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Problematizing the inclusion agenda in higher ec
Towards a more inclusive technology enhanced l

by Denise Wood

Abstract

The focus on inclusive approaches to higher education and increasing availability of educational technologies designed to enhance student communication and collaboration has led to new opportunities for widening participation and improving the learning outcomes of students from diverse backgrounds. However, despite the potential, the principles of inclusive education are often applied in ways that serve to further disenfranchise the very students the approach seeks to support. This paper draws on research undertaken through funding support provided by the Australian Government, Office for Learning and Teaching in presenting the case for teachers to adapt their learning and teaching strategies to address an increasingly diverse student population and to adopt more transformative pedagogical approaches to engaging all students with "difference". This paper explores issues of particular relevance to the design of technology enhanced learning that is inclusive of the diverse needs of higher education students with disabilities, however, the term "diverse students" is preferred, acknowledging the transient nature of some disabilities, the varying ways in which individuals choose to identify, the multiple layers of equity overlap, and the benefits of inclusive design of technology enhanced learning for all students. The inclusive education approach presented in the paper incorporates accessibility, usability, personalization and transformative pedagogy within a holistic model, as well as strategies for implementation at the institutional, program and individual student level. This paper concludes by arguing for more transformative approaches to understanding diversity and strategies for implementing inclusive design of technology enhanced learning in the higher education context.

Contents

Introduction

The widening participation agenda, which has gained momentum in recent years, has been supported by the new and emerging opportunities afforded by technologies to bridge the so called "digital divide" (Elliott, 2010). However, as Allan (2004) argues, the goals of inclusive education cannot be fully realized by focusing on strategies for "managing difference"; there is an imperative for educators to also adopt more transformative approaches to learning and teaching. This paper advances Allan's argument by problematizing the term "inclusive education" with particular focus on strategies for applying the principles to the design of inclusive technology enhanced learning (TEL) environments. The paper describes a proposed model, which recognizes the importance of accessibility, usability and strategies for personalizing the learning environment, as well as the need to utilize the affordances of

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technologies in ways that can open up the space for transformative pedagogical practices to accommodate an increasingly diverse student population (Wood and Willems, 2012).

In advancing the argument for a more holistic understanding of inclusive education, the paper draws on research undertaken through a national learning and teaching funded project, the aims of which are to provide guidelines for academics on the design and redevelopment of inclusive TEL curricula, and to develop an open source responsive learning system (RLS), which adapts to student needs by delivering content that is personalized to meet their individual accessibility needs and learning preferences. The RLS meets the first three components of the model by providing a solution that is responsive to an individual student's particular accessibility and usability needs through the personalization of the online learning environment. The fourth component of the model therefore addresses this concern by providing a strategy that can be adopted by teachers to accommodate and be responsive to individual student needs, while also adapting their pedagogical approaches to challenge all students to engage with difference and gain an appreciation and understanding of diversity.

The first section of this paper draws on a review of the literature to provide the case for an alternative inclusive education model. The second section focuses on the theories underpinning the approach including biopsychosocial understandings of diversity, social constructivism and Engeström's (2001) concept of expansive learning, as well as an ethic of care framework. The third section presents a holistic inclusive education model that incorporates accessibility and usability, as well as personalized learning and transformative pedagogical approaches as core to the inclusive education agenda. The final section of the paper returns to the problematic of "inclusive education", arguing for an inclusive technology enhanced learning approach which recognizes that the goals of inclusive education in higher education cannot be achieved by only focusing on access and strategies for "managing" or "accommodating" difference (Allan, 2004). Rather, as the paper concludes, a truly inclusive education model in higher education requires an integrated approach; one which addresses accessibility, usability and personalization of the learning environment, while also adopting more transformative pedagogical approaches to engaging students with "difference" underpinned by an ethic of care.

Problematic discourses

Inclusive education can be defined as the right of any person to access mainstream education regardless of their abilities, race, gender, nationality or any other factor (Gaad, 2010). In the context of higher education, there has been a global trend towards widening participation and improving the opportunities and learning outcomes for students from diverse backgrounds. With increasing access to more technology enhanced learning opportunities (Elliott, 2010), there are also new possibilities for engaging students from diverse backgrounds, wherever they are located geographically (Wood and Willems, 2012) and regardless of the platform or technology available. Such new and emerging technologies have the potential to link students who are isolated by disability, geographical location and social circumstances, and have the potential to enable people with disabilities to pursue social, educational and employment pathways that may have been difficult or impossible to achieve in the past [1].

Inclusive education has gained global attention through international initiatives such as the United Nations Millennium Development Goals (United Nations, 2015), Education for All (UNESCO, 2014) and the United Nations Convention on the Rights of Persons with Disabilities (CRPD) and its Optional Protocol, which opened for signature on 30 March 2007. The two articles of the CRPD of particular relevance to inclusive education with respect to students with disabilities are Article 9 and Article 24. Article 9 is primarily concerned with the rights of persons with disabilities "to live independently and participate fully in all aspects of life" and the CRPD outlines the responsibilities of States Parties to "take appropriate measures to ensure to persons with disabilities access, on an equal basis with others, to the physical environment, to transportation, to information and communications, including information and communications technologies and systems, and to other facilities and services open or provided to the public, both in urban and in rural areas" (United Nations, 2006). Article 24 focuses on the rights of persons with disabilities to education without discrimination and requires that States Parties employ the principles of equal opportunity to "ensure an inclusive education system at all levels and lifelong learning" (United Nations, 2006).

However, despite the goals of such international initiatives emphasizing the rights of all people to an inclusive education, Armstrong, *et al.* (2008) argue that the themes of social inclusion and education for all are policies that have been developed by first world states. They suggest that such policies are consistent with neoliberal forms of governance and free market forces of competition, which is premised on the "Assimilation of difference by an over-riding imperative of technologically driven

modernization" [2]. They argue further that the strategies for ensuring inclusive education are often closely related to managing students by minimizing disruption in regular classrooms and by regulating "failure" within the education systems. Allan (2004) argues that despite the proliferation of theories (for example postmodernism, post-structuralism and critical theory), and policies aimed at improving access to education for all students, there has been a failure to apply such constructs to the "refashioning" of pedagogical approaches to learning and teaching. As Allan argues, the move towards standardization of inclusion, access and equity through institutional policy has "reterritorialized difference" leading to a focus on management of, rather than engagement with, difference [3].

