

ePE: USING CONNECTIVISM TO THEORISE DEVELOPMENTS IN DIGITAL TECHNOLOGY IN PHYSICAL EDUCATION IN AOTEAROA/NEW ZEALAND

Margot Bowes and Chris Swanwick

INTRODUCTION

Connectivism emerged out of the explosion in scholarly and popular interest in recent decades, around the issue of the relationship between digital technology and learning. One specific debate that emerged from this interest was the issue of theories of learning. The question, put simply was, ‘Are existing learning theories sufficient, or do we need new ones to explain what we now see routinely happening in classrooms’? The response to this from George Siemens and Stephen Downes, first collectively and later separately, was the development of connectivism as a new learning theory (2005), describing it as “the first learning theory for the digital age” (Siemens, 2004). It was defined thus:

Connectivism is the integration of principles explored by chaos, network, and complexity and self-organisation theories. Learning is a process that occurs within nebulous environments of shifting core elements- not entirely under the control of the individual. Learning (defined as actionable knowledge) can reside outside of ourselves (within an organisation or a database), is focused on connecting specialized information sets, and the connections that enable us to learn more are more important than our current state of knowing. (Siemens, 2004)

From this definition there are three key concepts integral to connectivism that will be explored during this chapter; learners existing in a *network*, the notion of *actionable knowledge*, and encountering information and knowledge not for its own sake, but to enable us to *learn more*.

1. Networks

Educators have long understood the value of the metaphor of ‘networks’ to describe a community of learners (Moreno, 1934). However, there are a number of specific properties of networks that we see as important in taking them beyond the metaphor. Networks strengthen the quality of learning that can occur both within individual networks, and when connected across networks. This happens because of the diverse composition of individuals and information sources within a given network, the networks ability to scale rapidly, and the ability of the network itself to act as filter; knowledge of the greatest utility that serves the participants best tends to surfaced and retained most frequently. Some of these principles of networks and their implications for learning are summarised in Figure 1.

<box begins>

FIGURE 1 NEAR HERE

<box ends>

Siemens (2004) theorising of networks and network connection introduces two key principles to the discussion of learning- *hybridity* and *exteriority*. By hybridity we mean composed of human and non-human actors, and by exteriority we mean exterior to the minds of the learners in the network. This distinction is clear from Siemens (2004) treatment of behaviourism, cognitivism and constructivism as theories which only deal with learning that “occurs inside a person”. They cannot account for learning which takes place somehow outside of the person or the brain. He gives the examples of “within organizations” or that which is “stored and manipulated by technology” (Siemens, 2004). The technological

advancements involved in the development of the internet mean that, when it comes to knowledge retention and construction, networks should now be regarded as consisting not only of human actors but also a range of non-human actors. He deploys the concept of a *learning ecology* to capture this (Siemens, 2004) and which maybe a more fitting metaphor than network. The second and third of his ‘principles of connectivism’ point towards this notion of hybridity and how successful learners will need to negotiate it, specifically “Learning may reside in non-human appliances” and “Learning is a process of connecting specialized nodes or information sources” (Siemens, 2004).

It is clear that the specific technological advancements that have taken place, in terms of its implications for the development and facilitation of connectivist ideas, is that bundle of innovations and technologies that facilitate the move from the ‘Worldwide Web’ to ‘Web 2.0’ (DiNucci, 1999; O’Reilly, 2005) sometimes referred to as ‘the read-write web’. This shift, put simply is the conversion of the internet from a one-way, broadcast medium to a two-way broadcast *and* publishing medium. The net effect is the transformation of the internet into a social space. The range of tools associated with the rise of the concept of Web 2.0, such as blogs, wikis, social networking tools and platforms, have served to turn the internet into a space which is more “user-centred, user-generated and user controlled” (Gooding, 2009). This gives rise to the proliferation of ‘user-generated content’ in the form of blog posts, status updates, multimedia uploading to photo and video sharing sites such as Flickr and YouTube, to name a few which one now associates with the internet. Teachers and educators have, over the past 10-15 years seen the potential benefits of embracing these multiple forms of publication for the purposes of learning, seeing it as a way of mirroring the

personalisation and personal control that has occurred in the web, and bring those same benefits of personalisation and student control to the learning process (necessarily mediated by digital technologies). Acknowledging that pedagogy is always specific to context and contingent on the complex interplay of a host of, there is a general argument to be made about the development of Web 2.0 and the extent to which it has enabled teachers to make learning more 'student-centred'. Richardson (2007, p. 150) explicates this by asserting that "We must be readers and writers, editors and publishers, to maximize the benefits of our participation; and we must be willing to collaborate and co-create with others, working closely together to learn even more in the process".

