

Paper Title: 'Connectivism': Who is the new kid on the learning theory block?

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Keywords: learning theory, connectivism, new learning design, networked learning

Introduction

If the question "what is a learning theory?" is posed to educators, the chance is that a multitude of perspectives are offered. Some educators may list some learning theories that have stood the test of time, such as 'behaviourism', 'cognitivism' or even 'constructivism', whereas others might point to the fact that there are multiple forms of, for example, 'behaviourist learning theory' (e.g. Pavlovian and Skinnerian theories), 'cognitivist learning theory' (e.g. Gagneian, Bandurian etc). Others even would start questioning the inclusion of Bandura in the cognitivist 'camp' and would rather place him with Skinner and Pavlov. So, when does someone's idea or conceptualisation of how learning/teaching is happening or should be structured, become a theory? This problem is currently being investigated

concerning a newcomer on the landscape of learning and teaching approaches, namely 'connectivism'. Is connectivism a new learning theory as some would argue (Siemens, 2004; Siemens, 2006b), or is it merely a pedagogical method or developing idea, as postulated by others (see Bell, 2010; Kop & Hill, 2008)? This has become a very current topic of discussion amongst researchers in many institutions, especially as some teacher education programs are offering courses on 'connectivism' (see for example, The University of Notre Dame Australia's, ED2203 Networked Learning course).

Bell (2010) suggests connectivism needs wider conceptual debate and empirical evidence for its development as a new conceptualisation of learning and teaching. This paper is a response to this identified need, providing a theoretical outline of connectivism's 'conceptual fit'. It is hoped that the critique provided here will assist in the development of a theoretical foundation for the gathering of empirical evidence in the future.

Given the increased interest in teaching and learning in Australian higher education (Fetherstone & Hill, 2011), it may be timely to review the latest developments and debates concerning the concept of 'learning theory'. This paper aims to provide a conceptual overview of the learning theories and the possible placement or 'fit' of connectivism in this construct. Hence, it begins with a brief discussion of the importance of a systematic and comprehensive language for scientific work, before explaining the theoretical framework used to engage in the systematic learning theory mapping, utilising a multi-dimensional, taxonomy-based approach to coding and analysing properties of well-established learning theories. This is then followed by a deconstruction of the concept 'connectivism' and based on the coding system applied to other learning theories, the results of the analysis is discussed and possible implications for practice and further research are outlined.

What is a theory?

A scientific theory can be viewed as a conceptual construct that is used for the identification and explanation of observable phenomena and its relationship to the wider context and other phenomena. Whereas Karl Popper's ideas on scientific theory construction are based on bipolar dimensions of verification and falsification (Guba & Lincoln, 2005) or natural phenomena, Alan Fiske's (1992) framework for a unified theory on social relations involves a taxonomy of elements to distinguish key features of interactional relationships and social phenomena. Both agree that a scientific theory concerning natural or social phenomena needs to be able to establish sub-groups or sub-classes within which statements can be made to organise them as 'belonging' or 'not belonging' to particular groups according to their unique properties or elements.

As Popper famously notes:

If there exists, for a theory t , a field of singular (but not necessarily basic) statements such that, for some number d , the theory cannot be falsified by any d -tuple of the field, although it can be falsified by certain $(d + 1)$ -tuples, then we call d the characteristic number of the theory with respect to that field. All statements of the field whose degree of composition is less than d , or equal to d , are then compatible with the theory, and permitted by it, irrespective of their content. (cited in Corfield, Schölkopf, & Vapnik, 2005, p. 3)

In other words, a classification system with clearly articulated statements is able to provide verification and falsification data, which would then allow the formation of a theory as a descriptive taxonomy (Fiske, 2004; Haslam & Fiske, 1999) or relational fit between a

conceptual construct and observable property or associated factors of a phenomenon or relationship.

What is a learning theory?