Over the last decade there has been increasing recognition of the potential of online communities in providing a medium through which people from diverse backgrounds including those with disabilities can exercise agency, exploring "the intersections and interaction of disability (social oppression) and impairment (bio-social functions) of [their] bodies" [4]. However, unless such environments are accessible to diverse users, their potential as sites of resistance are diminished. Just as the principles of inclusive education are often enacted in ways that are designed to manage and control difference, so too virtual environments are often constructed in ways that restrict the participation of certain groups of individuals. As Hickey-Moody and Wood (2008) observed in their account of the exclusionary practices of 3D virtual worlds such as *Second Life* (*SL*), despite the potential of this environment to facilitate varied kinds of engagement for people who identify as having a disability, for many, the technology is disabling and exclusionary. As they argue [5],

> Herein lies a paradox: on the one hand, 3D virtual worlds such as *Second Life* are exciting and pleasurable for some users, on the other hand, some people with certain forms of sensory and cognitive impairments are largely excluded from such participation. Arguably, the most significant barrier to accessibility in an environment that is primarily user-generated is not technological, but is rather, the attitudes of the community.

This paradox is also described by Annable, *et al.* (2007) who have observed that the very technologies that can be productive for people with disabilities, through "activating human rights, citizenship, and the possibilities of everyday life" [6], continue to be disabling. The same challenges are encountered, though in more subtle ways, in the ways in which the principles of inclusive education are often enacted. For example, focusing only on the provision of access to educational services and technologies, while ignoring the ideologies underpinning the view that disability is a "problem in need of a solution" (Titchkosky and Michalko, 2012), is one subtle way in which exclusionary education practices are perpetuated. Another widely accepted exclusionary practice in higher education is perpetuated by only providing accommodations such as synchronized captioning of lecture recordings to students who self-identify as having a disability and register for disability support, even though all students benefit from having the option to view streaming captions, particularly (but not exclusively) students of non-English speaking background, those who prefer text to audio modes of learning and those whose environment or technologies make listening to audio difficult.

This paper argues for an approach which challenges the outmoded medical model in which disability is viewed as a problem within the individual to be cured or managed, and the social model which locates the problem in society thereby perpetuating a Cartesian "disembodied notion of disability" [7]. Rather, this paper adopts a biopsychosocial theoretical approach (Engel, 1978; Gabel and Peters, 2004), which recognizes that it is the combination of the biopsycho (Thomas, 2001) and social processes that lead to physical and emotional oppression (Reeve, 2004). Such an approach counters the "tragic" view of disability perpetuated by the medical model, and the Cartesian disembodied approach of the social model by affirming the value of human diversity rather than standardization (Baglieri and Shapiro, 2012). This approach also advances the position that the aim of inclusive education should be "about confronting all forms of discrimination as part of a concern to develop an inclusive society based on social justice, equity and democratic participation" [8]. It is to this area of inclusive education with a particular focus on the need to ensure equitable access to technology enhanced learning that this paper now turns.

Theoretical framework

The theoretical framework upon which the inclusive design of technology enhanced learning approach is based on a biopsychosocial understanding of diversity and social constructivist approaches to learning and teaching, which recognizes that learning and teaching is culturally situated, historically informed and imbued with power and control (Hardman and Amory, 2015; Wood, 2015). These factors impact on the ways in which

technologies are employed and their effectiveness in engaging diverse students and supporting transformative approaches to learning and teaching. The approach is also founded on an ethic of care framework (Tronto, 1993), which focuses on the "compelling moral salience of attending to and meeting needs of particular others for whom we take responsibility" [9]. In this next section, these three theoretical frameworks, which provide the foundation for the inclusive design of technology enhanced learning model, are discussed in further detail.

Biopsychosocial model of diversity

The biopsychosocial model rejects the reductionist medical and social models of disability, both of which have constructed the view of disability as a "problem to be managed" and perpetuated a Cartesian disembodied view of disability. The approach acknowledges the fluid and multi-faceted dimensions of diversity and recognizes the need to shift focus from regarding diversity as a "problem" to be managed (through either a medical or social "cure") to one in which engaging with and affirming difference is embedded in policies and practices at the institutional, program and individual level.

Despite its critics (see, for example, Eid, 2012; del Puente and Bragazzi, 2012), the biopsychosocial model as an alternative to the medical and social models has gained traction since first proposed by George Engel in 1978. The approach addresses the need for a more inclusive model by dispensing with the "scientifically archaic principles of dualism and reductionism" [10] in favor of a more holistic model based on the principle that an individual's health reflects the extent to which there is harmony between the interconnected biological, psychological and social systems. Therefore, as Engel points out, a disturbance or disruption of any one of these interconnected systems can have profound impact on other systems; thereby acknowledging the diversity in the ways individuals' experience the same disability or illness depending on their individual biological makeup, their socio-cultural history, psychological factors and/or environmental circumstances.

The biopsychosocial model is also reflected in the World Health Organization's (WHO) transition to the International Classification of Functioning, Disability and Health (ICF) in 2001 (World Health Organization (WHO), 2002). The ICF, in contrast to previous approaches such as the International Classification of Impairments, Disabilities and Handicaps (ICIDH) first published in 1980 (World Health Organization (WHO), 1980), changed the perspective from the biomedical model of diseases to that of the biopsychosocial model of health; acknowledging the fluidity and transient nature of health status at any given time. As Kraus de Camargo (2011) observes, the ICF classification does not classify people according to a diagnosis, but rather, their functioning given their biological makeup and the psychological, social and environmental circumstances at a particular point in time. The ICF therefore acknowledges that the functioning and disability of an individual occurs in a context, taking into account "what a person with a health condition can do in a standard environment (their level of capacity), as well as what they actually do in their usual environment (their level of performance)" [11]; domains which are classified from body, individual and societal perspectives.

