# Connectivism as a Learning Theory and Its Relation to Open Distance Education

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## Abstract

This paper focuses on connectivism as a learning theory and its relation to open distance education. Connectivism is presently challenging existing learning theories and is unlike behaviourism, cognitivism and constructivism, which place learning at the centre of the cognitive development of the learner. Connectivism stresses that learning is located in different networks and the social construction of knowledge makes the learner key in the knowledge creation process. Connectivism is the thesis that knowledge is distributed across a network of connections, and therefore that learning consists of the ability to construct and traverse those networks. This is a learning environment where students simply plug into the network and create their own learning. Unlike traditional learning methods and theories like cognitivism (where learning is an active, constructive process), behaviourism (a theory of learning based on the idea that all behaviours are acquired through conditioning) or constructivism (the theory that humans construct knowledge and meaning from their experiences), with connectivism, learning is defined by connections to a network of knowledge that can include any form of interaction. Siemens' theory of connectivism is based on Web 2.0 technologies. This raises key questions as to whether it can be seen as a learning theory in the context of open distance learning (a delivery mode and teaching and learning approach that focuses on increased access to education and training where barriers caused by time, place and pace of learning are eliminated). Web 2.0 learning in the last decade has impacted on the way we teach in traditional classroom settings and how knowledge is disseminated in an online learning environment. Siemens' theory of connnectivism is a paradigmatic shift from traditional learning theories to new ways of learning through networks, databases, and Web learning on different virtual learning platforms. This raises questions about the radical

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discontinuity of traditional knowledge systems as the learner becomes part of the social creation and social construction of knowledge in a virtual learning environment.

**Keywords:** learning theories; connectivism; networks; Web 2.0

## Introduction

With the inception of democracy in 1994, we have seen the fast progression of access to the internet (e.g. WWW) and online e-learning platforms. Online e-learning platforms can be defined as an integrated set of interactive online services that provide trainers, learners, and others involved in education with information, tools and resources to support and enhance educational delivery and management and distance education (e.g. *my*Unisa, Blackboard, or Sakai). With a vast population of learners that were previously excluded from higher education in South Africa, online and distance learning has been seen as an answer to learning challenges for learners from the "other side" of history or historically excluded communities. The transactional distance of learning in space and time has become very important for those from historically excluded communities to acquire knowledge through online learning platforms like *my*UNISA so that these learners can free themselves from the painful challenges of socially engineered poverty created under a false ideology of apartheid. Many of our students cannot afford to attend residential and traditional learning institutions whereas open distance learning, blended learning and online learning platforms like UNISA connect these communities and learners to a digital, global learning community of learners, scholars, discussion groups, blogs, wikis and different social media platforms like Facebook, Twitter, WhatsApp and different scholarly databases and networks. The growing hunger of learners from the "other side" of history can be seen a major drive for learners to conform to new technologies through different learning platforms (like *my*Unisa, Blackboard, Sakai) in a virtual learning environment. Connectivism as a learning theory faces different challenges as learners struggle to conceptualise, interpret, and learn from different networks in a virtual learning environment. Connectivism raises concerns about the value of learning as a learning theory, unlike behaviourism, cognitivism and constructivism, in the development of the learner. Siemens and Downes (2005) observe,

> Behaviourism, Cognitivism and Constructivism are the three broad learning theories most often utilized in the creation of instructional environments. These theories were developed in a time when learning was not impacted by technology or in a time when "information development was slow."

Most of these theories focus on traditional classroom learning and teaching, i.e. face-to-face interaction. This led to the challenge of traditional learning methods in the wake of the progression of knowledge through personal networks and data servers (Siemens 2005a). Over the last 20 years, technology has reorganised how we live, how we

communicate, and how we learn in a virtual classroom. Learning theories need to describe learning principles and processes and should reflect underlying social environments and contexts of where the learners find themselves (Siemens 2005b). Siemens challenges traditional classroom learning and proposes a new learning theory. Connectivism is a paradigmatic shift that provides open access to learners anywhere, anytime; i.e. there is no restriction to the space and time where learning takes place. Whether the learners sit under a tree in rural KwaZulu-Natal or in an office block in downtown Sandton, Johannesburg, as long there is connectivity to the WWW (World Wide Web, Wi-Fi), learning can take place on different online learning platforms and can be transacted regardless of distance and time.