Siemens and Tittenberger (2009) used the notion of *the participative web* to maintain that "sensemaking is an emergent property of social interaction" (p.31), and that therefore collaborative tools, like wikis (they use wikis in their example) offers learners the ability to "connect (across a network), to collate and discuss content for themselves, engaging in a knowledge building process" (p.31). This argument extends to a whole range of online tools, including social media, which learners can learn to use collaboratively to build knowledge, and engage in a process of "participatory sensemaking" (p.31).

A connectivist therefore would favour an approach to learning which seeks to develop a network or 'ecology' of learners, and it is this set of principles that we seek to apply not only to the web generally and wikis, as in the above example, but also to our continued use of tools such as those in the Google Apps for Education (GAFE) and the institutional Learning Management Systems (LMS) in New Zealand, that are also elaborated on in the cases

presented later in the chapter. We seek to create an ‘ecosystem’ of learners, tools, resources and ideas to develop and support learning.

2. Actionable Knowledge

Actionable Knowledge, as defined in his general definition of connectivism given above, is Siemens preferred term for, and used synonymously with ‘learning’ (Siemens, 2004). This view produces a picture of learning where ‘facts’ distinguish themselves from being merely information by the action that immediately follows their acquisition. Stated another way, a fact only counts as knowledge if it is acquired with a specific purpose in mind which follows on from its acquisition, or if it is acquired with the intention to develop the specific capacity to learn further itself. These characteristics are best summarised in the precept that ‘all knowledge is information, but not all information is knowledge’. (Siemens, 2006)

3. Using Knowledge to Build Learning Capacity

Under web 2.0, learners now exist in networks which demand participation from them and the development of a distinct set of valued skills based around finding and selecting information and interaction to construct further knowledge. We understand this to be operating at the global level of educational discourse, with its core pedagogical ideas and tenets permeating educational thought, policy and practice in diverse and varied ways that are often not explicitly associated with connectivism.

CONNECTIVISM IN THE NEW ZEALAND CONTEXT

In this section we attempt to build on these connectivist ideas, and specifically the 3 concepts discussed in the previous section into the New Zealand teaching policy literature. We begin by describing 6 themes of Future- Focused Learning (Bolstad et al., 2012) that are currently informing teaching and educational policy in New Zealand. The emergence of these future-focused themes are the result of a synthesis of ten years of national and international research into generic innovative practices of teaching and learning by the New Zealand Council for Educational Research (NZCER). The 6 themes of Future Focused Learning in New Zealand (Bolstad et al., 2012) include:

Theme 1. Personalising Learning.

This theme captures a key shift towards students being in control of their own learning. In practice this means that students understand how they learn and have agency to use this to meet their learning needs and achieve individual success. It also means that students and teacher co-design the learning activities from the curriculum and together develop the learning environment. In practice, while students help shape the content, this is in conjunction with the knowledge that teachers consider to be of high importance to learning. The key educational shift encompassed in this theme is that this knowledge is co-constructed to ensure that the context is relevant for the students. It also signals a shift in thinking away from students fitting an education system to the education system meeting their needs.

Theme 2: New views of equity and diversity.

This theme is about inclusiveness. It addresses educational success for those whose educational success has not kept pace with others. It includes those learners who have been discriminated against because they are different, a minority or from lower socio-economical groups. This

theme addresses disparity and discrimination in educational contexts. Diversity positions difference as a strength that enriches education and encourages world views that are different from one's own. This diversity of ideas and people improves social justice and may assist to solve environmental, social and socio- economic challenges of the 21st century.

Theme 3: Knowledge to develop learning capacity.

This theme challenges the traditional view of knowledge as the reproduction of discipline knowledge to define school subjects and their content. A future focused view of knowledge is to do something with it to find solutions. With this knowledge future focused learners can connect and collaborate with others with different knowledge, making the learning deeper and the solutions more considered. The key premise is the shift from discipline knowledge creating capabilities , to actionable knowledge, to develop key competencies that allow 21C learners to access and use knowledge to solve modern day problems.

Theme 4: Rethinking the role of learners and teacher roles.

Teachers are no longer viewed as transmitters of knowledge since the learner no longer needs to memorise knowledge. This theme is about the role that teaches can play to support the different capabilities of learners. This is about building knowledge together by drawing on the strength of both parties. It is not a call for 'anything goes'. It recognises that teachers bring considerable 'knowledge' to this new relationships by virtue of their experience and capabilities but the learning is no longer totally teacher driven.

