forms may be exclusionary because of expectations about their content from research ethics committees. Grayson and Myles (2005) illustrate the problem by demonstrating that the response rate to a survey was substantially reduced when participants received a

more 'legalistic and impersonal' (p. 298) introductory letter and consent form (whose wording complied with institutional requirements) compared to a more personalised and informal one. Brooks et al. (2014) concur with this challenge, noting that: 'the way in which information is presented to potential respondents is not neutral…the formality of some initial consent procedures may alienate some groups, particularly those who are vulnerable' (p. 95).

Indeed, Brooks et al.'s (2014) above comment highlights that concerns about the presentation of research information become magnified and more complex when the involvement of (so-called) 'vulnerable' groups is mooted (Parsons, Abbott, McKnight, & Davies, 2015; Sikes & Piper, 2010); 'vulnerable' groups usually include children and young people and others with potentially reduced capacity to consent such as the elderly, and people with learning disabilities or mental health difficulties (ESRC, 2015). The concerns about free and informed consent arise in relation to these groups mostly in relation to the potential for the abuse of power (knowingly or unconsciously) through participants feeling pressure to participate and/or not really understanding what they are participating in or why their participation is necessary (Cameron & Murphy, 2007; Flory & Emanuel, 2004; Stalker, 1998).

Children and young people are crucial informants and participants in many research projects and, as noted earlier, have a right to express their views in matters that affect them (UNCRC, 1989, Article 12). However, there are debates about whether and how children's informed consent can be appropriately gained (Jones & Stanley, 2008; Wiles et al., 2005), leading to their exclusion from some research (Dawson & Spencer, 2005). There are concerns that the insistence of formal procedures and particular forms of wording, often required by ethics committees, can exclude children from research. For example, Scott and Fonseca (2010) discuss a research project where the researchers planned to involve 5−6 year old children as participants; the ethics committee insisted that children be given, and asked to sign, written information sheets and consent forms that were not accessible to them. The children's school principal objected to the formality of the process but the ethics committee would not change their recommendation. As a result, the research was completed without the involvement of the children—a vital group of stakeholders whose views the research was designed to gather (Scott & Fonseca, 2010).

Such concerns about understanding of rights and processes are especially true for children and young people who have additional support needs due to disability, special educational needs, and/or language comprehension and expression (Cuskelly, 2005; Lundy, 2007). Consequently, those who are amongst the most vulnerable are often the least likely to be given opportunities to express their views about matters which are important to them, suffering a 'double denial' of their right to be heard (Lundy, 2007; p. 935). In other words, they are denied expression and participation due to doubts about their competence to make decisions and give informed views: firstly because they are children, and secondly because they are disabled.

Guidance regarding children's participation in research emphasises the need to support children's understanding of the research process by tailoring methods and information appropriately (ESRC, 2015; Department of Health, 2001). For example, Dockett and Perry (2011) and Christensen and Prout (2002) consider the importance of consent as a process rather than a one-off 'tick-box' exercise at the beginning of research projects. Others, (e.g. Alderson & Morrow, 2004) provide guidance about 'child-friendly' features for providing accessible information, such as using plain language, larger font size and incorporating images; online resources offer useful exemplars of such materials (e.g. www.ethicsguidebook.ac.uk/; http://www.easyhealth.org.uk/content/about-website). While younger children are less likely to fully understand their rights when participating in research (Hurley & Underwood, 2002), there is some evidence that presenting information in more accessible formats (including shorter sentences; use of bullet points; increased font size; and pictures) improves 7−10 year old children's understanding of the material, compared to a group that received a 'standard' form (Tait, Vopel-Lewis, & Malviya, 2007).

Nevertheless, research into the comprehension of research information for children and young people is rare (Lewis, 2010). The examples that do exist tend to be oriented towards medical/clinical contexts and content (Tait et al., 2007; Williams et al., 2011), and exclude children with disabilities (Hurley & Underwood, 2002) and/or comprehension difficulties (Tait et al., 2007). Moreover, there is a widespread tendency to assume that informed consent information (the familiar 'information sheet' for participants), and the process of gaining consent that the information sheet supports, is presented and negotiated as a paper-based exercise, augmented by discussion, often including the requirement for a child to write or sign their name on a consent form to indicate their agreement (Parsons et al., 2015; Parsons, Sherwood, & Abbott, in press). For children whose sensory, learning and communication needs may preclude them from accessing written or printed text and images, it is reasonable to assume that the presentation of research information using such forms will be inherently exclusionary for them (Wright, Sheehy, Parsons, & Abbott, 2011). In a world where digital technologies are continuing to transform communication as well as the presentation of, and access to, information, the practice of using paper-based forms seems surprisingly anachronistic and potentially exclusionary.

Indeed, technology of any kind is rarely mentioned in the research and guidance included above nor by the

guidance provided to researchers by research intensive universities in the UK (Parsons et al., 2015); certainly no specific examples of technologies being used in the informed consent process are provided. Although there are some social researchers who report using more technology-based methods for supporting informed consent with children and young people in research (Parsons et al., in press), these methods are rarely reported in the literature and are certainly not common (see Flewitt, 2005, for an exception). Wright et al. (2011) even report that researchers with significant expertise in the development and application of assistive technologies for communication and learning used 'accessible' paper-based forms for supporting the informed consent process rather than the technologies that formed the substantive foci of their projects.

This lack of exploration and use of different methods for supporting the informed consent process led Parsons et al., (in press) to conclude that innovation in informed consent practices with children and young people is much needed because 'the increasing bureaucratization of research ethics governance within UK universities has reified expectations about the methods used to gain informed consent for research participation.' In other words, paper-based information and processes of communication tend to dominate practices because that is what university research ethics committees expect, and this can curtail risk-taking or creativity that researchers may otherwise wish to exercise (Nind, Wiles, Bengry-Howell, & Crow, 2013).

Research that has explored and developed technology-based presentation of information for consent purposes is, again, very rare, tends to be clinically oriented (cancer research) and with a focus on adult respondents (Wright, 2012; Kim, Young, Neimeyer, Baker, & Barfield, 2008). One of the few examples of research that has sought children and young people's views directly about how research information should be provided, and informed consent from children and young people sought more effectively, also comes from the context of clinical research (Spencer, Boddy, & Rees, 2014). Spencer et al.'s (2014) research included a small number (c. 18) of children and young people attending mainstream schools and colleges, aged 9−18, in one-off workshops where they were shown a short film showing a (fictional) clinical consent procedure in action and asked to discuss the ethics considerations from their perspective. Among the many useful insights from these young people, it was clear that many favoured the use of videos and websites as ways of communicating with them (and their parents) about research. In addition, the children and young people:

> 'reiterated their preference for a dialogue and meaningful relationship with the research team across the research process. Identifying ways in which researchers can build trust and respect with young people in research would appear key to adequate information provision, and points to a pertinent area for future research'. (Spencer et al., 2014, p. 37)

Thus, there is considerable scope for considering how such meaningful relationships can be initiated and maintained, and how researchers can build the trust and respect needed in order to communicate effectively with young people about research. Digital technologies should be considered as potentially playing an important role in this respect. However, opportunities for cognitive and sensory scaffolding of understanding and responding via digital technologies, as well as their potential for engaging interest in participation, have been significantly underexplored in relation to informed consent procedures with children and young people. In the spirit of the innovation called for by Parsons et al. (in press) the following section considers some of the features—or affordances—of digital technologies that may be helpful for communicating and supporting children's decision-making about, and participation in, research.