Cultural historical activity theory (CHAT)

In the context of inclusive education, the biopsychosocial model as a systems based theory is complementary to social constructivist approaches such as cultural historical activity theory (CHAT), which recognizes that learning is a collectively shared process with significant cultural and historical dimensions (Vygotsky, 1978). The approach draws on Vygotsky's (1978) concept of the zone of proximal development, which is the distance between what an individual (for example a student) can achieve on their own and what they can accomplish when guided by more capable peers or adults (for example, their peers, tertiary tutors, lecturers) through social interactions that take place in a historical and cultural context (Wood, *et al.*, 2015). CHAT provides a heuristic for analyzing activities within the context in which those activities take place (Jonassen and Rohrer-Murphy, 1999). Vygotsky's conceptualization of CHAT was a simple triad (see Figure 1) in which he argued that every activity system includes a subject (in the case of education this might be the student whose activity system we are studying). An object is what drives or motivates the activity; for example, the object might be for students to develop communication skills and particular technical skills required to fulfill the requirements of the course. The third component are tools which include both cognitive and material tools (including traditional tools and information and communication technologies), which in the higher education context, might be the cognitive strategies, academic literacies and the digital technologies students require to complete their studies.

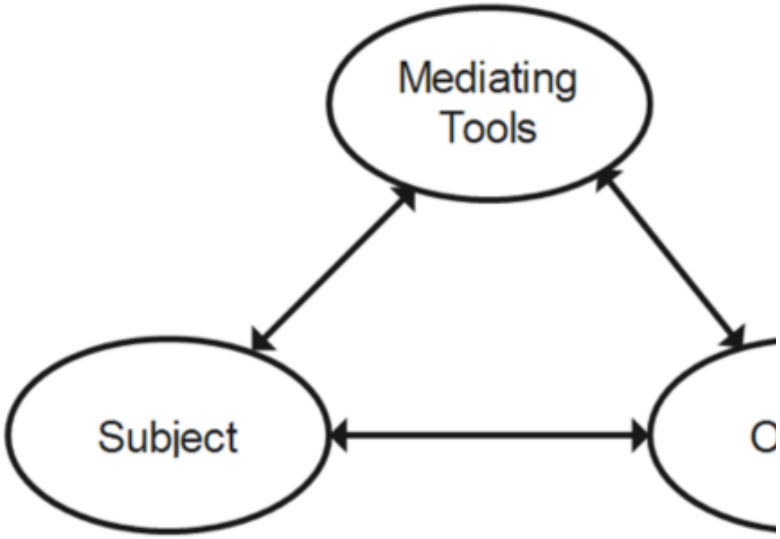

Figure 1: Vygotsky's conceptualization of an activity system (first gen

Leont'ev (1978) recognized that Vygotsky's conceptualization was under-developed since as he argued, activity systems are more complex, taking place with a community in which there is a division of labor and rules which affect the subject's interactions and use of tools. Leont'ev also noted that activity systems include operations — the specific activities undertaken by the subject using tools to achieve a goal, motivated by the object. This model became known as second-generation CHAT, and was subsequently depicted by Engeström as a more complex triad (see Figure 2).

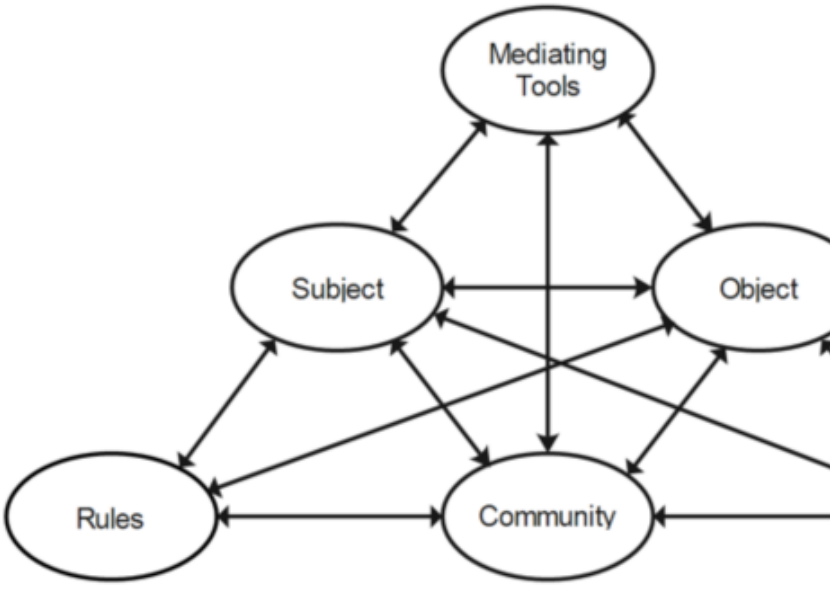

Figure 2: Engeström's visual depiction of Leont'ev's conceptualization of an a generation CHAT).

Engeström (2001) further developed the model, which he referred to as third-generation CHAT, arguing that individuals operate within a number of activity systems, each with multiple points of view, traditions and interests. According to Engeström (2001), the interactions of two or more activity systems reveal contradictions in the objects of each system. Such contradictions are not regarded in a negative light; rather Engeström identifies such contradictions as opportunities for expansive learning, which can occur when the facilitator, or in our example, the teacher, adapts their learning and teaching approach in ways that enable the objects of activity systems to be shared, or jointly constructed.

In explaining his concept of expansive learning, Engeström (2001) draws on Gregory Bateson's three types of learning. Learning I refers to "acquisition of the responses deemed correct in the given context — for instance, the learning of correct answers in a classroom" [12]. Learning II is described as the type of learning that occurs when the student acquires an understanding of the deep-seated rules and patterns of behavior required in a particular context (for example, students learn the "hidden curriculum" required to pass exams or be accepted by the group). Such learning creates what Bateson refers to as a double-bind for the student, which can only be resolved by the collective endeavor of the group with the support of knowledgeable others (teachers, peers etc.). This type of learning is referred to as Learning III by Bateson and is what Engeström means when he refers to expansive learning. It is the type of learning that can occur through the collective action taken by the teacher and the students to resolve the double-bind or contradictions between the objects of activity systems. Thus, expansive learning can occur when a student or a group moves beyond the contradiction to "radically question the sense and meaning of the context and to construct a wider alternative context" [13].

It is this type of learning that we need to focus on when redesigning curricula and activities that are designed to facilitate a process by which students are able to confront the contradictions between their preconceived notions about diversity and their exposure to new situations requiring them to engage with and begin to appreciate diversity as an articulation of difference, and something to be valued.