The importance of systematic and comprehensive language for describing any event or phenomenon in a scientific manner cannot be disputed and is clearly of significance when dealing with education change practices and the development and testing of new educational theories and pedagogies (Cruz, 2010). Distinguishing various characteristics of learning theories allows for the examination and comparison of the theories. As noted above, determining if a conceptualisation of learning can be termed 'a theory' as such requires a common language for describing the properties of the phenomena under investigation. The more systematic and detailed the language, the more precise the analysis and critique can be.

Bell (2011), notes that a theory of learning is something that assists educators and learners to "think about how and why change (in learning) happens" (p. 528). More importantly, she also explains that "this begs the question of whether we conceive of learning as a process or product" (p. 528), alerting to the important epistemological position from which learning theories originate (see Table 1 below).

Moving away from positivist conception of knowledge production, in an earlier paper, it was argued that students will need to be constructed as producers of knowledge and artefacts rather than mere consumers (Dobozy, 2011). Hence, the discussion of whether 'connectivism' can be classified as an emerging learning theory is critical in this debate as we move into a new learning and teaching paradigm.

Theoretical framework

This paper is based on a systematic review of research and other documentation available on the Internet concerning 'connectivism' to date. Hence, this project can be classified as secondary research, which is gaining traction in academia and business (Joy, 2011; McQuarrie, 2005). The problem of the quantity of information available, much of which is of varied quality, is likely to lead to information overload, impeding informed decision-making. Secondary research, which utilises a mix of previously published theoretical and empirical data to arrive at new knowledge, is able to infer new connections between seemingly unrelated concepts.

A number of alternative phrases have been proposed over the years for the kind of research that aims to 'dig for nuggets' in already published work (Pawson, 2006); from secondary or desktop research (Hague, Hague, & Morgan, 2004) to meta-study (Paterson et al., 2001), meta-interpretation (Weed, 2005) and qualitative meta summary (Sandelowski & Barroso, 2007). The reasons provided for the eclectic and innovative mix of terms is to signal changes in the conception of what counts as 'research' and alert to alternative conceptions of reality as unstable, tentative and heavily dependent on professional values.

The value of defining learning theory characteristics as indicators in the evolution of higher education learning design is three-fold. First, indicators of learning theory characteristics provide a mechanism for measuring inclusion/exclusion of key components of various learning theories as they are understood at present in Australia (O'Donnell, Dobozy, Bartlett et al, 2011). This allows careful examination of the relationship between theory components in order to determine if the conceptualisation can be classified as a theory. Secondly, descriptions of learning theory characteristics provide a benchmark for monitoring change in learning/teaching behaviour and learning outcomes. The effects of underlying theory on enacted pedagogy can be examined, providing ways to measure learning theory/pedagogy

alignment and efficacy. Finally, this work contributes information on the importance of pedagogical variables of classroom pedagogy that can be attributed to learning theory.

One way to address the issue whether ‘connectivism’ can be classified as a ‘proper’ albeit emerging learning theory, is to define characteristics and indicators of accepted learning theories as outlined in Table 1. Although there are a number of sub-strands of learning theories that have emerged over the years as noted in the introduction, it is not the purpose of this paper to provide a comprehensive list of known and accepted characteristics of each and every sub-strand of a learning theory. Detailed information to this effect is available in educational psychology texts (see Snowman, Dobozy, Scevak, et.al. 2009).

Table 1: Learning theory mapping

Learning theory	Characteristics	Recognised forms	Philosophical underpinning	Proxy for / indicator of competence and domain	Learning response
Behaviourism	Operant conditioning	Pavlovian Skinnerian	Positivism	Focused practice of transmitted information	External motivator/ reward for ‘good behaviour’ (conditioned response to stimulus) - passive
Cognitivism	Information processing theory	Gagneian Banduraian	Positivism/ Post-positivism	Focused practice of transmitted information	Changing mental schema in the brain through external stimulus and internal motivation/experience – passive and active
Constructivism	Active constructive process	Deweyian Rogerian Piagetian Vygotskyian Von Glaserfeld	Relativism	Focused practice of constructing personal and/or collective knowledge	Active construction of knowledge based on prior knowledge, integration of various knowledge/skills sets (generic and technical)