3. Some Potential Affordances of Digital Technologies in Supporting Informed Consent with Children and Young People

Dye, Hare and Hendy (2003) suggest that comprehension, decision-making and communication capabilities are key factors that can impact on the capacity of people with learning disabilities to give consent to take part in research. These factors are likely to be just as important and applicable when the participant is a child or a young person, with or without a learning difficulty or disability. Applying these factors directly to the involvement of children and young people in research, suggests there are (at least) three main dimensions of participation for children and young people in which digital technologies could play an important role, and these are discussed further, in turn, below:

1) *accessibility* of information presented for improved comprehension;
2) *motivation* to take part in the research*;* and
3) *competence and autonomy* to make and express an informed decision.

These categories, and the examples that are used to illustrate them, are by no means intended to be definitive or exhaustive, but offer a starting set of possibilities from which ideas can be further developed and discussed.

3.1. Accessibility of Information Presented

Digital technology has the capacity to improve the accessibility of research information provided to poten-

tial participants in ways that go significantly beyond the presentation of materials in shorter sentences, larger font sizes, and images for paper-based leaflets. Digital technologies afford the possibility of presenting written text in ways which can be easily transformed and customised according to individual needs, including font size, type and colour, as well as the background colour on which the text is presented. Being able to customise these basic aspects of written text can make a significant difference to readers with specific learning difficulties (Morphy & Graham, 2012) for example. In addition, many people, without a specific difficulty or diagnosis, have been documented as experiencing visual stress, which can be alleviated through changing the colour contrasts between text and background (Singleton & Henderson, 2007; Smith & Wilkins, 2007). Thus, presenting or producing even simple information electronically could improve accessibility for a wide group of potential participants.

For other participants, the addition of graphical symbols, or the replacement of some of the text with symbols, can enhance understanding (Abbott, Detheridge, & Detheridge, 2006; Detheridge & Detheridge, 2013; Jones, Long, & Finlay, 2007), especially for children, young people and adults with autism and/or learning disabilities who already have some familiarity with symbols (Mirenda, 2003; Poncelas & Murphy, 2007). Importantly, Zentel, Opfermann and Krewinkel (2007) demonstrated that the presentation of information for people with learning disabilities using a combination of text + symbols + speech produced the highest levels of understanding. In other words, information made more sense to individuals when they were shown the information in a simplified form and this was accompanied by a verbal explanation. This links closely with the feedback from Spencer et al.'s (2014) participants noted above who emphasised that decision-making about research participation needs to take place in a dialogue rather than simply within an information transaction; something that is also strongly echoed by other researchers (Crow, Wiles, Heath, & Charles, 2006; Nind, 2008).

Written text can also be accompanied or replaced by audio instructions or narratives, for example through the use of text-to-speech technologies, or the recording and supply of relevant audio clips. These audio files can be replayed, paused and slowed down to enable children and young people to check and update their own understanding of the information provided, which can be very powerful in aiding comprehension (e.g. Lange, McPhillips, Mulhern, & Wylie, 2006; Parr, 2012). In addition, text and audio that describes or explains a research project can be accompanied by short video vignettes or scenarios (Flewitt, 2005) to illustrate, for example, which members of the research team the child is likely to meet or what a focus group or an interview actually looks like in practice. This facility for presenting audio alongside images also works both ways: not only can participants be told about or shown different aspects of the research without the need for written text, but they can also provide verbal responses (if appropriate) which can be video or audio-recorded. In other words, the role of technology can be to record verbal assent or dissent, as well as the discussion about the research that precedes it. Thus, the benefits of presenting research information to participants via technology rather than via traditional paper-based means are cognitive and sensory, as well as practical.

Certainly, the potential for the use of video in supporting informed consent processes in research was acknowledged and supported by the participants in Parsons et al. (in press), who were all social researchers (with varying levels of experience) working with children and young people in their research. Participants suggested that videos could be especially helpful for enabling parents and children to jointly view, and discuss, what the research entailed rather than relying on parents to give or translate information intended for young people via paper-based forms. This is also in line with the feedback from the young people in Spencer et al.'s (2014) research who recommended that video could play an important role in supporting discussion between parents, young people and the researchers. Given the widespread availability of video record and playback on tablets and smartphones, video production and access has become much more accessible and easy to use in recent years, making this kind of approach much more feasible than even a few years ago.

Touch interfaces could be particularly powerful in supporting a wide range of involvement of children and young people, including those with learning and physical disabilities, because a touch interface is easy to understand and does not add unnecessary complexity to the learning process. For example, a touch interface is more accessible than numerical keyboards because, if configured appropriately, the interface can be visual rather than text-based. The rapid development of tablet technology, and the availability of Windows 8, has brought touch technology within the reach of all research projects. Technology-based research supports the engaging and communicative benefits of touch technologies; for example, early research demonstrated that users engaged in more pointing, made more preparatory statements and made more on-task comments when an information display was horizontal (as with a tablet PC or smartphone) than when it was vertical (as with standard PCs or laptops; Inkpen et al., 2005). Kruger, Carpendale, Scott and Greenberg (2004) also found that the orientation of information in touch technologies was important in determining comprehension, coordination and communication. Specifically, they found that users rotate text or images to help with comprehension, making text easier to read (making the task easier) or to have an alternative perspec-

tive. Moreover, the principal advantage of direct-touch interfaces is that they are more natural and intuitive for users (Ryall, Morris, Everitt, Forlines, & Shen, 2006; Shneiderman, 1982), negating the need for lengthy training or familiarisation periods, which may make people feel more motivated to use them and engage in the material presented via them.

There is certainly emerging research evidence that even young children (4–5 year olds) are natural and intuitive users of touch screen technologies, finding them enjoyable and easy to use in the classroom (Clarke & Abbott, 2015). Teachers also report being able to use touch screens (via iPads) to support differentiated learning in class (Clark & Luckin, 2013), highlighting the value of such a flexible tool in helping to meet the additional learning needs of less able children. Clarke and Abbott (2015) also report teachers' observations that children seem to have a greater *readiness* to engage with literacy and numeracy when supported with structured iPad apps, alongside the more 'traditional' input from teaching assistants and full class teaching using whiteboards. These findings suggest that children and young people may be more willing to engage with ideas, and understand them more effectively, when presented via touch screen devices rather than via paper-based methods, although of course there is a need for much more research in this area to explore and observe this potential (Clarke & Luckin, 2013).

3.2. Motivation to Participate in the Research

Macfarlane (2009) argues that overly legalistic wording of research information within the social sciences could deter potential participants because it could be seen as unfriendly and suspicious. Within clinical research, Dawson and Spencer (2005) go further in raising concerns about current research practices regarding informed consent for vulnerable groups, arguing that 'children will be harmed, as vital research will not be performed' (p. 235) because the expected wording on information sheets is too complex and off-putting. This is something to which children and young people may be particularly sensitive given that they are likely to be unfamiliar with being approached by university researchers seeking their involvement in research (Danby & Farrell, 2005). The language and formality of paper-based information sheets and consent forms, even with efforts at accessibility, may feel alienating and odd. Given the increasing prevalence of, and familiarity with touch technologies noted above, children and young people are very likely to have expertise, experience and affinity with touch technologies, particularly smartphones and, in many cases, tablet technology such as iPads and other mobile touch-interface devices in a way that adult researchers may not (Parsons et al., in press). Through using these devices as a means to communicate about research, we may therefore encourage participation through giving validation to the technology of choice of children and young people.