Educators have often relied on learning theories such as constructivism, which is participant-centred and moves from the teacher to collaborative student work. Cognitivism, which is characterised by individualised, self-paced learning, includes little if any peer-to-peer interaction (Mallon 2013, 19). Constructivism suggests that learners create knowledge as they attempt to understand their experiences (Driscoll 2000, 376). Knowledge is shaped by the learner's social, economic and political environment. This results in a new interpretive understanding of what knowledge is and its fluidity (not restricted to context, time or space or distance) as knowledge shapes the learner's understanding through different online and social engagements with the text, a move from traditional chirographic writing to hypertext interpretation of learning.

From the early 1970s, the instructional theory was split into two categories, behaviourism and cognitivism (Black 1995). Behaviourism and cognitivism view knowledge as external to the learner and the learning process as an act of internalising knowledge. Constructivism assumes that learners are not empty vessels to be filled with knowledge. Instead, learners are actively attempting to create meaning. Learners select and pursue their own learning (Siemens 2005b, 2). These theories do not address learning that occurs outside of people (e.g. learning that is stored and manipulated by technology and social media platforms). These theories also fail to describe how learning happens within organisations of learning because learning theories are concerned with the actual process of learning, not with the value of what is being learned. This is in agreement with Paulo Freire's ideas expressed in *Pedagogy of the Oppressed* (2007), which criticised this kind of education and called it "banked." Freire held extremely negative views of mainstream approaches to education, using the metaphor of the "banking" system to describe such kinds of learning. For Freire, such kinds of learning dehumanise the oppressed. A classic example of this has been Bantu education under the previous apartheid regime. The following theories, constructivism, behaviourism and cognitivism, do not address learning outside of the body nor learning that is stored and manipulated by technology within networks.

Siemens and Downes (2005) proposed new ideas concerning distributed knowledge. The proposed discourse centred on the status of "Connectivism" as a new learning theory for a digital age. The question that continually comes up is, to what extent do

existing theories meet the needs of today's learners that are technology savvy and anticipate the needs of learners of the future? There is a need for a new theory as the older theories are to be replaced by "connectivism." Kerr (2007) maintains that for connectivism to be seen as a new learning theory, the limitations and full range of contexts in which learning can take place must be accounted for (Kop and Hill 2008, 1). If not, the application of connectivism to learning and teaching can be misguided. Connectivism aims to address not only the knowledge explosion through technology, but the way technology has changed the way we "live, communicate and learn" and conceptualise our world (Siemens 2005b).

Kop and Hill (2008) indicate that the reason for developing a new theory like connectivism was to build on older learning theories without discarding them, as new developments in learning have occurred which older theories no longer explain (2008, 1–2). This raised a concern about the empirical bedrock of connectivism as a learning theory. Kerr (2007) raises a concern about the context of learning and where it takes place. This can become a challenge for teachers in the implementation of connectivism and the distribution of knowledge (Kop and Hill 2008, 2). In the last few years, educators in higher education institutions have been forced to adapt to new technologies. Whether they are prepared for this or not raises concerns in itself. This calls for a new delivery method from learning to learners, a redesign of the curriculum from a blended learning approach to learning and acquiring knowledge in the virtual classroom. Instructional designers are required to deliver course material in accordance with the learning outcomes of educational institutions (Kop and Hill 2008, 2). This has changed the academic landscape of learning and how learners conceptualise learning in a virtual classroom. Connectivism challenges existing methods of learning, existing approaches and interpretations of learning as well as the creation of such knowledge in a traditional frame of learning. This has forced educators to rethink how we teach in a digital learning environment.

In terms of the challenges connectivism faces as a learning theory for ODL, Siemens (2005b) observes,

> Those who struggle to create an adequate theory of learning must admit that the process is much like stumbling in the dark. So much of our thought structure is shaped by hidden assumptions evident in our existing learning and educational systems.