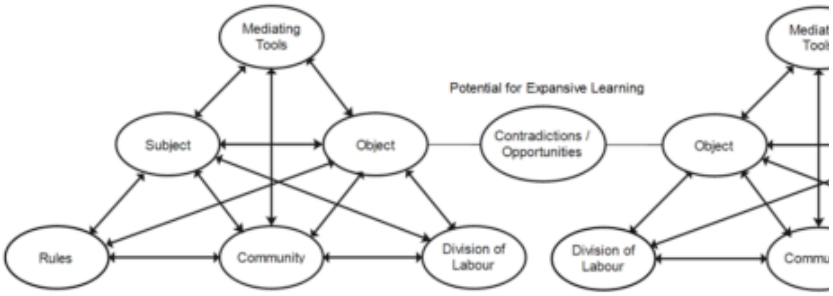

Figure 3: Engeström's conceptualization of two interacting activity systems (th

Ethic of care

The origins of ethics of care as a moral theory is generally attributed to the feminists Carol Gilligan (1982) and Nel Noddings (2003) who argued for a relational moral theory. Despite criticism of Gilligan's conceptualization of care ethics as essentialist and privileging women (see, for example, the critique by O'Brien, 2005), the principles have been advanced by several feminist scholars including Selma Sevenhuijsen (1989), Berenice Fisher and Joan Tronto (1990), and Virginia Held (2006).

Held (2006) argues that despite the differences between various conceptualizations of care ethics, the five underlying principles are: 1) the central focus is on the moral salience of attending to and meeting the needs of others for whom we take responsibility; 2) the valuing of emotions such as sympathy, empathy, sensitivity, and responsibility; 3) universalistic and abstract rules are rejected in favor of caring relations which act for self and others; 4) the boundaries between public and private are conceptualized, social and public arrangements examined, and at times transformation of society is sought; and, 5) individuals are understood to be relational and interdependent [14].

The ethic of care adopted in the inclusion model outlined in this paper is that of Joan Tronto (1993) who defines care as "a species activity that includes everything that we do to maintain, continue, and repair our 'world' so that we can live in it as well as possible. That world includes our bodies, ourselves, and our environment, all of which we seek to interweave as a complete complex life-sustaining web" [15]. Tronto (1993) identifies four phases of caring: 1) caring about; 2) taking care of; 3) care-giving; and 4) care receiving [16]. She further identifies four elements of care arising from these four phases including: 1) attentiveness; 2) responsibility to care; 3) competence; and 4) responsiveness [17]. Failure to act on inequalities and caring for others, according to Tronto, is a form of parochialism or "privileged irresponsibility"; that is, elevating one's needs above the needs of others, or distancing oneself from the needs of those who are unrelated. In contrast, an ethic of care advocates responsibility; the requirement to act and take responsibility for the needs of particular others.

An ethic of care is therefore fundamental to the inclusion model and also

an essential foundation for implementation of the inclusion strategy within an institution. By adopting an ethic of care approach, the teacher commits to being attentive to the needs of students, takes responsibility for ensuring their diverse needs are accommodated through the teaching strategies employed and the manner in which curriculum materials are designed to ensure they are accessible to students with diverse needs and is responsive to students and their changing circumstances. An ethic of care also commits the teacher to seeking strategies for engaging students in learning activities that facilitate expansive learning by challenging them to confront their assumptions, consider multiple points of view and to value difference. In this next section, the inclusion model based on these theoretical foundations is outlined.

Inclusive design of technology enhanced learning model

The inclusive design of technology enhanced learning is based on the aforementioned theoretical foundations; the biopsychosocial model of diversity; social constructivist approaches such as CHAT; and, an ethic of care framework. The model incorporates four interrelated components (accessibility; usability; personalization; and, transformative pedagogical practice), each of which is essential for the design of inclusive learning environments (See Figure 4). These components are elaborated upon in further detail in the following sections.

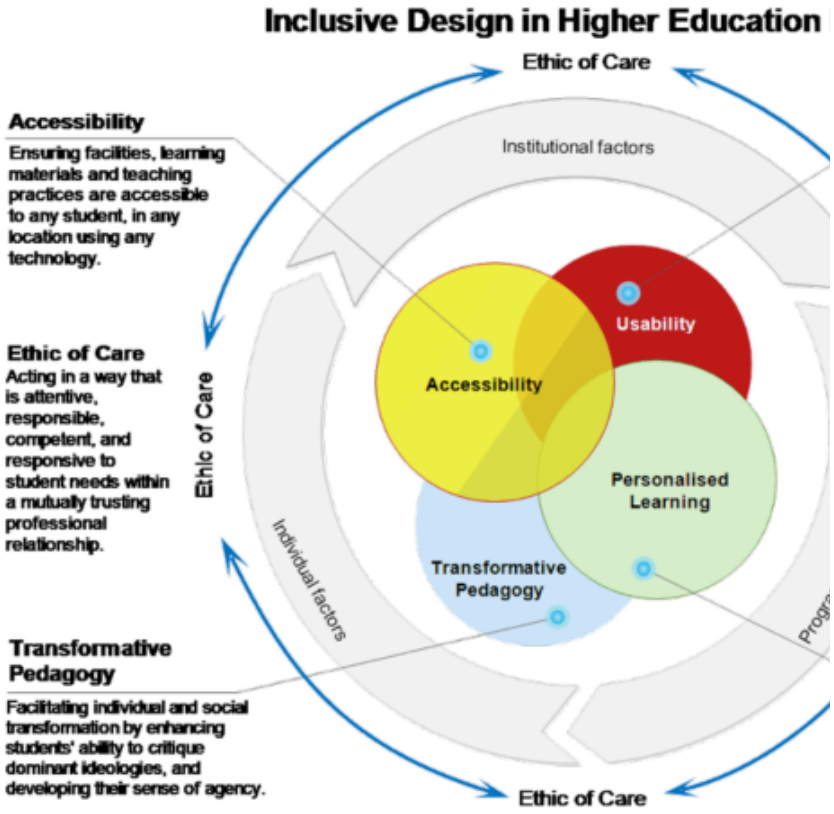

Figure 4: Inclusive design of technology enhance learning m

Accessibility

For the purposes of this paper, accessibility is defined as an approach designed to ensure that the information and communication technologies (ICTs) employed by universities can be accessed by any student and staff member, using any device or platform from any location. The approach is consistent with the World Wide Web Consortium (W3C) Web Accessibility Guidelines (World Wide Web Consortium, 2008), which guide content authors and designers in the strategies they can employ to ensure that the Web sites they create are accessible to a broad range of users, including those with visual impairments, hearing impairments, mobility impairments and learning disabilities, as well as those from linguistically diverse backgrounds, those with varying digital literacy levels and those located in remote locations. There are four overarching WCAG 2.0 design principles. These principles state that online content must be:

1. Perceivable (*i.e.*, information and user interface components must be presentable to users in ways they can perceive);

2. Operable (user interface components and navigation must be operable);
3. Understandable (information and the operation of user interface must be understandable); and,
4. Robust (content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies).