Theme 5. Continuous culture of learning for teachers and learners.

If we accept that there are new purposes for education and new knowledge in addition to what is already known about knowledge and learning, this future focused theme simply sets the scene for a society where learning is recognised and valued beyond the school, classroom and qualifications.

Theme 6 : New partnerships and relationships.

This theme de silos subjects from each other and schools from communities. It is about generating learning or knowledge in the real world in which they exist. This theme values new partnerships and places considerable responsibility on the community to embrace the way that education and learning need to change.

Bolstad et al, (2012) argue that there are two further important subthemes to the these 6 themes that facilitate future focused learning; *the role of new digital technologies and the effect of collaborative learning practices*. These are also highly significant to any discussion about connectivism in physical education. Digital technology has made knowledge far more accessible to every student. Bolstad et al. sum this up succinctly, proposing that learning should provide students with the ability to “create and use new knowledge to solve problems, and find solutions as they arise, on a *just-in-time basis*” (2012, p. 4). This provides the link to the concept of actionable knowledge, discussed earlier, and is perhaps best understood as using technology to access the information that is required as required. We might best use terms like knowledge ‘on-demand’ or ‘as required’ to capture this.

Further to this, students require new skills to connect and collaborate with other members of digital networks, who collectively can contribute in complementary ways to achieve successful outcomes for learners (2012, p. 23). Integral to this, is the idea that knowledge is a verb, not a noun. Learners no longer need a system which furnishes them with facts and then assesses their ability to retain those facts at a point which is disconnected from the *learning moment* (2012, p. 32). This collapses the time between the points at which a) something is learnt b) the knowledge acquired is put to use, and c) the point at which it is assessed. In the connectivist frame, all of these moments are/should be combined, generating corollary arguments about how the structures of curriculum and assessment need to change.

These connectivist themes and sub-themes as contemporary understandings of learning are strong drivers for the Ministry of Education New Zealand (MOE) and of the current New Zealand Curriculum (NZC) (MOE, 2007), that since 2008, has set forth the direction for learning and the accompanying ‘vision’ for learners graduating from secondary schools in New Zealand in all learning areas, including Physical Education. The hope for the Vision of the NZC is for every student to be a ‘confident, connected, actively involved, lifelong learner’ (MOE, 2007, p.7). The critical linkage between the theoretical nature of the Supporting Future-Focused Learning and Teaching report (Bolstad et al., 2012) and the NZC (MOE, 2007), explains the future- focused potential of the NZC stating in their report that:

The capacity for innovation already exists in our education system. The New Zealand Curriculum and Te Marautanga o Aotearoa are flexible and enabling frameworks. The vision, values, and principles of these documents provide a strong foundation for teachers and school leaders to take a future-oriented approach to learning and teaching.

(Bolstad et al., 2012, p. 4)

When reviewing the summary of the Key Principles of global connectivism (see Figure 1) , there appear to also be a number of synergies with the Key Competencies of ‘Future Focus’ and ‘Thinking’ in the NZC and the Māori medium parallel document, Te Marautanga o Aotearoa (MOE, 2007), to be developed in all learning areas, including in Physical Education. For example, in the NZC, the Key Competency ‘Thinking’ covers many connectivist ideas:

Thinking is about using creative, critical, and metacognitive processes to make sense of information, experiences, and ideas. These processes can be applied to purposes such as developing understanding, making decisions, shaping actions, or constructing knowledge. Intellectual curiosity is at the heart of this competency.

(MOE, 2007, p.12)

In the PE context, a critical evaluation about the comparative merits of a Teaching Games for Understanding (TGfU) approach for developing skill in games compared with a Constraints Led Approach that emphasises the situated, social and distributed nature of skill learning (Ovens & Smith, 2006) would be an example of applying ‘Thinking’ as a Key Competency in senior school physical education.

An additional Key Competency in the NZC, and in Te Marautanga o Aoteroa, is the ability to use ‘Language, Symbols and Texts’ to build knowledge. “Using language, symbols and texts is about working and making meaning of codes in which knowledge is expressed’ (p.12).

There is also research on the theme of knowledge building in a New Zealand context, which includes studies such as O’Hare (2012), Lai et al. (2012) and Russell (2012) that successfully incorporate web 2.0 tools and social software in studies centring on New Zealand secondary

schools. Digital technology has made knowledge far more accessible to every student, succinctly emulating the Future- Focused themes of reimagined roles for teachers, using knowledge to build learning capacity and to personalise learning. This emphasises the importance of new (critical) skills to select and differentiate different types of knowledge. Of particular relevance to the New Zealand context is the work of Noeline Wright who contends that ‘connected’ can easily refer to digital connections and the sorts of social networking that many young people already engage in, which can be harnessed educationally’ (Wright, 2010, p. 2). Examples of connectivism and harnessing educational developments in digital technology in physical education in New Zealand are the focus of the next section.