Additionally, children and young people who may struggle with motivation and participation in other ways are likely to find digital, visual media more engaging (Carrington, 2007). Walker and Logan (2008) suggest this is because digital media reflect youth culture, and this further enables young people to manage and explore their identities. Indeed, Nind and colleagues (Clarke, Boorman, & Nind, 2011; Nind, Boorman, & Clarke, 2012) found that engaging young women with behavioural, emotional and social difficulties in developing digital comic strips for presenting consent information about their project was highly effective in supporting their knowledge and participation in the research. The prevalence of personalised and portable smartphone and tablet technologies, and their widespread use by children and young people (Ofcom, 2014a; Rideout et al., 2010), makes them ideal tools for presenting research information to potential participants, not least because young people say internet and mobile technologies offer them greater control over social interactions and given them time to 'stop and think' about their responses (Madell & Muncer, 2007). The researchers interviewed by Parsons et al. (in press) also indicated that the ability for children to answer consent questions electronically, in their own time, was a valuable and positive feature of portable technologies.

The asynchronous affordance of communication via digital technologies has also been shown to be valuable for those with social and communication difficulties, specifically people on the autism spectrum. Asynchronous communication refers to the ability to send or post a message online and for someone to be able to read and respond to the message in their own time i.e. an immediate response is not needed in the same way as in the context of face-to-face communication. For example, Benford and Standen (2009) interviewed 23 young people and adults with autism about their online communication preferences and found that many preferred the visual anonymity and asynchronous, flexible nature of their interactions. These features helped people to feel more in control of conversations and, therefore, empowered to engage in social interactions on their own terms. Brosnan and Gavin (2015) report similar findings through exploring young autistic people's use of Facebook; respondents reported finding online communication easier because there is less pressure to understand non-verbal social cues and there is time to think through replies.

3.3. Competence and Autonomy in Decision-Making

Nind (2009, p.7) notes that: 'researchers can take positive action to increase capacity [to consent]'. Similarly, the Department of Health (2001) presumes that:

> 'many children will be competent if information is presented in an appropriate way and they are supported through the decision-making process' (DoH, 2001, p. 4).

Consequently, there is an onus on researchers to develop appropriate methods to achieve informed consent which can scaffold understanding in order to encourage and maintain voluntary and positive participation. This includes careful consideration of what information about the research is provided and how it can be tailored effectively to meet the information needs of particular children or groups of children (Dockett & Perry, 2011; Wiles, Heath, Crow, & Charles, 2005). The presentation and accessibility of the information itself is covered above; in addition, researchers need to consider how children can be reminded and supported over time regarding their rights to participation and withdrawal (cf. Crow et al., 2006; Nind, 2008).

In this regard, touch-screen technologies such as smartphones and tablet devices offer a direct, familiar interface for many children and young people that can be used for supporting and recording decision-making both at the start, and during the research process. For children for whom written or spoken responses may be problematic, demonstrating choice through touch offers an important avenue for autonomous decision-making. In addition, video/audio capture of responses (both verbal and non-verbal) can be easily achieved via digital technologies and revisited as many times as necessary throughout a project to check or aid understanding and memory. At this stage, these suggestions are largely hypothetical although many researchers agreed that these were positive affordances of digital technologies and some (a small minority) reported using social networks to recruit, and maintain communication with, research participants (Parsons et al., in press).

An additional inclusive affordance of portable digital technologies is around location/presence; portable technologies are of course situated with their 'owners' at all times, whereas previous technologies (PCs, laptops) were sited—and 'owned'—by the school or home. Not only could this be an important feature in helping children to make individual and autonomous decisions, but such 'ownership' (even if temporary within the context of a research project) also offers social kudos for young people trying to protect their image and vulnerable identities (Nind et al., 2012). Moreover, Clark and Luckin (2013) in reviewing the evidence regarding the use of tablet technologies to support learning report that the individual ownership, and scope for personalisation, afforded by such devices are 'highly motivational' for children (p. 11). Digital technologies are therefore likely to be valuable for presenting initial information about research to participants and their families, and also for providing opportunities for capturing individual visual records of decisions and choices if consent is negotiated over time (cf. Dockett & Perry, 2011).

4. Challenges and Cautions

Of course, no discussion about the role of digital technologies in children's lives would be complete without appropriate acknowledgement of the concerns that also arise. The different communication habits between children and adults reported by Ofcom (2014a, 2014b) have also raised concerns about the extent to which children are using technologies and whether this is acceptable and safe. For example, media headlines in the UK have questioned whether children need a 'digital detox' (Woollaston, 2013, no page numbers) and even whether smartphones are making children 'borderline autistic' (Espinoza, 2015, no page numbers); research has also discussed concerns about children's vulnerability and safeguarding online especially in the context of using social media (Weeden, Cooke, & McVey, 2013). Indeed, the public nature of social media (e.g. Twitter and Facebook) is inherently at odds with the confidential or anonymous nature of much research. This means that considerable care needs to be taken with establishing the privacy settings when using such platforms and ensuring that users are aware of the boundaries. Appropriate use of such platforms, with clear planning and support, is nevertheless feasible; for example, Kurtz (2009) describes the careful use of Twitter within his primary school classroom as a way of strengthening home-school communication. He discusses the measures taken to protect pupils' privacy but also notes the valuable learning opportunity about privacy issues created through the use of Twitter in this context.

Concerns about online safety and vulnerability tend to become amplified when children and young people are deemed as more vulnerable or at risk than others (Livingstone & Brake, 2010). For example, Lough, Flynn and Riby (2015) argue that children and adults with autism are at more risk online due to their offline difficulties in social communication and understanding of others' intentions. The Wirral Autistic Society (2015) appears to confirm this in a report about the high level of 'mate crime' reported against people with autism, when their social vulnerability is exploited by others (although the report available is very short and not peer-reviewed). Such concerns give rise to important discussions of the challenges involved in keeping children safe online and how children understand consent regarding the decisions they make (Byron, 2010); as well as balancing the risks of online interactions against the benefits (Livingstone & Brake, 2010), especially in the context of the undeniable strength of social change and expectations inherent in children's use of technologies (Ofcom, 2014a).

Of course, access to technologies in the home and at school varies substantially and is governed by social and economic factors, as well as adult perceptions and decisions about appropriateness (Plowman, McPake, & Stephen, 2010; Thomas, O'Bannon, & Britt, 2014). This means that it may be undesirable, impractical and even unethical to assume technologies can be a part of informed consent processes in some contexts and for some participants; the use of technologies may, therefore, in itself be exclusionary. In addition, the power of adults (teachers and parents) as gatekeepers in the processes of informed consent and research participation must be acknowledged and should not be underestimated (Brooks et al., 2014). The generational divide revealed between children and adults in Ofcom's (2014a) research only serves to add further complexity to these power dynamics, especially if there are different preferences and expectations from adults and children about how information is presented and communication takes place.

However, as Parsons et al. (in press) note, the use of technologies in the informed consent process can be an option that is available rather than the only means of communication with children and families; researchers should not be the initiators of children and young people joining social networking sites (for example). Moreover, as Livingstone and Brake (2010) argue, any risks of using social networking are also balanced by opportunities and 'for most children, social networking affords considerable benefits in terms of communication and relationships' (p. 80). Byron (2010) also cautions that most children are unlikely to experience harm online and that a more balanced debate about children's use of technologies is needed. There is certainly a need to find out from more children and young people what would be appropriate and acceptable in terms of how researchers could and should be communicating with them about research in ways that reflect generational differences in communication (Ofcom, 2014a), and respect children and young people's skills in 'different mediums of communication' (Morrow & Richards, 1996; p. 100). The fact is that children *are* using, and increasingly expect to be able to use, portable digital technologies for communication and interaction; researchers must take these experiences and preferences seriously to understand how the appeal of technologies can be harnessed positively to support understanding, participation and decision-making.