Although the principles provide the foundation for Web accessibility, the 12 guidelines relating to those principles provide the more detailed framework and objectives required to implement the techniques of accessible design in practice. Testable success criteria associated with each of the 12 guidelines provide the means by which the conformance of a Web site can be evaluated against the three levels of conformance specified by the W3C, namely: A (lowest level of conformance); AA (the level accepted by a large number of organizations as a realistic level of attainment); and, AAA (highest level of conformance). Each guideline, and associated success criteria, is accompanied by detailed notes on the techniques that are sufficient for meeting the success criteria and those that are advisory. Despite the considerable variation in the national laws and policies governing the accessibility of ICTs, the W3C notes a growing body of national laws and policies exist which take the approach of establishing a human or civil right to ICT, Other laws and policies take the approach that any ICT purchased by government must be accessible, while others mandate that any ICT sold in a given market must be accessible [18].

A second set of accessibility principles relate to universal design, advocating for a "socially conscious, general approach to designing in which designers ensure that their products, environment and services address the needs of the diversity of users of products, irrespective of users' age, ability or cultural background" [19]. The principles of universal design were adapted by the Center for Applied Special Technology (CAST) and developed into a Universal Design for Learning (UDL) framework (National Center on Universal Design for Learning, 2014; Coombes, 2010), which is of particular relevance to the design of inclusive e-learning materials. The Universal Design for Learning (UDL) framework is based on three primary principles: 1) providing multiple means of representation to accommodate different learning styles and needs; 2) providing the same information through different sensory modalities (*e.g.*, through vision, hearing, or touch); and, 3) providing information in a format that will allow for adjustments by the user (*e.g.*, text that can be enlarged, sounds that can be amplified).

These guidelines are complementary and provide a comprehensive set of strategies that educators can follow to ensure their TEL environments are accessible to their diverse students, while also benefitting all students by providing alternative formats and being adaptable to their specific preferred learning styles and needs.

Usability

Usability has been defined as "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use" (International Organization for Standardization (ISO), 1998), and usability testing within a TEL should consider factors such as learnability, effectiveness, efficiency and user satisfaction. The W3C Web Accessibility Initiative (WAI) recognizes the interrelationship between usability and accessibility in describing inclusive design as concerned with "making technology available to and usable by all people whatever their abilities, age, economic situation, education, geographic location, language, etc." (World Wide Web Consortium (W3C), Web Accessibility Initiative (WAI), 2011)

Cooper, *et al.* (2012) also discuss the interrelationship between accessibility and usability, arguing for a broader definition and alternative strategies for achieving a more inclusive Web. As they suggest, technical Web accessibility guidelines are only one component of the strategy required to develop a more inclusive Web experience for diverse users. They advocate a human-computer interaction focused approach that takes into account task completion (including measures of time on task, usage patterns and successful completion of tasks) to provide a more context-based approach to accommodating diverse user needs.

The approach advocated by Cooper, *et al.* (2012) is consistent with the theoretical foundation of the inclusive approach to TEL, and social constructivism in particular, advanced in this paper. As they propose, the strategy "locates disability and the experience of accessibility within a relational socio-cultural frame of competing economic, cultural and political forces and subsist alongside other indices of exclusion (for example, age, gender, sexuality, ethnicity, class)" [20].

Several researchers have argued for greater involvement of students in informing continuous improvement of learning environments (Jara and Mellar, 2010; Könings, *et al.*, 2008). As Könings, *et al.* argue, "a reciprocal relationship between designers, teachers, and students is proposed ... students' perceptions of a learning environment should provide input in the design process ... . Discrepancies between the educational aims of designers and teachers on the one hand, and students on the other hand, are suboptimal for students' learning." [21]

The protocol for usability testing often employs usability testing software enabling a facilitator to set up a series of course related tasks that users undertake while the installed client software records the pathways they take, the mouse clicks made, the time on task and whether the student was able to complete the task. At the same time, the user is asked to "think aloud", reporting on what they are thinking as they navigate the course site to complete the task, while a Webcam records their description of the experience and visual cues, facial expressions and where the user is looking.

The interrelationship between accessibility and usability is best illustrated by the experiences of a visually impaired student enrolled in a previous offering of a course coordinated by the author. The course had been developed in the Moodle Learning Management System (LMS) with accessibility being a primary consideration, but despite preliminary accessibility testing of the course by the coordinator, several of the accessibility issues did not emerge through standard automated and manual testing alone. It was only through the usability testing of the site by a student with a disability that the extent of the problems became evident. Since the student relied on assistive technology to access the course site, a manual approach to usability testing was conducted with the student via Skype. In this case, the student shared her screen with the course coordinator who asked her to step through the process of completing a number of course-related tasks while a Webcam recorded her interactions and captured her shared experiences. These tasks included finding the contact details for the coordinator, joining a group for the team assignment required for the final assessment piece and posting a message to the discussion forum.

- The first task proved challenging for the student as she relies on each section of the course site having headings to quickly navigate the content to find the relevant section. Since a label which did not have a heading associated with it was used to identify the 'contact' section, the student did not locate that section on her first attempt at tabbing through all the major headings. She subsequently located the contact section after several minutes, and only by tabbing through each and every link on the page.

- The second task proved even more challenging for this student. This was because the link to the Wiki enabling students to sign up for a group for the final assignment was located immediately beneath the link to Assignment 3. A sighted student could easily see the link to the Wiki located after the link to Assignment 3, but since this student relies on tabbing through the links, she reached the link to Assignment 3 and logically expected the Wiki to be contained within that section of the site, and so could not find the Wiki link without extensive assistance.