Learning theories have an identifiable internal orientation, with roots both in educational philosophy and psychology and can be historically positioned in time and space. As such learning theories can be mapped and their underlying theoretical frameworks classified and coded. The main aim here is to position connectivism in relation to the three major learning theories: behaviourism, cognitivism and constructivism. This will determine if connectivism can and should be viewed as a theoretical framework based in philosophy and psychology to inform learning design, curriculum mapping, critique and educational research. Dobozy (2010) argued that Siemens (2004/2005/2006a), who coined the term ‘connectivism’, was building on social and/or radical constructivist conceptions of learning, which emerged in the 20th century. Consequently, the list of influential education thinkers is confined to theorists who can be termed constructivist in their conceptualisation of education.

Tentative timeline of constructivism:

- ◆ Jean-Jacque Rousseau (1712-1778) – cognitive constructivist, personal sense making when learner is physically, emotionally and cognitively ready
- Immanuel Kant (1724-1804) – cognitive constructivism, based on rational thought, empiricism and high personal moral values

- George Wilhelm Friedrich Hegel (1770-1831) – cognitive constructivist, knowledge (altered cognitive state) emerges from trial and error processes
- Johan Pestalozzi (1746-1827) – cognitive/social constructivist, education must be personal and relevant, the ‘living room’ analogy
- Fridrich Froebel (1782-1852) – invented the kindergarten and advocated learning through play with geometrical/mathematical toys
- John Dewey (1859-1952) – cognitive/social constructivism
- Maria Montessori (1870-1951) – freedom and choice of decision-making ‘help me do it myself’
- Jean Piaget (1896-1980) – cognitive constructivism
- Lev Vygotsky (1896-1934) – social constructivism
- Carl Rogers (1902-1987) – social constructivism, experiential learning
- Jerome Bruner (1915-) – cognitive and social constructivism, discovery learning/mastery learning
- Von Glaserfeld (1917- 2010) – radical constructivism

Each of these thinkers has, over the years, provided their unique perspectives and ideas, contributing to the evolution of the learning theory, enabling it to become mainstreamed as the currently accepted orthodoxy in education all over the world.

The purpose of the above table and the list of constructivist thinkers is to establish agreed upon characteristics of known learning theories as a benchmark for the discussion concerning connectivism’s rightful place. Hence, the next section will discuss some characteristics of ‘connectivism’ as outlined by contemporary education scholars, making overt its close relationship to constructivist conceptions of learning.

What is ‘connectivism’?

George Siemens, who coined the term ‘connectivism’ in 2004, contends that it is a learning theory for the age of today or the digital age and driven by the understanding that decisions are based on rapidly altering foundations [and] the ability to recognize when new knowledge alters the landscape (Siemens, 2005/2006). Bell (2010) notes that: “prior to this, the term ‘connectivism’ had been used when applying ideas from biological models of the brain to neural networks in machine learning, treating the neural network as part of a whole” (p 528). Based on Siemens (2005/2006) conceptualisation of learning, knowledge production is "a process that occurs within nebulous environments of shifting core elements" (Siemens, 2005, p 1). Hence, according to Siemen’s connectivist ideas, learning is the process of building connections, which are enablers of new knowledge production (learning) as they assist the learner filter information and transform them into new knowledge with the help of others. This focus on cognitive connections between learners recognises the importance of currency (up-to-date knowledge) and ‘shifting foundations’ and is “the intent of all connectivist learning activities" (Siemens, 2005, p 2). There is certainly knowledge negotiation in connectivism, but the theory requires some system of external validation and expertise to evaluate currency. Like constructivism, connectivism requires some way of validating the accuracy or soundness of the knowledge aquired. In the connectivist model, such knowledge validation processes take the form of multi-faceted exchange of ideas between novices and experts, where the more knowledgeable can provide "trusted nodes" (Hotrum, 2007, p 4). This purposeful exchange and rigorous debate not only assists in personal knowledge gain, but enables the construction of what Stephen Downes (2008) refers to as ‘distributed knowledge’, which is only possible through rigorous and focused debate and discussion.