It is also essential to acknowledge, in line with the young people in Spencer et al.'s (2014) research, that decision-making needs to be understood as part of a discussion or dialogue between young people, parents/caregivers and the researchers. Likewise, comprehension of information is not as straightforward as improving accessibility by being able to increase the font size or add images to text (cf. Zentel et al., 2007) but rather depends upon interaction and negotiation in the context of trusting relationships (Cuskelly, 2005; Nind & Seale, 2009). It is not the intention to suggest here that simple tweaks to presentation of information, via digital technologies, will by themselves support improved comprehension and autonomy. However, it could be that simple tweaks, in conjunction with different modes of engaging with information (e.g. via social networking and websites), which can be multi-vocal (including parents and teachers as well as children and young people) and easier for children to understand and navigate, could be a more effective starting point for scaffolding research relationships and comprehension than traditional paper-based methods.

The governance of research ethics at universities in the UK, including the requirement for research activities to be insured, also provides an important part of the context about how informed consent information is presented, and a decision recorded, so that there is an effective audit trail (ESRC, 2015; Wiles et al., 2005). This includes an expectation that consent to participate should 'typically' be signalled by a written signature, as noted earlier (ESRC, 2015). While alternative means of providing consent are permissible (e.g. verbally recorded; gained post hoc) it is clear in the ESRC's guidelines that these are cases that would require full justification and, therefore, a higher level of scrutiny by committees. It is unknown to what extent universities might be willing to accept alternative means of demonstrating consent such as touching a response option on a screen; selecting a symbol; using eye-gaze technology to signal a decision; or video footage of discussion about the research. However, if an appropriate audit trail can be established irrespective of the type of response made the universities are likely to be more persuaded to trust and accept alternative modes for committing consent decisions. This could be achieved by storing logging data (e.g. Burton & Walther, 2001) alongside video or photographic records of pointing to or touching a particular response option. Crucially, a positive response consenting to participation can be reviewed and checked at the start of each contact if research takes place over time; just as with traditional methods for consent, options to dissent or withdraw from the research should also be displayed with equal valence and revisited on repeated contact (if the research design allows for this; Dockett & Perry, 2011).

The valence of response options (attraction or aversion to a specific object or event) regarding participation is another area which could give rise to concern. Specifically, the motivational and attractive features of personal digital technologies which might make children and young people feel interested and engaged in their content, may also risk becoming too persuasive. This could mean that children and young people may not feel, or may not be sufficiently aware, that they can exercise their choice to say no to participation. Wright et al. (2011) discuss this issue in the context of ensur-

ing ongoing consent during research projects that involve engaging digital content. They caution that researchers need to take extra care to 'make clear delineations between private, public and research spaces' (p. 4) and to remind participants that their interactions and responses are being recorded.

Berdichevsky and Neuenschwander (1999) present a framework for the ethical principles of persuasive technology design, the first principle of which is that:

> 'The intended outcome of any persuasive technology should never be one that would be deemed unethical if the persuasion were undertaken without the technology or if the outcome occurred independently of persuasion.' (p. 52)

In other words, the same considerations relating to the fundamental principle of beneficence in research ethics (benefits should outweigh harm) applies here too. In addition, Berdichevsky and Neuenschwander (1999) rightly emphasize that it is the creators of the 'persuasive technologies' who must assume responsibility for their use and the creators 'should never seek to persuade a person or persons of something they themselves would not consent to be persuaded to do' (p. 52). This is a position strongly endorsed by this paper and it is clear that there is some important research to be carried out in this area that systematically investigates the nature of decision-making by children and young people using traditional (paper-based) and technology-based methods in order to better understand how the use of technologies can be used to navigate the line between motivation and persuasion or coercion.

5. Conclusions

Overall, there is a compelling rationale for incorporating digital technologies in informed consent processes for children and young people, including those with additional support and communication needs, asked to take part in research. At the simplest level this rationale is based on the ability to easily and quickly customise the colour and size of text and images in order to improve the accessibility of research information. At a deeper level, the affordances of touch, portability, and video and audio capture and replay available through tablet PCs and smartphones, may support comprehension, motivation and engagement with the information presented. This, in turn, could encourage greater autonomy in decision-making and participation in research, which will offer important insights into children's views and experiences.

Currently, there are very few available examples of how technologies have been used in this context and so this is an area ripe for exploration and development, not least to explore the extent of the concerns and cautions that may exist as well as the positive benefits. Universities, researchers and research funders all have roles to play in developing and sharing approaches to this important area of research, and critically investigating and reporting the strengths as well as limitations of different methods. An online Observatory of research exemplars, with critical reflections and commentary would be a good starting point for this: a space where researchers can make public their creativity and innovation in research ethics methodologies and share good practices. A separate and dedicated space is needed because there is very limited reporting of research ethics methods in social science peer-reviewed journal articles (Peled & Leichtentritt, 2002) or sharing of examples and practices at the university level (Parsons et al., 2015). Targeted research is also needed to examine the extent to which children and young people, including those with disabilities and a range of communication needs, comprehend and remember the information that is given to them when they are approached for research participation. Compared to the social sciences, there is much more scrutiny of informed consent materials and practices and methods in medicine and health sciences (e.g. Tait et al., 2007), and so it is timely for social researchers to use the societal push towards increasing technology use as an opportunity for research and debate in this area.

In addition, there is considerable scope for much wider public engagement to better gauge and reflect the understanding and expectations of members of the general public, including children and young people, about the presentation of research information and how ongoing research participation can be effectively communicated and supported. Inclusive and participatory technology design processes with children and young people, and their families, would be a very valuable next step (cf. Abascal & Nicolle, 2005) for informing what may be possible, as well as socially acceptable, in this regard. Children and young people have substantial knowledge and expertise to contribute to this arena and we need to hear more from them. For example, universities could establish valuable outreach or public engagement activities with schools and organisations to routinely include children and young people in checking and advising on the accessibility and appropriateness of research ethics methods and information in research that plans to involve children and young people. Such activities could help to identify key principles and practices from the perspectives of children and young people about the things that matter to them. As social science researchers interested in the 'reality of children's everyday lives' (Farrell, 2005, p. 177), this is the very least that we can do if we are serious about pursuing high quality research that has relevance and impact for children and their families.

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The author declares no conflict of interests.

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Article

Opening Doors or Slamming Them Shut? Online Learning Practices and Students with Disabilities

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Abstract
Online learning has the potential to open doors to education for everyone who has access to the technology required to participate. Or does it? When it comes to social inclusion in online learning, who are the "haves" and who are the "have-nots?" Some online learning practices erect barriers to individuals with disabilities—uncaptioned videos are not accessible to students who are deaf, content presented only within graphic images is not accessible to individuals who are blind, unorganized content cluttered on a page creates barriers to some students with learning disabilities and attention deficits, web pages that require the use of a mouse are inaccessible to those who cannot operate a mouse. This article explores the question, "What online learning practices make social inclusion possible for individuals with disabilities?" The author answers this question with lessons learned from her own teaching experiences as well as those presented in research and practice literature. She also shares overall characteristics of distance learning programs that promote the social inclusion of students with disabilities in their courses. The author points out how making courses welcoming to, accessible to, and usable by individuals with disabilities may promote the social inclusion of other students as well. She recommends further dissemination and future research regarding inclusive practices in online learning.