- The third task also proved challenging as when the student accessed the discussion forum she was trapped in a popup window that opened up asking her to attach a file to her discussion forum posting. Since she could not see the popup window, she was unaware that she needed to close the link to post her message.

- Another challenge for this student was the course guide which had been output in PDF format. Unless PDF documents are appropriately tagged they too are inaccessible for students with disabilities.

- Numerous other accessibility issues can be created unwittingly by a teacher when developing content within a LMS such as Moodle. For example, while Moodle provides an option for the teacher to add an alternative text tag to images, many teachers are unaware of the importance and Moodle does not force the teacher to add alternative text tags for each image. Without these alt tags, images make no sense to a student who relies on a screen reader which would normally read the descriptions of the images provided by the teacher in the form of alternative text tags. Another common accessibility issue often generated by teachers is the failure to provide transcripts for audio or captions for video content, despite the importance of this accessibility feature for hearing impaired students and those of non-English speaking backgrounds.

This section has highlighted the value of user testing of course sites to identify both accessibility and usability challenges for students with diverse needs and the value of such testing in enabling the teacher to create content that is more accessible for their students. The next section describes projects underway which seek to add an extra layer of accessibility and usability to the course site by enabling the student to vary the way in which their course materials are presented, thereby personalizing their learning environment.

Personalized learning

The diversity of student needs has been shown to impact on their proficiency in the use of digital technologies in numerous studies (Hargittai, 2010; Helsper and Eynon, 2010; Kennedy, *et al.*, 2009; Vaidhyanathan, 2008; Wood, *et al.*, 2010). Personalized learning environments (PLEs) offer great promise in meeting the diversity in student needs.

A PLE is defined by Siemens [22] as "a collection of tools, brought

together under the conceptual notion of openness, interoperability and learner control". Downes (2008) asserts that PLEs need to provide the functionality to enable the individual to organize, customize and shape his own learning environment. Although learning management systems (LMSs) such as Moodle and Blackboard are increasingly being used by universities to facilitate learning and teaching activities, the ability to customize the environment is limited by the teacher who has control over what content to incorporate and the tools that are activated for the course (Bateman and Willems, 2012; Weller, 2009). As a result students are limited in being able to customize and/or contribute to the development of the environment (Bateman and Willems, 2012). Despite claims that LMSs are "personalized" learning environments, the evidence suggests that the current use of these systems is used to manage content rather than be to individual needs. As McLoughlin and Lee [23] argue, PLEs stand in stark contrast to such institutionally controlled, content-centric LMSs by providing the ability for the learner to "adjust, select, integrate and use various software, services and options based on their needs and circumstances".

Although there have been several PLE projects addressing TEL approaches to customizing the sequencing of modules and activities within LMSs, and other projects focusing more specifically on accessibility for students with disabilities (for example, Amado-Salvatierra, *et al.*, 2012), there are as yet no fully adaptable and responsive PLE approaches that take into account the full range of diversity of student needs including usability and accessibility considerations (Attwell, 2009).

To be consistent with the principles of inclusive design of technology enhanced learning then, a PLE must also incorporate the key elements of inclusive design including: 1) interoperability; 2) accessibility to users with disabilities; and, 3) customization and localization features for people from different countries and cultures (Usability First, 2013; World Wide Web Consortium (W3C), Web Accessibility Initiative (WAI), 2011).

The conceptual model developed through the national learning and teaching grant which funded the design of the responsive learning system (RLS) that is currently under development, is an example of the kind of PLE that can fulfil the objectives of the inclusive TEL model. The conceptual model aims to addresses the diversity of students learning styles, digital literacy, English language proficiency, access to technologies, and accessibility requirements through a RLS that has been informed by and based on the Global Public Inclusive Infrastructure (GPII) software and service enhancement project, which "aims to allow users to invoke and use the access features they need anywhere, anytime, on any device" (Raising the Floor, 2011). GPII is an open source initiative of Raising the Floor — International (RtF-I); a consortium of software developers, academia, industry (mainstream and assistive technology), consumers, non-governmental organizations, governments and activists.

The structure of the RLS as shown in Figure 3 below, is modeled on the GPII architecture (http://gpii.net/node/108), which delivers online content in the format required by the user by combining information about the user's personal preferences and needs with information about the device they are using to via information stored on a secure server and hosted in the cloud. The user can login to their profile from any computer to retrieve their personal profile, which is combined with information stored in the cloud about their client side device to communicate the information back to the LMS, which in turn can deliver the LMS content in a format that best meets the individual user's needs. An option to output the profile information to a USB is available, enabling the user to launch their profile from any device that supports a flash drive, thereby overcoming potential situations where they are unable to access the network, but still need to launch assistive software to improve the user experience.

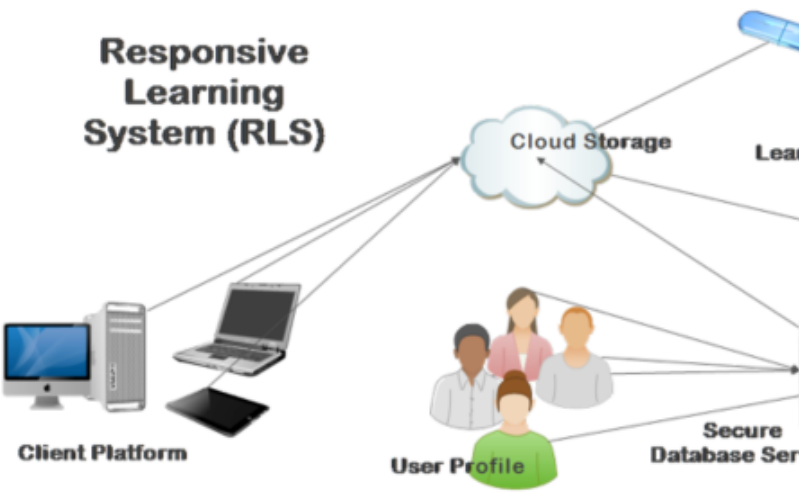

Figure 5: Visual representation of the conceptual model of an adaptive RLS bas
Inclusive (GPII) Infrastructure, http://gpii.net/node/108.