What is new about connectivism?

Whereas all forms of constructivism (cognitive, social, radical etc) are, similar to earlier learning theories, exclusively applied to human behaviour, learning and tools (such as cognitive, affective and physical), Siemens (2004) argues that although his connectivist ideas originate in social constructivist theories, most notably those outlined by Vygotsky (1978), mixing human and non-human tools for learning, analysing and meaning making is unique to 'connectivism'. This aspect of Siemens's (2005/2006) and Downs (2008) conceptualisation of 'connectivism' is, so Bell (2010) notes "attractive to those wishing to incorporate internetworked technologies (such as Web 2.0 products and services) into their teaching and learning practices" (p 532). Based on the arguments presented thus far, we contend that it is possible to include 'connectivism', even if only tentatively, in the list of learning theories as a welcome addition (see Table 2).

Table 2: 'Connectivism' – A welcome addition in the map of learning theories

Learning theory	Characteristics	Recognised forms	Philosophical underpinning	Proxy for / indicator of competence and domain	Learning response
(Connectivism)	Connecting specialised nodes or information sources	Siemensian	Relativism	Focused practice of constructing mainly collective knowledge	Disequilibrium facilitates learning, alternative perspectives aid personal meaning making

There is general agreement among the educational research community that a theory is a useful conceptual tool to commence the meaning making journey from idea to the development of principles and a more concrete conceptualisation that can be developed, debated and altered (Cruz, 2010; Denzin & Lincoln 2005). To this end, Siemens (2004) has developed a set of principles that underpin connectivism as a phenomenon/learning theory.

Should 'connectivism' be classified as a learning theory?

Kop and Hill (2008) and Bell (2010) argue that although Siemens's 'connectivism' is a novel and potentially useful conceptualisation, contributing to the current evolution of learning theories and practices, with transformational potential. However, Kop and Hill (2008) also argue that:

A paradigm shift, indeed, may be occurring in educational theory, and a new epistemology may be emerging, but it does not seem that connectivism's contributions to the new paradigm warrant it being treated as a separate learning theory in and of its own right.

Similarly, Bell (2010/2011) and Verhagen (2006) explains that the challenge for 'connectivism' as a knowledge network is to increase its capacity in related but unexplored areas, through boundary-crossing activities of researchers and practitioners. For Verhagen (2006, p. 2) 'connectivism' as a phenomena is not yet "sufficiently specific and coherent" to be referred to as a theory of learning. Although we accept Bell's (2010/2011), Kop and Hill's (2008), and Verhagen's (2006) concerns about the conceptual fit of connectivism in the current learning theory and practice landscape, based on argument outlined above, we do not share their views. Consequently, we tend to side with Siemens who has declared 'connectivism' as a new and emerging learning theory, building on – but surpassing social constructivist ideas. He states:

The eyes through which we see learning, the boundaries in which we construct learning, have been shaped and created by the great debates from previous generations. The established notions of knowledge and learning appear inadequate in a world and space subject to substantially different pressures than earlier societies. (Siemens, 2006a, p.9)

It is important to locate the debate about connectivism as a legitimate theory in time and space as well as in relationship to earlier theories of learning. Once we have formulated the question, we discussed the development of indicators, which assisted in the codification of information (see Tables 1 and 2). As such, creating data clusters for each learning theory, we applied an inductive approach.

Conclusion and Implication

Theorising the contribution of connectivism to the educational literature will assist the educational community understand not only the rightful place of this new concept, be it as a learning theory in its own right or an extension of or augmentation of existing constructivist theories. Downes (2006) comments that connectivism stresses that knowledge and the learning of knowledge is distributive, consisting of the network of connections formed from experience and interactions with a knowing community.

Using a multi-dimensional, taxonomy-based approach to coding and analysing properties of learning theories, we arrive at the conclusion that 'connectivism' can be classified as a learning theory. It is imperative for any empirical work that a strong conceptual foundation is provided for discussion, critique and testing of new and emerging ideas and applications.

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