Keywords
disabled students; inclusive learning; online learning; social inclusion; technologies

Issue
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1. Introduction

Online learning opens doors to education for everyone who has access to the technology required to participate. Or does it? When it comes to social inclusion in online learning, who are the "haves" and who are the "have-nots?" In some places, such as many postsecondary campuses worldwide, the availability of information technology (IT) places everyone in the institution on the right side of what has been called the "digital divide." However, even there some faculty and students find themselves on the wrong side of the "second digital divide":

> This line separates people who can make full use of today's technological tools, services and resources from those who cannot….People with disabilities who are on the right side of the first digital divide, too often find themselves on the wrong side of the second digital divide. They have technology but do not have full access to all of the benefits it delivers to others. (Burgstahler, 2005, p. 84)

Inclusive practices in online learning (otherwise called e-learning or distance learning) that support social inclusion can be informed by five cornerstones for promoting social inclusion: (1) valued recognition, (2) human development, (3) involvement and engagement, (4) proximity, and (5) material well-being (Donnelly & Coakley, 2002). Applying this model to inclusive online

learning, valued recognition requires the acknowledgment and respect of individual and group characteristics. Human development requires the encouragement of diverse capabilities, skills, and perspectives and recognition of them as worthwhile. Involvement and engagement requires that students receive the necessary support to be fully engaged in all aspects of a course. Proximity ensures the opportunity for students of all backgrounds and abilities to interact in the shared social space of a course. Material well-being requires that potential students have the resources necessary to fully participate in an online course. Donnelly and Coakley (2002) make a clear distinction between inclusive programming and programming that promotes social inclusion and/or integration. Simply being enrolled in an online learning class does not mean that a student is fully included. Ensuring that all students are fully included requires the instructor to take intentional steps, some summarized in the remainder of this article, that ensure a welcoming and accessible environment for students with a broad range of characteristics, including disabilities.

Some online learning practices erect barriers to individuals with disabilities. Uncaptioned videos are not accessible to students who are deaf. Content provided only within a graphic image (without an alternative description in a text-based format) is not accessible to screen readers that are used by individuals who are blind, since this technology can only read aloud content formatted as text. Even text-based content in a document or on a web page can be tedious to access for these students when the headings are not structured because their screen readers can only skim through heading text if it is formatted as a heading. In addition, since a screen reader can skip from link text to link text to determine resources they wish to access, links to online resources that are not descriptive of the resource (e.g., "click here" is routinely used instead of a description of the content they will find if they click on that link) do not help in this process; blind students are required to link to each resource to determine what it is. Unorganized content cluttered on a page creates barriers to some students with attention deficits or learning and other disabilities. Web pages that require the use of a mouse are inaccessible to those who cannot operate a mouse or other product with mouse functionality.

This article explores the question, "What online learning practices make social inclusion possible for individuals with disabilities?" The author shares suggestions presented in the literature as well as lessons learned from her own teaching. The article includes recommendations for practices that promote the social inclusion of students with disabilities in online learning programs as a whole and in an individual course. The author points out how making courses welcoming to, accessible to, and usable by individuals with disabilities benefits others as well, thus laying the foundation for the social inclusion of all potential students. She also recommends future research and dissemination in the field.

2. Approaches to Access: Accommodations and Universal Design (UD)

Today, it is possible for assistive technology to allow individuals with almost any types of disabilities to operate computers (Closing the Gap, 2015). These products include screen readers for individuals who are blind or who have reading-related disabilities, alternative keyboards and mice for people who have mobility impairments, and assistive software for students with learning disabilities. Worldwide, many people do not have access to these technologies. However, online courses can erect barriers even to students who have access to computers and the assistive technologies they need (National Council on Disability, 2004). For example, screen reader software with speech synthesis reads aloud text that appears on the screen and, thus, provides access to only the content of online resources that are available in text formats. Therefore, online learning designers and instructors can avoid erecting barriers to students who are blind and have access to text-to-speech technology by providing text alternatives such as <alt> tags to fully describe the content presented in graphic images. Similarly, structured text-only versions of documents in Adobe Portable Document Format (PDF) are accessible to individuals who are blind.

Employing multiple and flexible teaching methods to reach students with a wide range of characteristics fosters the academic and social growth of all students (Gurin, Dey, Hurtado, & Gurin, 2002), including those with disabilities (Silver, Bourke, & Strehorn, 1998). Often mentioned in this regard are teaching practices that include cooperative learning, contextual learning, constructive learning, the provision of organizing tools, multimodal instruction, peer editing, and testing in the same manner as teaching.

"Universal design" (UD)—and similar approaches labeled with other names such as "design for all" or "inclusive design"—has emerged over the last two decades as a framework for describing a proactive, fully inclusive model for all aspects of instruction. UD has a rich history in a wide range of applications. Architects, product designers, engineers, and environmental design specialists at the Center for Universal Design (CUD) established seven principles of UD to provide guidance in designing products and environments to be usable by all people, to the greatest extent possible (CUD, 1997). Researchers and practitioners have applied these principles to specific products, practices, and environments. In all applications of UD to teaching, instructors anticipate the presence of students with diverse abilities and other characteristics, and make design deci-

sions that result in learning opportunities available to all of these individuals, rather than focusing only on the average or "typical" student (Burgstahler, 2015a). Thus, universally designed courses are welcoming to, accessible to, and usable by all potential students.

IT is well suited to delivering the multiple presentation options characteristic of UD. In 1995 the author of this article co-taught the first online course offered through the University of Washington (UW) distance learning program. It is described below.

> The course presented an overview of assistive technology for people with disabilities. She and her co-instructor, Professor Norm Coombs at the Rochester Institute of Technology, who happens to be blind, set out to make the content and interactions fully accessible to anyone with a disability who might enroll in our course. A series of DO-IT [Disabilities, Opportunities, Internetworking, and Technology] videos that were both captioned and audio described and presented in Video Home System (VHS) format were mailed to the students. Electronic mail and a text-based listserv distribution list were used for communication. There was no world wide web, but a gopher server developed at the University of Minnesota was used to organize text-based course materials. Other online resources were accessed through Telnet and File Transfer protocols. When the instructors were asked if students with disabilities were enrolled in course offerings they were proud to say that they did not know. There was no need to disclose a disability when all of the materials and communications were in accessible formats. Dr. Coombs disclosed his blindness, but only because of its relevance to the course content. (Burgstahler, 2015a, pp. 49-50)

The years since this course was taught have witnessed tremendous increases in the number of technologies used in online courses, in the number of online courses available, and in the number of students taking these courses (Allen & Seaman, 2009; Kim-Rupnow, Dowrick, & Burke, 2001; Kinash, Crichton, & Kim-Rupnow, 2004; Phillips, Terras, Swinney, & Schneweis, 2013). The rapid pace at which new technologies are introduced make accessibility issues both more complex and more important to address. However, the basic issues remain the same—pedagogical *and* technical issues must be addressed in order for courses to be welcoming to, accessible to, and usable by all students. For example, access barriers can emerge when the learning management system (LMS) that delivers the content and engagement options includes inaccessible features. In addition, teaching methods used by online instructors and the IT they employ (e.g., videos) can erect barriers to some students. Ideally, a universally designed course would support a student's preferred access methods (e.g., speech input, alternative keyboard, the keyboard alone) and output preferences (audio text, graphical, video), and be customizable.

Online instructors and institutions tend to employ an accommodations-only model rather than a proactive model in dealing with accessibility (Barnard-Brak & Sulak, 2010; Kim-Rupnow et al., 2001; Kinash et al., 2004; Seale, 2014a). The accommodation-only approach problematizes individual deficits rather than addressing inequalities that result from the inaccessible design of the course. UD at its best promotes a culture of diversity that celebrates individual differences. Being *both* proactive (by applying universal design principles) and reactive (by being ready to provide accommodations to individual students when needed) is the ideal when it comes to social inclusion in the online world.