An alternative approach which is already available for implementation by any educational developer at the institutional level is FLOE (flexible learning for open education); an open source solution developed by the Inclusive Design Research Centre, OCAD University (a partner of Raising the Floor). This solution can be implemented as a toolbar available on any Web site including LMS environments such as Moodle. As shown in Figure 5, FLOE enables the user/student to customize their LMS interface to suit their specific needs such as choice of color, font size and style, appearance of links, whether to display a table of contents and there is also an option enabling the student to have the Web page content read aloud if they are not using their own assistive technology. Although students who rely on a screen reader, such as students with significant visual impairments, would normally prefer to use their own screen reader software, the text aloud feature is useful for students who benefit from the text being presented in both visual and auditory formats including students of non-English speaking backgrounds and those with cognitive impairments such as dyslexia.

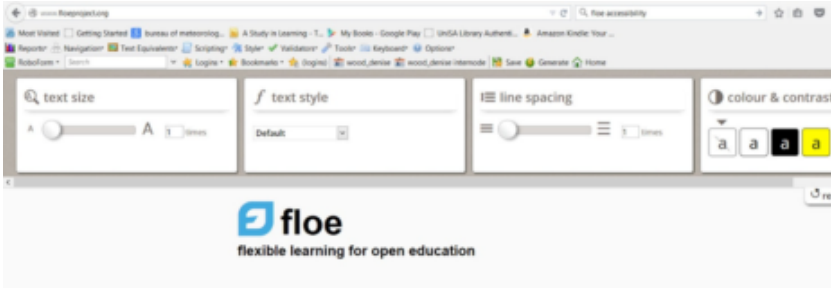

Figure 6: FLOE open source solution enabling students to personalize the
http://www.floeproject.org/.

Transformative pedagogy

The final component of the inclusive TEL model responds to Allan's (2004) call for pedagogical practices that engage students in a learning process in which they are exposed to and engage with difference in ways that are transformative. Although the origins of transformative pedagogy have included constructivist approaches advocated by scholars and humanist approaches (see, for example, Mezirow, 1991), which regard human beings as being free and autonomous, thus capable of making major personal choices (Taylor, *et al.*, 2012), the inclusion model is based on critical social theory, with its focus on critiquing and changing or acting to improve society. The three core assumptions on which critical theory is founded are: 1) Western democracies are highly unequal societies; 2) the dominant Western ideology is perpetuated by an assumption and acceptance that inequality is the norm; and, 3) the role of critical theory is to critique the reasons for such ideologies in order to bring about change (Brookfield, 2005).

The transformative approach advocated by the inclusion model presented in this paper is also consistent with Paolo Freire's (1970) critical pedagogy. Freire advances the argument that social transformation is best achieved by exposing students to opportunities which awaken their critical consciousness enabling them to perceive social, political and economic contradictions and take actions against such oppressive practices [24]. Learning and teaching strategies designed to develop students' critical thinking skills have the potential to facilitate such transformative pedagogical change. Brookfield (2012) outlines four elements of critical thinking: 1) discovering the assumptions that influence the way we think and act; 2) assessing whether these assumptions are valid and thus appropriate guides for action; 3) challenge the assumptions by attempting to view them from multiple perspectives; and, 4) taking informed actions based on the process of critically evaluating assumptions and determining if the available evidence supports the proposed actions. Brookfield (2012) argues that this final element, taking informed actions, cannot be undertaken in isolation from consideration of moral and political values. In this sense then, critical thinking is consistent with an ethic of care, which as a moral theory, challenges academics and students to confront and overcome "privileged irresponsibility" and to take responsibility for acting to address the needs of particular others.

Engeström's conceptualization of expansive learning is important in understanding how teachers can facilitate transformative learning by

creating learning activities and opportunities in which their students are challenged to question existing value positions to better understand the assumptions that influence the way they think and act, view their assumptions from multiple perspectives and take informed actions. This next section provides a case study of how the teacher (the author of this paper) attempted to implement expansive learning in a third year offering of a media arts course in which students were learning to design Web sites that are accessible to a diverse population (see also Wood, 2015).

In this case study, students undertaking a capstone course in Web design, accessible interactive media (AIM), undertook service learning involving the design of accessible Web sites for not-for profit organizations. Students enrolled in the 2009 offering were given the opportunity to undertake their service learning with organizations that provide support services for people with disabilities (also referred to as residents) of the 3D virtual world, *Second Life* (*SL*). Nine of the students enrolled in the 2009 offering of the course elected to undertake their service learning with organizations via the *SL* platform. The aim was to use the "affordances" of the platform to provide the opportunity for the students to develop their communication, critical thinking and technical skills.

The course harnessed the affordances of the technology (in this case the 3D virtual world platform) to provide students with an authentic learning experience (Herrington, *et al.*, 2010) through which they could be challenged to confront their assumptions about diversity as well as the need to employ accessible design in practice, to assess the validity of their assumptions, reverse their assumptions to understand multiple perspectives and to then act responsibly to take appropriate actions. The term "affordances" has been attributed to Gibson (1979) who argues that objects or environments have existing properties that impact on how an actor will use or act on that object. In the context of TEL, an affordance is the perceived and actual properties of the technology that determine how that technology can be used for learning [25]. Savin-Baden, *et al.* (2010) describe three major affordances of 3D virtual worlds. These are: 1) for undertaking scenarios, simulations and role-plays; 2) to facilitate teamwork or team-building enhanced through the sense of presence and co-presence created by avatar representations of students; and, 3) as the focus of the activity (for example programming, 3D construction or modelling). As these descriptions of the affordances of 3D virtual world environments suggest, such platforms have the potential to support collaborative, intrinsically motivating, authentic learning activities and to support the development of critical thinking that can lead to "Transformation and social reform, whereby teachers awaken students to values and ideologies that are embedded in texts and common practices within their disciplines" [26].

The students were exposed to different understandings of disability, why people with disabilities choose to participate in the 3D virtual worlds such as *SL*, and the importance of accessible Web design through their engagement with members of disability organizations and the debriefing sessions facilitated by members of the disability support organizations, and through critical reflection facilitated through the discussion forum. Drawing on CHAT as the heuristic, the object of the course motivating the activities was for students to undertake an authentic learning task designed to facilitate the development of their communication skills and to enhance their understanding and appreciation of cultural diversity, while also demonstrating the technical Web design skills they would require in professional practice upon graduation. The students/subjects had to negotiate the university rules and regulations as well as the program and course requirements. They were members of a community of learners of which their teacher was also a member. The tools they used included the university learning management system and the Web design software applications required to complete the project work. As students their role was as student, peer and apprentice designer.