CONNECTIVISM IN THE PHYSICAL EDUCATION CONTEXT

The growing ubiquity of mobile computing devices and Wifi networks have been instrumental in transforming learning and the way schools and tertiary-based practitioners conceive of the act of teaching and learning in New Zealand. These changes have been considerably accelerated by the rapid growth in personal ownership of a diverse array of smartphones, tablets, laptops and hybrid computers. These devices typically utilise different operating systems, software and apps, and which increasingly both students and teachers bring to the learning experiences whilst at school, often orchestrated by school Bring-your-own-device (BYOD) or similar policies. This process has also been further accelerated in schools that have undertaken significant improvements to their wireless networking capability, investing on top of that provided by the Ministry of Education (MOE) commitment to upgrade school’s internal networks via the School Network Upgrade Programme (SNUP). The Ministry of Education in New Zealand has committed nearly \$15

million NZD to a programme of school upgrades across the country since its introduction in 2013 (www.education.govt.nz).

In light of these developments, we argue that physical education practitioners in the New Zealand context have been amongst the first to embrace the potential opportunities that these technologies afford, relative to other subject areas. The subject specific dynamics of a 'highly mobile, highly collaborative and a highly visual' (Bowes & Ovens, 2014, p. 23) learning area has positioned Physical Education as a suitable space for incorporating learning through mobile devices. Arguably, New Zealand physical educators have for some time been experimenting with iPods, iPads and mobile phones and thinking through the implications of mobile devices movement pedagogy (Forrest, 2009). Developments in physical education teaching and learning include connectivist concepts such as networked classrooms, collaborative teaching spaces and a flexible and personalised curriculum. These have been achieved through blended learning and through the meaningful integration of subjects, devices and online platforms. Readily identifiable examples such as Coaches Eye, Coach Cam and Hudl Technique apps have been adopted and are now well embedded in learning about movement and skill analysis in physical education. We might argue that the relatively rapid uptake of digital technologies in this subject area is reflective of the way in which professional sport and the broader sporting culture has always embraced advances in technology.

In the remainder of the chapter we draw on two specific examples of this and show how connectivist concepts and learning, are influencing developments in New Zealand physical

education, across two different fields of our practice. Those two fields include initial teacher education (ITE) (Case Study 1 and 2) with a focus on physical education teacher education (PETE) and teacher professional learning and development (PLD) (Case Study 3). Both of these spheres of education we argue exemplify a connectivist shift, through the changing emphasis from pedagogies and interactions that are bounded in time and space and use digital technology as enrichment and augmentation of practice, to new practices which are no longer bound by the constraints of distance and synchronicity, and take the shape of new and networked forms of practice.

CONNECTIVISM IN INITIAL TEACHER EDUCATION IN PE (PETE)

PETE initial teacher training is going through a period of intense experimentation and change, in order to find the best uses of mobile and networked technologies now available. (Heap et al., 2014; Matthewman, Bowes, Burchill, Heap, & Tickner, 2015). Of the 6 Future Focused themes identified through the Bolstad et al. (2012) research, many of them have been adopted in current PETE practice. Rapid digital advancement and the need for universities to lead in this area, has seen the advent of learning designers employed to work in digital technology pedagogy with lecturers and this practice has assisted the development of connectivism in practice as the following case studies illustrate.

CASE STUDY 1: FORMATIVE ASSESSMENT FOR LEARNING IN PETE

Using the learning management system (LMS) of CANVAS with GAFE, a physical education PETE lecturer and students have been exploring how to successfully personalize learning for individual students and challenge the role of teachers and learners for graduate

students. This case study captures an attempt to move the focus from summative assessment of learning at the end of a semester to assessment for learning using networks and actionable knowledge to assist students to learn throughout. The Learning Objectives for the courses included developing a senior school unit of work that could be assessed by a National Achievement standard in Physical Education. The lecturer and learning designer used digital technology to network with and between the students and to provide more effective and immediate feedback to them on their learning and progress. To personalise the learning, students were given choice over the context they were preparing for the graded assessments. To facilitate the use of networks, the assessment was set up in two parts providing for a planning component in Part A that critical friends and the lecturer could provide peer assessment and formative feedback to their colleague. In an attempt to incorporate theme 3 and 4 of future focused themes of Bolstead et al (2012) work, students could choose either written or video feedback and were asked to provide feedback on the feedback to the lecturer and peers by discussing the issues raised using one of these mediums. The students used their professional judgement to decide whether or not the feedback on Part A was valuable and if they intended to act on it and resubmit their work. Students could also choose to accept the grade for the first part and incorporate the feedback into the second part.