3. Guidelines for Inclusive Online Courses

Accessibility has been addressed in general standards for high quality online learning. For example, the International Association for K–12 Online Learning (2011) published standards for quality online courses that include accessible design recommendations for both technology and learning activities. In addition, the Quality Matters Rubric for high quality e-learning courses includes accessibility and usability as the eighth benchmark and recommends that this benchmark be applied to the other seven—course overview and introduction, learning objectives (competencies), assessment and measurement, instructional materials, course activities and learning interaction and engagement, course technology, and learner support (Quality Matters, n.d.). With respect to accessibility, many online learning guidelines point to the work of the World Wide Web Consortium (W3C). W3C is the organization that develops and maintains protocols to ensure interoperability of the web world-wide. It has always been committed to UD. According to Tim Berners-Lee, the inventor of the web, "The power of the Web is in its universality. Access by everyone regardless of disability is an essential aspect" (Berners-Lee, n.d.). Consistent with its vision of a fully inclusive environment, in 1997 W3C introduced a Web Accessibility Initiative (WAI) to develop guidelines for the accessible design of websites. The WAI recognizes that

> web accessibility also benefits people without disabilities. For example, a key principle of web accessibility is designing websites and software that are flexible to meet different user needs, preferences, and situations. This flexibility also benefits people without disabilities in certain situations, such as people using a slow Internet connection, people with "temporary disabilities" such as a broken arm, and people with changing abilities due to aging. (WAI, n.d.-c, What is Web Accessibility section)

In 1999, the Web Content Accessibility Guidelines 1.0 (WCAG 1.0), with input from a wide variety of stakeholders worldwide, were published as a W3C recommendation (2003). Now WCAG 2.0 is widely regarded as the current international standard for web accessibility. The WAI guidelines make it possible to objectively measure whether web pages are accessible, and many software tools have been developed for checking or validating content for accessibility. WCAG 2.0 includes recommendations for making web content accessible to people with a wide range of disabilities that include blindness and low vision, deafness and hearing loss, learning disabilities, cognitive limitations, limited movement, speech difficulties, photosensitivity, and combinations of these. The guidelines are organized around four principles (WAI, n.d.-b, Understanding the Four Principles of Accessibility section) to ensure that web content is

- *Perceivable*—Information and user interface components must be presentable to users in ways they can perceive.
- *Operable*—User interface components and navigation must be operable.
- *Understandable*—Information and the operation of user interface components must be understandable.
- *Robust*—Content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies.

Making the web accessible to people with disabilities requires that different components of IT and user involvement work together. These components include web content in text, images, and sounds, as well as markup that defines the structure and presentation; user agents such as web browsers and media players; assistive technology such as screen readers and alternative keyboards; user knowledge, skills, and adaptive strategies for using the web; developers, designers, coders, and authors, including those with disabilities; authoring tools used to create websites; and evaluation tools such as web accessibility evaluation tools and HyperText Markup Language (HTML) validators.

WAI (n.d.-a, Table of Contents section) offers the following quick tips for ensuring web accessibility:

1.1 *Text alternatives.* Provide text alternatives for any non-text content so that it can be changed into other forms people need, such as large print, braille, speech, symbols, or simpler language.
1.2 *Time-based media.* Provide alternatives for time-based media.
1.3 *Adaptable.* Create content that can be presented in different ways (for example, simpler layout) without losing information or structure.
1.4 *Distinguishable.* Make it easier for users to see and hear content, including separating foreground from background.
2.1 *Keyboard accessible.* Make all functionality available from a keyboard.
2.2 *Enough time.* Provide users enough time to read and use content.
2.3 *[Medical] Seizures.* Do not design content in a way that is known to cause seizures. (e.g., avoid flashing images)
2.4 *Navigable.* Provide ways to help users navigate, find content, and determine where they are.
3.1 *Readable.* Make text content readable and understandable.
3.2 *Predictable.* Make web pages appear and operate in predictable ways.
3.3 *Input assistance.* Help users avoid and correct mistakes.
4.1 *Compatible.* Maximize compatibility with current and future user agents, including assistive technologies.

WAI guidelines are updated regularly. They are general enough that they stand the test of time, applying to new technologies as they are developed. In addition to WCAG, individual countries have developed standards for web accessibility (e.g., the British Standard BS 8878; British Standards Institute, 2010).

4. Guidelines for Program-Level Inclusive Practices

There are many ways to justify making social inclusion of students with disabilities an important issue for online learning program administrators to address. They include: (1) many people consider it unethical to bar some eligible participants from program access; (2) applying accessible design principles is a best practice for all students; (3) costly redesign may be required when a student with a disability enrolls in an inaccessible course; and (4) legislation in some countries mandates that programs be accessible to qualified people with disabilities. Even the Convention on the Rights of Persons with Disabilities of the United Nations (2006) states as a purpose to ensure that people with disabilities have access, on an equal basis with others, to information and communications, including information and communications technologies and systems.

How UD can be integrated into the practices of online learning programs as a whole is not widely addressed in the literature. However a set of guidelines for distance learning programs was created as a product of a study conducted by the DO-IT Center at the University of Washington in Seattle (Burgstahler, Corrigan, & McCarter, 2005) and disseminated through DO-IT's Center for Universal Design in Education (DO-IT, n.d.-a).

The exploratory study addressed the research question: What are program-level policies and practices re-

lated to delivering online courses that are fully accessible to students with disabilities? Building on lessons learned in early work in this area (Burgstahler, 2002; Burgstahler, Corrigan, & McCarter, 2004), a draft of an initial list of *Distance Learning Program Accessibility Indicators (DLP Accessibility Indicators)* was created. It was designed to be used as a checklist of programmatic characteristics that can ultimately lead to more inclusive courses in any online learning program. The study engaged online learning programs at institutions whose disabled student service directors were part of projects funded by the United States Department of Education (grant #P333A020044 and #P333A990042) and directed by the DO-IT Center. These projects focused on training faculty and staff at postsecondary institutions to more effectively include students with disabilities in their courses and service offerings. Of the twenty-three schools initially considered for the distance learning project, eighteen had online learning programs that offered courses at a distance and in multiple academic areas. Online learning administrators of two of these eighteen schools declined to participate in the study, resulting in an 89% participation rate.

A wide range of institutional characteristics was represented in the sixteen participating schools—large and small schools; two-year (5) and four-year institutions (11); and schools from rural, suburban, and urban areas. A DO-IT staff person contacted online learning administrators at the participating schools. She shared the draft *DLP Accessibility Indicators,* web resources, and DO-IT publications and training videos to increase participant awareness of accessibility issues and solutions; encouraged them to join an electronic discussion group, *AccessDL*, focused on the accessible design of distance learning; collected examples of each *Indicator* applied at institutions as models for participants to consider; performed accessibility reviews of program web pages and offered suggestions for improvements; encouraged participants to adopt the *Indicators* at their schools; and helped develop a resource website, *AccessDL* (DO-IT, n.d.-c).

The *DLP Accessibility Indicators* were refined through formative feedback from participants in an iterative process that resulted in the list shared in the paragraphs that follow. (Burgstahler, 2006, p. 86, 2012, p. 3). It is organized by relevant stakeholder group.

For Students and Potential Students

Distance learning programs committed to accessibility assure that students and potential students know of the programs' commitment to accessible design, how to report inaccessible design features they discover, how to request accommodations, and how to obtain alternate formats of printed materials; the distance learning home page and all online and other course materials of distance learning courses are accessible to individuals with disabilities.