The second activity system, that of *SL*, has its own set of rules (the *SL* platform's Terms of Service), community expectations, tools for interaction and navigation, and within the service learning context, students were operating as both "residents" of *SL* and designers providing a service to community organizations operating in the virtual world, which had their own objects for engaging with students to receive the desired service. A range of tensions arose for students attempting to manage the complex interactions across the two different activity systems. Operating in different time zones made it difficult for students to meet with their virtual clients at times convenient for both parties, especially for students also working full-time or part-time. The complexities of the virtual world interface tools and the accessibility challenges for students with disabilities added to the frustrations for students attempting to complete the service learning tasks. Contradictions between the rules of the university, course requirements and *SL* Terms of Service also limited the extent to which learning outcomes could be achieved, and proved confusing at times for students. Moreover, working with diverse clients with particular needs and challenges was also confronting for some students. For example, one student was frustrated by the delays in his client group's responses to his e-mail messages. CHAT analysis reveals the contradictions across these activity systems, but also opportunities to address those challenges and to facilitate expansive learning by supporting students to confront their own preconceived notions of disability and resolve the contradictions they encountered across the two

activity systems.

By revealing the contradictions across diverse students' activity systems, the course coordinator was able to address the challenges that arose and transform the experience to one, which while challenging, proved to be enriching for students and their client groups. For example, the mediated activities involving the use of *SL* as both a material and cognitive tool enabled students to investigate how disability support groups were using *SL*, as a conduit for situated information, a medium for meetings with clients, and as a supportive environment through which students were mentored by the teacher as well as people with disabilities representing each client group who provided regular debriefing sessions.

The community that developed through this course within *SL* therefore became a medium to scaffold students developing their understanding and awareness of cultural diversity and the accessibility/usability challenges posed by digital technologies for people with diverse needs. This mentoring component of the *SL* interactions via the community is consistent with Vygotsky's (1978) concept of the zone of proximal development; the distance between what the students could achieve on their own and what they could accomplish when guided by their teachers, the members of the disability organizations and their peers through social interactions that took place in the cultural and historical context of the *SL* environment. This example then illustrates the benefits of recognizing the challenges for diverse students operating across different activity systems and responding to those challenges constructively to transform the challenges into expansive learning opportunities.

Although only nine students participated, and therefore the student feedback is limited, comments from students in response to the end of semester course evaluation suggest that for at least some of the students, a degree of transformation in their thinking was achieved. For example, one student commented on the benefits he gained from experiencing the diversity of people he met within the virtual world as indicated by his comment that "Learning about the world of *Second Life*, affected me personally after meeting with my client. I learned that there is more to *Second Life* than idiots buying land that they cannot even step on". It is evident from this student's comment that he held strong preconceived attitudes about the types of people who are users of such virtual worlds. These values were exposed when he was confronted by the contradiction between his existing views and his experience interacting with people who identified as having a disability whose primary support network was *SL*. Through scaffolding provided by the teacher and disability organizations in *SL* the student was able to resolve this double-bind and engage in what Bateson would refer to as Learning III, or in Engeström's term, expansive learning. Another student stated that she benefited from gaining insight into "Understanding why people might engage in such an environment". Other students suggested that having access to expert mentors was beneficial to their learning experience as reflected in the comment that "I was able to source out influential people and gain a lot from different events based around accessibility" and another noted that "The weekly meetings provided a very helpful tutorial environment for this directed study course".

Although it is not possible from such limited feedback to make any claims that the course achieved transformative learning for the participating students, since as Brookfield (2000, cited in Taylor and Cranton, 2012) asserts, learning can only be called transformative if it involves a fundamental and lasting change, the example illustrates the potential of making use of the affordances of particular technologies to provide the opportunities for students to engage with difference, uncover and challenge their assumptions, understand alternative perspectives to their own, and take informed actions through the skills gained in the course to confront injustices as practitioners — for example, learning about the importance of Web accessibility by engaging with the very individuals who benefit from inclusive design, was a more powerful and effective strategy for teaching students about the importance of ensuring the sites they design are accessible than would have been achieved by citing legislation requiring them to accommodate or "manage" diversity as future graduate Web designers.

Conclusion

The inclusion model presented in this paper seeks to address criticisms of neoliberal inclusive education approaches to managing diversity by advancing an alternative approach; one which builds on a biopsychosocial understanding of diversity, social constructivism and an ethic of care. The model recognizes the importance of a holistic understanding guiding the design of technology enhanced learning which addresses accessibility, usability, personalization and facilitates transformative educational experiences. The model, although aimed at ensuring students with disabilities can benefit from TEL that is adaptive to their needs, is predicated on a more universal design approach, recognizing that inclusive practice benefits all students. At the same time, by adopting an ethic of care approach, the model recognizes that the institution and the program team also have a responsibility to provide for the needs of

particular students who may require adaptations to the TEL environment or more flexibility to meet their specific needs.

The examples of the way in which the author sought to harness the affordances of technologies (in this case the 3D virtual world *SL*) to facilitate transformative expansive learning experiences for students enrolled in the AIM course has shown the potential of TEL for opening up "new territories" for students, thereby maximizing the affordances of the virtual to enable students to "contend with the ethics of their encounter with the other" [27] through a process of exploration of diversity and discovery of the self. Although the limited trial of the course cannot demonstrate that students enrolled in the course were indeed transformed and more likely to act on social injustices in the longer term (in this example relating to the need for more accessible Web design practices), since this would require a longitudinal study involving several offerings of the course and a much larger sample of students, the example serves to illustrate the potential that harnessing the affordances of TEL offers to achieve such outcomes.

This paper has focused primarily on the benefits of inclusive design of TEL for students from diverse backgrounds. However, it is important to note that the other critical dimension of inclusive educational practice involves addressing strategies for ensuring that the institutional policies, processes and actions are also supportive of a diverse staff population. The theoretical frameworks on which the inclusive education model advanced in this paper is based are also relevant in understanding and engaging with the diversity of an institution's academic and professional staff members, and thus future research should focus on the strategies that can build on the model presented in this paper to address the importance of this dimension of the inclusive education agenda.

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