Key to the success of this for the students was the speed and timeliness of the feedback of the media files on the LMS during the learning process and the opportunity for dialogue with the lecturer and peers. Additionally, to personalize the learning, the focus was changed to concentrate on each learner and the context they had selected to study. Students

then went on to plan the second phase of their units again sharing with critical friends via GAFE before submitting a final piece of work through the LMS.

The role of teacher, learner and peer was networked to build actionable knowledge and roles were reversed with the students driving the learning. Many of the students choose to develop units for the schools they would be working in following graduation and this action strengthened learners' connections to the relevance of the actionable knowledge. This action further served to build capability to contribute to authentic teaching situations. A number of students chose to contextualise their work in traditional Māori games (Ngā Taonga Tākaro) to explore diversity through the significance of traditional cultural games in a multi-cultural society.

The students and lecturer's co-construction of this new approach took the 'work' aspect out of the assessment. The tasks were relevant, personalized and authentic and this combined with the ability to network and give and receive regular and immediate feedback effectively changed the role of the teacher and learner to reconceptualise learning. For Physical Education a shift to formative assessment, personalising learning and rethinking the role of the teacher and learner has enormous potential to improve student learning and engagement in this course.

What this case study showed was that if tertiary providers wish to be research-informed regarding future focused learning, they will need to rethink the way the universities are organized for teaching and especially the way they assess. Digital technology is laying down both a challenge for the need to do this and providing solutions of how to achieve this..

CASE STUDY 2: USING CLOUD-BASED DIGITAL TECHNOLOGIES IN PE TO NETWORK AND USE KNOWLEDGE TO BUILD LEARNING CAPACITY

Students are coming into university courses expecting to be able to successfully integrate multiple technologies into their lessons as new teachers and are looking for a way to address the issues of students being mobile, capturing and reflecting on movement, and collaborating in networked ways as they do so. In this case study the lecturer and learning designer planned a series of scenarios for groups of students to work on, in which they had to collaborate to produce a resource or strategy using the tools in the Google Apps suite.

The university staff used a scenario based approach because it allowed them to create authentic tailored problems that were more likely to be owned by the learner. It also allowed for a more dynamic form of learning in which the students were networked to practice skills and actively construct meaning relevant to teaching in schools. Four physical education scenarios using one of four tools in the Google Drive suite - Google Docs, Slides, Sheets and Forms (GAFE) were constructed for students.

Following this initial exploration of GAFE for teaching, the HPE department hosted an international symposium on Teaching Games for Understanding (TGfU). One of the things we wanted to achieve was to host a networked provocation with academics from around the world. The lecturers choose to use Google Hangouts as the network tool and a pedagogical strategy known as a 'Fish Bowl' to achieve this. Fish Bowl has a central discussion group with observers around the outside looking in to it (a metaphoric Fish Bowl)'. Academics in the physical room could contribute to the discussion by coming and

go from the central table (Fish Bowl), but the lecturers hosting this symposium also wanted to find a way for delegates from the United States to join in as well. The lecturer and learning designer discussed the best way to turn a face to face strategy into a blended one. They decided to try Google Hangouts to accommodate the number of virtual participants and guests, and they also wanted consider the possibility of the event being livestreamed on an unlisted YouTube link. The results was successful using one of the Collaborative Active Learning Spaces (CALs) as the venue for the Hangout where there was a live video link on all the large TV/ video screens around the outside of the room with the guest experts contributing via the virtual Fishbowl discussion.

The lecturer and learning designer have now begun to think about how they can use Google Hangouts on Air for blended learning in other university courses and learning situations to bring flexi students into lectures from off campus. This comes with the added benefit of being able to embed livestream events and recordings into the LMS, Canvas, from YouTube. Using Google Hangouts-on-Air, as well as platforms such as Zoom and Appear In has proved to be a very useful connectivist strategy and stable digital platform to overcome the problems of distance and provide multiple opportunities for students to learn at times to suit them.