- *DLP Accessibility Indicator 1:* The distance learning home page is accessible to individuals with disabilities (e.g., it adheres to Section 508, World Wide Web Consortium, or institutional accessible-design guidelines/standards).
- *DLP Accessibility Indicator 2:* A statement about the distance learning program's commitment to accessible design for all potential students, including those with disabilities, is included prominently in appropriate publications and websites, along with contact information for reporting inaccessible design features.
- *DLP Accessibility Indicator 3:* A statement about how distance learning students with disabilities can request accommodations is included in appropriate publications and web pages.
- *DLP Accessibility Indicator 4:* A statement about how people can obtain alternate formats of printed materials is included in publications.
- *DLP Accessibility Indicator 5:* The online and other course materials of distance learning courses are accessible to individuals with disabilities.

For Distance Learning Designers

- *DLP Accessibility Indicator 6:* Publications and web pages for distance learning course designers include: (a) a statement of the program's commitment to accessibility, (b) guidelines/standards regarding accessibility, and (c) resources.
- *DLP Accessibility Indicator 7:* Accessibility issues are covered in regular course designer training.

For Distance Learning Instructors

- *DLP Accessibility Indicator 8:* Publications and web pages for distance learning instructors include (a) a statement of the distance learning program's commitment to accessibility, (b) guidelines/standards regarding accessibility, and (c) resources.
- *DLP Accessibility Indicator 9:* Accessibility issues are covered in training sessions for instructors.

For Program Evaluators

- *Accessibility Indicator 10:* A system is in place to monitor the accessibility of courses, and, on the basis of this evaluation, the program takes actions to improve the accessibility of specific courses and to update information and training given to potential students, students, course designers, and instructors.

An average of only 3.3 (33%) of the ten *Indicators* were already implemented to some degree at participating schools as the project began. These findings are consistent with literature that concludes that students

with disabilities are rarely considered in the design of distance learning courses (Kinash et al., 2004). At the beginning of this study the sixteen participating schools had implemented a total of forty-eight *Indicators,* at least partially, representing an average of 3 per school; by the end of the study, they had implemented or partially implemented a total of sixty-six *Indicators*, an average of 4.1 per school. In addition, some participants took steps that did not represent enough improvements to change an *Indicator* from "no" to "some" or "yes." It should be noted that changes made at three schools accounted for 14 (78%) of the changes overall.

The idea of accessibility, once understood, was enthusiastically received by most of the distance learning staff engaged in the study, but change was slow. These findings are consistent with literature that has for many years concluded that systemic change is often a slow process (Bruce & Wyman, 1998; Guy, Reiff, & Oliver, 1998). Reports from participants suggest increases in awareness, interest, and skills that may lead to ongoing, systemic changes in the distance learning programs they represented. In many cases, project engagement opened or increased communications between staff from disability services, distance learning programs, and computing services. Lack of time to address accessibility issues and the need to work with other staff were the most commonly reported reasons for not implementing changes. More research is needed to study how online learning programs can employ practices that ensure the social inclusion of students and instructors with disabilities in all course offerings.

5. The Current State of the Accessibility of Online Learning Courses

Many e-learning courses unintentionally erect access barriers that can have a negative effect on the social inclusion of students with disabilities (Burgstahler, 2002, 2006, 2007, 2015b; Coombs, 2010; Fichten et al., 2009; Keeler & Horney, 2007; Kim-Rupnow, Dowrick, & Burke, 2001; National Council on Disability, 2004; Thomson, Fichten, Havel, Budd, & Asuncion, 2015). Inaccessible features of these courses that students with disabilities report include uncaptioned videos, disorganized content and presentations, and PDF files and other course documents that cannot be read by screen readers (Gladhart, 2010). In one study, close to 70% of students with disabilities had not disclosed their disabilities to their online instructors (Roberts, Crittenden, & Crittenden, 2011). Almost half of the respondents said that they perceived their disabilities to have a negative impact on their ability to succeed in an online course. In another study female students with learning disabilities who enrolled in online courses reported that the learning environments of these courses were less supportive and less satisfactory than females who did not have learning disabilities (Heiman, 2008).

Some designers are unaware of accessibility issues; some are aware but place a very low priority on employing accessible practices; others consider the market for accessible courses to be too small to address. One study concluded that

> People with disabilities want to use the same products that everyone else uses. Implementation of universal design satisfies this desire of people with disabilities, while also providing more cost-effective products for all users. While it is impossible to satisfy the needs of all users, products and services that come closer to accommodating a variety of physical and cognitive differences will benefit both users and companies. (National Council on Disability, 2004, p. 20)

Many strategies for making online learning accessible to students with disabilities are reported in the literature (e.g., Burgstahler, 2015b; Coombs, 2010; Fichten et al., 2009; Keeler & Horney, 2007; Pearson & Koppi, 2006; Rangin, 2011; Savidis & Stephanidis, 2005; Seale, 2014a). For example, to get started in designing an accessible online course, DO-IT (n.d.-b, p. 1) has suggested that first steps include:

- Include a statement on the syllabus about how to request a disability-related accommodation and how to report a design feature of the course that is not accessible.
- Make learning objectives, expectations, assignments and due dates, grading rubrics, assessment questions, and other course elements clear.
- Use consistent and predictable screen layouts and single columns when possible.
- Structure lesson pages and documents using the heading feature of the product you are using (e.g., Microsoft Word, PDF).
- Make sure the text of links is descriptive of the resource linked to rather than use wording like "click here".
- Make sure that color is not the only way to convey important information and make background screens plain and with high contrast to text.
- Share definitions of terms that might be unknown to some students.
- Provide alternative text to describe important content presented in images.
- Caption videos or, when not possible to do so, provide transcriptions.
- Design HTML, Microsoft Word, Microsoft PowerPoint, and PDF documents in accessible formats.

Online learning researchers and practitioners offer these questions to be addressed by online instructors

(Thomson, Fichten, Havel, Budd, & Asuncion, 2015, pp. 282-283):

1. Has careful thought been given to the diversity of learners in the course? Are there barriers in any area of the course for learners with different abilities (e.g., artistic, numerical), circumstances (e.g., English language learners), concerns (e.g., finances) and disabilities (e.g., visual impairment)?
2. Has the accessibility of the LMS, including its various components, been considered for all persons, including those with different disabilities (for example, are the calendar, announcements, discussion board, chat, and quizzes accessible, can students easily distinguish new discussion threads, does the announcements tool indicate the number of new announcements posted)?
3. Has consideration been given to the variety of platforms and mobile devices students could be using to interact with the e-learning and the course material?
4. Are there alternative digital representations of course content that are accessible and usable?
5. Are there options offered for student engagement with the course content and the course objectives through accessible e-learning tools (such as online mind mapping, discussion forums)?
6. Are there alternatives offered to students to demonstrate what they have learned through accessible ICTs [information and communication technologies] or e-learning tools (such as audio, visual, written, demonstration)?
7. Has the institution's access technologist been consulted as the e-learning and digital learning modules and activities are designed (to ensure that all aspects of the course structure and components are accessible and usable—for example, how readily and easily can the web site be navigated)?

Faculty, distance learning designers, and support staff should also be aware of accommodations that might be required if an online tool (e.g., the LMS or a third-party addition) is known to be inaccessible to certain students. For example, if a graphics-based writing "wall" or animated avatar application that is not accessible to students who are blind is used in a course, the instructor should consider not using the tool or providing alternatives for a student who is blind to gain the content that is a result of use of the tool (e.g., providing a transcript, summary) if they are enrolled in an offering of the course. A campus disability services office may be able to provide assistance in this regard.

Most studies of online learning do not address access issues for people with disabilities. Even studies about performance differences of student subgroups such as those defined by gender, age, and race, rarely explore differences between students with and without disabilities (e.g., Xu & Jaggars, 2014).