PE TEACHER PROFESSIONAL LEARNING AND DEVELOPMENT (PLD)

A further change that we argue has taken place with the growing influence of connectivist ideas in physical education in New Zealand, is those that have taken place in the sphere of professional development and learning (PLD) for physical educators at all levels of teaching. This changing trend shows that the provision of PLD is timely, as it affords teachers the rapid advancement of technology for enhancing student learning. We argue that the change is

generally away from one off, face to face events for professional learning, and towards educators being continually networked through a variety of online communities with their professional peers. These networks allow physical educators to access information, support, and resources that are immediately applicable to the challenges and issues they are confronting in their practice, making professional learning much more relevant, timely, and productive.

CASE STUDY 3: FROM ONE OFF, FACE-TO-FACE TO CONTINUOUS NETWORKED PLD

This case study is demonstrative or representative of a trend from face to face to networked continuous PLD. We suggest that the annual national conference is assuming less significance in the professional learning and direct practice of physical educators. While conferences provide the benefit of face to face networking , they can be expensive, protracted in responding to PLD changes, and can lack specific applicability for physical education practitioners attending. Much of the content teachers encounter at conference, whilst being of significant general interest, may be limited in its ability to impact on their specific practice. Because of the advances in technology, teachers are now sharing and are wanting to share and have access to PLD in real time, every day.

To demonstrate this, a document analysis of the National Conference presentations in New Zealand 2010-2017 revealed perhaps surprising low growth in the number of abstracts detailing the use of digital technologies in physical education in New Zealand (See Figure 2). This relatively low percentage of total presentations increased from an initial 2% of the total conference presentations in 2011 to 12% in 2012 then fluctuates to 7.8% 2013; to 3.95% 2014; to 7.6% 2015 and to 10% in both 2016 and 2017 (Figure 2). Although the data suggests

that presentations have consistently remained low as a proportion of the conference, they do represent a shift over time from content based on technology itself, to presentations where the prime concern is issues of pedagogy and assessment, and technology is considered in the more minor role of how it can be used to help support the address of those issues. The early years of our analysis, from 2010, reveal a focus on specific physical education orientated apps, focused on measuring fitness or training methods.

FIGURE 2 NEAR HERE

Over the time analysed (2010- 2017), we chart a subtle but important change in the presentations from 2013 onwards, becoming increasingly orientated around specific issues of ePedagogy, and subsequently increasingly orientated to assessment and assessment practices in physical education (See Figure 3). We argue the conference data demonstrates, that as physical educators have become more aware of the what digital technologies afford for teaching and learning, they have also become increasingly selective and discerning users of technology. This professional criticality is noted and timely in the light of the remarks we make at the end of this chapter.

FIGURE 3 NEAR HERE

Similarly articles in the Journal of Physical Education New Zealand on the learning advancements of technology have also been surprisingly few. The articles also reflecting the

same trend with an initial focus on the ‘10 top apps’ to an increased focus on the pedagogy of using Google Classroom and Social Media to network, self and peer assess in real time. What is also significant from the analysis of the conference presentation data is that there has been little growth in the number of presentations over the past 7 years, yet we know from practice, that physical educators are very high users of technology in the classroom. So, while the focus of presentations at National Conferences has changed from exciting, often fitness-based new apps, for teaching physical education, to a focus on networked classrooms, the lack of growth evidenced at national conferences and perhaps in the academic journals coincides with the increased growth in the use of social media to share effective PLD ideas amongst physical educators, and may account for this observation.

In New Zealand this has been evidenced by the development of many social media PLD sites using Facebook, Twitter and blogging. Many are PE specific such as The PE GEEK, PE Gearshed, NZHPE Chat, PE CHAT, NZ PE Teacher, PE Office, World Class PE, PEPEPTALK, PhysEdMap, LovePhysEd, PE Scholar NZ PE Teacher, and PE Review to name but a few. These sites serve to network teachers and share online resources and comment. Teachers will find a useful link to a resource, comment on its use in PE and provide the link for others to access and use it in their teaching. Some of these social media sites are commercial, while most remain free to followers through the internet. Sites such as THE PE GEEK will provide teachers with a taster such as ‘3 ways to capture and track student achievement’ and then encourage followers to sign up to online courses and nationwide Workshop Tours. The PE GEEK focus is on pedagogy using digital technology to enhance student engagement and learning outcomes in the PE classroom. PE Gearshed is a

free online platform ‘by and for PE teachers (using the NZ curriculum) made to share ideas, share resources, meet new people, collaborate, ask and answer questions’. These questions often involve access to resources that explore many of the socio-critical Health and Physical Education (HPE) contexts encouraged through the NZC (MOE, 2007).

While the professional subject associations also have online presence such as Facebook sites that are well supported, an emerging trend is impacting on the way the subject associations will need to deliver PLD going forward: The annual membership that provides access to discounted workshops and conferences will find it hard to compete with the ‘free’ online networked PLD. While the national associations currently deliver annual national conferences and regional leadership initiatives that bring physical, outdoor and health educators together for PLD, there is no longer the need to wait a year to access and share knowledge.

PE teachers now have the ability to access knowledge online, tweet ones comments, receive immediate responses, access further research, re think, ‘re flect’ and re tweet. The challenges and affordances of digital technologies are not only changing the way physical educators access knowledge but are also changing the way we work as professionals. The knowledge is now networked, actionable and builds learning capacity. The effects of connectivism are highly evident in the learning area of Physical Education and the work of PE teachers in New Zealand.

CONCLUSION

Hamilton (2013) proposed in the 1980s that what happens in schools is both ‘socially-constructed and historically-located’ (p.151). This has set new expectations for schooling

mirroring and representing changes in society. Similarly, Paechter (2000) suggests that ‘curriculum change ...reflects, social change, [and more importantly], that how we as a society choose to educate our children reflects what we think is important’ (p.5). In this chapter we have explored connectivism as a powerful contemporary learning theory that is changing learning in physical education in the 21st century. We have considered connectivism as a highly relevant learning theory to underpin how we endeavour to educate students as “confident, connected, and active lifelong learners” (MINEDU NZ, 2007). We have explored 3 key concepts of connectivism; *Networks, Actionable Knowledge and Using Knowledge to build Learning Capacity*. Taking the 6 local themes of Future-Focussed Learning (Bolstad et al., 2012), we have tried to illustrate the influence and bearing that connectivism, as a relatively new learning theory, is having on our practice as physical educators in the New Zealand context. We have argued that the rapid digital uptake in physical education is further underpinned by an number of subject specific affordances being the highly mobile and highly visual movement learning contexts with which we teach.

We have described two local cases: PETE and the provision of continuing PLD in physical education in New Zealand, as examples of connectivist learning theory as it relates to our particular work. Specifically, through the three case studies included in this chapter we have, exemplified connectivism in action as a different way of viewing learning and assessment at university and in the changing nature of continuing PLD for physical educators. The chapter concludes with some questions for readers to consider what likely developments there may be for the digital future of physical education and it’s students.

Therefore, we offer this chapter to describe a trajectory to students, present and future teachers of physical education, and policymakers in order to make clear the direction of curriculum and connectivism in these debates regarding the role of digital technology and ePE in order that professionals can make clear decisions about what they teach and why. In his article, 'eHPE: a history of the future', Gard (2014) cautions physical educators to the potential dangers of adopting connectivist ideas in PE without critique. Gard reminds us that without critique, connectivism in PE, or as we have also called it 'ePE', has the potential to be a "performative, dull, repetitive, stressful, intellectually narrow and ethically dubious experience for students"(p. 845). The three case studies in this chapter have described ePE teaching and learning where the opposite is occurring and we trust this inspires you to explore connectivism as ePE in Physical Education in your own practice.

<box begins>

DISCUSSION QUESTIONS

1. What will be the likely developments in digital technology in Physical Education and Sport in the future?
2. What learning theory will supersede connectivism?
3. Given the advancements offered by connectivism, in making professional learning a) networked and b) continuous, what is the future of PDL for teachers in the digital and mobile landscape?

FURTHER READING

Bowes, M., & Ovens, A. P. (2014). Curriculum rhythm and HPE practice: Making sense of a complex relationship. *Teachers and Curriculum, 14*, 21-28.

Gard, M. (2014). eHPE: A history of the future. *Sport, Education and Society*, 19(6), 827-845.

Ovens, A. P., Garbett, D., Heap, R., & Tolosa, C. (2013). Sustaining high quality pedagogy in the changing technological landscape. *Computers in New Zealand Schools: Learning, teaching, technology*, 25 (1-3), 21-37. [Related URL](#).