UD can be applied to the overall design of a course, but it can also be built into an assignment. For example, in an online course taught by the author of this article,

> small groups were assigned to complete a project and answer specific questions to report their work. The first thing they were told to do was decide which mode of communication they would employ so that all students could attend group "meetings" and fully engage in the collaboration. One group reported back that they used e-mail, at least in part, because one of the participants was deaf and could not easily engage using the synchronous communication modes offered. Actually, the majority of groups used asynchronous communication options, usually because this mode of communication, when compared to phone conferences and real-time chat sessions, worked best when group members lived in different time zones and/or had different daily schedules. Asynchronous communication also works well for individuals with slow input speeds. Even though one member disclosed her deafness, members of groups were not required to disclose disabilities or any other characteristics that contributed to their communication preference; they just needed to reach consensus on the communication tool they would use. In this course, if not for her voluntary disclosure, not even the instructor would have known she was deaf because the class was universally designed. For example, captions were provided on all video presentations. (Burgstahler, 2015a, p. 51)

Most faculty members do not address accessibility issues as they develop online courses. In one study, 80% of the respondents in a survey of online learning faculty had not considered the needs of students with disabilities and less than 12% had "partially" considered the needs of these students as they developed their courses (Bissonnette, 2006). Many instructors report that they are unaware of how to make their online courses accessible to students with disabilities (Gladhart, 2010; Roberts, Park, Brown, & Cook, 2011). The combined results of three studies (Burgstahler, 2007) conclude that there is a need for accessibility training for online learning personnel and suggests that topics should include access challenges for people with disabilities, legal requirements, UD guidelines, specific design techniques and pedagogical strategies, and resources. Specific training for instructors, online course designers, and other stakeholder groups should be tailored to their needs. UD instruction should be integrat-

ed into more general training offerings such as how to use the campus LMS.

Applying UD reduces the need for accommodations for students with disabilities. For example, captioning videos to be used in an online course means that students who are deaf will not require an accommodation to access the content. Captions may benefit other students as well. Through captions, students can see the spelling of words spoken in the presentation and search through the caption text for specific topics. Second language learners report that captions increase their attention, improve processing of vocabulary, and reinforce previous knowledge (Winke, Gass, & Sydorenko, 2010). Several studies suggest the positive effects of captioning on recall and retention (Danan, 2004). Some evidence suggests that simultaneous text presentation along with audio can aid native and advanced nonnative speakers of English with word learning under certain conditions, as assessed by both explicit and implicit memory tests (Bird & Williams, 2002). Such findings align with UD principles that recommend multimodal instruction. Although empirical research and anecdotal reports suggest the beneficial effect of captions, more data needs to be systematically collected to determine specific long-term benefits for students with various characteristics.

6. Promising Approaches for Studying the UD of Online Learning and Its Widespread Practice

Many researchers consider involvement of the student critical in designing online courses, but they differ in their views regarding how best to involve them and the level to which people with disabilities are routinely involved in the testing. Design methods that measure aspects of the social inclusion of students with a wide variety of characteristics hold promise for exploring the efficacy of UD with respect to online learning practices (Emiliani, 2009; Friedman, Kahn, Borning, & Huldtgren, 2013). As summarized by Jane Seale in the United Kingdom:

> We need new methodological approaches to "liberate" disabled students' voices; methods that offer us opportunities for critical self-reflection but also enable a dialogical relationship to be established with disabled students in which they are genuinely heard. (Seale, 2014b, p. 192)

Seale has explored complex interactions between students and technologies in online learning using a *participatory design* approach, where students are engaged in all steps of the research (e.g., Bjerknes & Bratteteig, 1995; Seale, 2014b) and tests are made in real-life contexts and in iterative steps as the online learning design is improved.

Other design approaches that maximize the engagement of users include *learner-centered design* (Nesset & Large, 2004). In addition, *value-sensitive design*, a relatively new design approach which is grounded in the design of technology that accounts for human values within a cultural context (Friedman et al., 2013), addresses human values that include human welfare, privacy, freedom from bias, trust, autonomy, informed consent, identity, and courtesy. Steps in applying value-sensitive design may include identifying values, technology, and context; determining direct and indirect stakeholders; identifying potential benefits and harms for each stakeholder group; mapping benefits and harms onto corresponding values; identifying value conflicts; and integrating value considerations into the structure of the organization (Friedman et al., 2013).

The term *usability* is used to refer to the iterative testing and feedback process wherein users are observed as they interact with the product features. Usability issues addressed include ease of use, simplicity of learning, efficiency in performing tasks and addressing errors, memorability, and user satisfaction for all users (Nielson, 2012). The usability process is often employed multiple times during phases of product development in order to make the developing product more efficient and practical for customers. *Usability* testing practices hold promise for studying design practices that employ UD and thus maximize social inclusion in online courses when researchers engage participants with a broad range of abilities and disabilities in the usability tests (e.g., Horton, 2005; Schneiderman, 1999).

An example of a world wide effort that promotes the universal design of technology is the Global Public Inclusive Infrastructure (GPII), a project of Raising the Floor (2011). The purpose of the GPII is not to create new assistive technologies or services, but rather to create an infrastructure that makes their development and use easier, less expensive, and more effective. GPII leaders provide the following analogy:

> Like building a road system does not provide transportation but greatly enhances the ability of car companies and others to do so—and provides an infrastructure that car companies themselves cannot do. The Internet is the infrastructure for general information and commerce. The GPII enhancements to the Internet would provide the infrastructure to enable the Internet to be truly inclusive for the first time. (Raising the Floor, n.d., p. 1)

The goal of GPII is to eliminate barriers to access and use of the Internet that are related to disability, literacy, technical expertise, aging, or financial resources. As countries build their broadband infrastructures to reach everyone, GPII leaders work to ensure that "everyone" includes people with a wide range of characteristics that include disability.

In spite of efforts by researchers and practitioners

to promote universal/accessible design of online learning and the availability of guidelines and standards for the accessible design of technology and teaching strategies, evidence of widespread practice of the inclusive design of online courses does not exist. Besides general issues related to difficulties in making people aware of changes needed and integrating changes into existing practices, reasons for this situation may include that many content specialists who are charged with developing online courses have little guidance in creating effective online learning and little if any background in pedagogy and effective instructional design, including inclusive design practices. Even those charged with supporting the design of online courses may not have knowledge of strategies for reaching a broad audience and of IT accessibility issues. Therefore, few exemplar courses are available to faculty members and to those in course design and IT support roles. Based on interactions with individuals in these roles, the author of this article believes that few of them have learned of accessible/universal design practices in their own training process. In order for widespread adoption, there is a need to increase resources for online learning designers, faculty, IT support staff, and IT developers regarding legal requirements to offer accessible online courses, guidelines and standards available, and examples of successful practices. Further research is also needed to document the efficacy of specific universal design strategies overall and specifically for students with various types of disabilities.

7. Conclusion

The application of UD to online instruction holds promise for addressing the needs of a worldwide student body that is increasingly diverse with respect to race, ethnicity, culture, native language, age, learning style, background knowledge, gender, disability, and other characteristics. UD and similar terminology have emerged to describe approaches to inclusive design that has the potential to support social inclusion. In these approaches, instructors and course designers consider the needs of students with a broad range of characteristics as they develop flexible strategies that make instruction welcoming to, accessible to, usable by all students. Employing a UD process goes beyond ensuring accessibility for individuals with disabilities to address usability issues such as ease of use, efficiency, memorability, and user satisfaction for all users. Improving access and usability for people with disabilities also improves usability for others, thus creating a platform for the social inclusion of all students. It can be argued that it is simply good business practice for online course providers to avoid excluding large populations of consumers from effectively engaging in their courses.

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Conflict of Interests

The author declares no conflict of interests.

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