REFERENCES

- Bolstad, R., Gilbert, J., McDowall, S., Bull, A., Boyd, S., & Hipkins, R. (2012). *Supporting future-oriented learning & teaching - A New Zealand perspective. A Report to the Ministry of Education (NZ)*. Wellington, New Zealand. Retrieved from <http://www.educationcounts.govt.nz/publications/schooling/109306>
- Bolstad, R., Gilbert, J., McDowall, S., Bull, A., Boyd, S., Hipkins, R., ... with S McDowall. (2012). *Supporting future-orientated learning & teaching - A New Zealand perspective. A Report to the Ministry of Education (NZ)*. Wellington. Retrieved from http://www.educationcounts.govt.nz/__data/assets/pdf_file/0003/109317/994_Future-oriented-07062012.pdf
- Bowes, M., & Ovens, A. (2014). Curriculum rhythm and HPE practice: Making sense of a complex relationship. *Teachers and Curriculum*. Vol 14, p. 19-25.
- DiNucci, D. (1999). Fragmented future. *Print*, 53(4), 32-35.
- Downes, S. (2005, December). An introduction to connective knowledge. Retrieved 11 October 2016, from <http://www.downes.ca/post/33034>
- Forrest, G. (2009). Using iPods to enhance the teaching of games in physical education.
- Gard, M. (2014). eHPE: a history of the future. *Sport, Education and Society*, 19(6), 827–845. <https://doi.org/10.1080/13573322.2014.938036>
- Gooding, J. (2009). Web 2.0: A vehicle for transforming education. *ICTs for Modern Educational and Instructional Advancement: New Approaches to Teaching: New Approaches to Teaching*, 47.

- Hamilton, D. (2013). *Towards a Theory of Schooling (Routledge Revivals)*. Routledge.
- Heap, R., Garbett, D., Ovens, A., Tolosa, C., Bowes, M., Lee, S., & Leichtweis, S. (2014). Using technology enabled feedback in initial teacher education. In *SITE International Symposium 2014*.
- Lai, K., Bolton, C., Bennett, C., Campbell, M., Kelly, S., Proctor, T. Y., Zaloum, T. (2012). Designing knowledge-building communities in New Zealand secondary schools: Some preliminary reflections . *Computers in New Zealand Schools*, 24(3). Retrieved from <http://education2x.otago.ac.nz/cinzs/mod/resource/view.php?id=410>
- Matthewman, S., Bowes, M., Burchill, D., Heap, R., & Tickner, S. (2015). The Digital Challenges to Curriculum Thinking. *The 21st Century Curriculum?*
- Ministry of Education (NZ). (2007). The New Zealand Curriculum for English-medium teaching and learning in years 1-13. Wellington: Learning Media . Retrieved from <http://nzcurriculum.tki.org.nz/The-New-Zealand-Curriculum#collapsible2>
- Moreno, J. L. (1934). *Who shall survive? A new approach to the problem of human interrelations*. Washington, DC: Nervous and Mental Disease Publishing Co.
- Ovens, A., & Smith, W. (2006). Skill: Making sense of a complex concept. *Journal of physical education NEw Zealand*. Vol 39.1 p. 72-82.
- O'Hare, S. (2012). Knowledge-building communities: What, why, how? *Computers in New Zealand Schools: Learning, teaching, technology*, Vol. 24, No. 3, pp. 249 – 258.
- O'Reilly, T. (2005, September 30). What is web 2.0: Design patterns and business models for the next generation of software. O'Reilly blog. Retrieved Jan 20, 2017, from <http://www.oreilly.com/pub/a/web2/archive/what-is-web-20.html>
- Paechter, C. (2002). *Changing school subjects: Power, gender and curriculum*. Open University Press.
- Richardson, W. (2007). Teaching in a web 2.0 world. *Kappa Delta Pi Record*, 43(4), 150–

151.

Russell, J. (2012). Knowledge building: What is it all about? *Computers in New Zealand*

Schools: Learning, Teaching, Technology, 24(3), 239–248. Retrieved from

<http://education2x.otago.ac.nz/cinzs/mod/resource/view.php?id=389>

Siemens, G. (2004). Connectivism: A learning theory for the digital age. Retrived from

http://www.itdl.org/journal/jan_05/article01.htm

Siemens, G. (2005). Connectivism: Learning as network-creation. Retrieved from

<http://www.elearnspace.org/Articles/networks.htm>

Siemens, G. (2006). *Knowing knowledge*. Vancouver, BC, Canada: Lulu Press.

Siemens, G., & Tittenberger, P. (2009). *Handbook of Emerging Technologies for Learning*.

Retrieved from <http://elearnspace.org/Articles/HETL.pdf>

Wright, N. (2010). *e-Learning and implications for New Zealand schools: a literature*

review. Retrieved from [http://www.educationcounts.govt.nz/publications/ict/e-learning-](http://www.educationcounts.govt.nz/publications/ict/e-learning-and-implications-for-new-zealand-schools-a-literature-review/)

[and-implications-for-new-zealand-schools-a-literature-review/](http://www.educationcounts.govt.nz/publications/ict/e-learning-and-implications-for-new-zealand-schools-a-literature-review/).