It is import to understand connectivism as a learning theory and how knowledge is organised, acquired, retained and recalled by learners (Downes 2006). There are three important learning theories: behaviourism, cognitivism and constructivism. Behaviourism (e.g. drill, repetitive practice, verbal reinforcement, establishing rules, etc.) refers to how new behaviours or changes in behaviours are acquired through the associations between stimuli and response. According to cognitivism (e.g. discussions, mnemonics, analogies, real-world examples, classification, linking concepts), learning occurs through internal processing of information. With constructivism (e.g. case

studies, research projects, brainstorming, collaborative learning, simulations and problem-based learning), the learner constructs knowledge of the world based on individual experiences (Kelly 2012). According to Downes (2006), the link between constructivism and connectivism is that "knowledge is not being acquired as a thing." Kerr (cited in Kop and Hill 2008) stresses that connectivism is not losing "the lessons of constructivism and the need for each learner to construct his or her own mental models in an individualistic way" (Kerr 2007, 1). Connectivism deeply challenges the empirical and scientific bedrock of learning and how learning is created and disseminated in a learner-centred environment through nodes and different connections. Proponents of connectivism are not saying do away with the traditional learning theories, but question the epistemological and empirical foundations as networks become the extension of knowledge creation in a learning environment.

Connectivism is partially a product of a networked Web 2.0. which is the architect of participation and harnesses collective memory. Most aspects of Web 2.0 are tied in with the development of the learners. What underpins the development of connectivism is the technologies of Web 2.0. like blogs, wikis, social media platforms as a way for learners and teachers to collaborate, communicate openly and freely at any time, regardless of the transactional distance of time or space. Networks become platforms where learners virtually dialogue, learn, discuss and engage in learning in a virtual learning environment. Web 2.0 technologies used by connectivism have one common objective: to develop a community of scholarship through networked interaction learning and engagement. This is driven by a shared purpose and communication that enables different online communities to connect and produce different knowledge. This is effectively done through means of chat platforms, whiteboards, blackboards, Facebook, Twitter, Whatsapp, Teams, and other messaging services. Out of this emerged three main terms: shared interest, communication ability and paradigm of interest (Shriram and Warner 2010, 8–9). The results of such engagements challenge and expand our thinking on how community is seen traditionally to global communities of practice in synchronous and real-time.

In the last few years, Web programmes and Web media sharing have emerged which are referred to as Web 2.0. Web 2.0 encourages creative interaction and informal communication and facilitates the sharing of media. This can be seen in social networks (e.g. Facebooks, Myspace, WhatsApp etc). Other popular Web 2.0 applications are blogs, discussion forums, and wikis (Moore and Kearsley 2012). In the last decade, Web 2.0 applications have had a profound impact on connectivism as well as open distance learning. There has been a gradual move from blended learning to the virtual classroom due to Web 2.0. application in changing and redesigning the curriculum.

Web 2.0 learners in ODL settings can access the content that was created by someone else. Web 2.0 students can design their own content (e.g. blogging, wikis and tagging) or contribute to the creation of new knowledge. Web 2.0 represents a new era in online learning. Technology aimed at encouraging the collaborative nature of learning (e.g.

discussion groups, virtual classrooms, podcasts, mobile learning, games, blogs, and wikis) will revolutionise learning and teaching (Agaoglu and Kesim 2007, 68–70). New technologies allow learners to connect virtually anywhere due to a shift from a traditional classroom setting to virtual network dialogue.

Siemens (2005a, 5) provides the following overview of connectivism as a learning theory:

> Connectivism is the integration of principles explored by chaos, network, and complexity and self-organization 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 organization 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.

Connectivism is a learning theory founded by George Siemens and Stephen Downes. Both did substantial work on the networked and connectedness of online learning and the interpretative nature of knowledge (Al-Shehri 2011, 10). The term connective describes a form of knowledge and pedagogy based on the idea that knowledge is distributed across a network of connections and that learning consists of the ability to construct those networks. For Shriram and Warner 2010), Siemens built his theory of connectivism based on the work Driscoll. Driscoll (2000) categorises learning into three epistemological frameworks: objectivism, which relates to behaviour; pragmatism, which relates to cognitivism; and interpretivism, which relates to constructivism. Siemens (2005b) integrates principles of different theories such as chaos, network, complexity and self-actualisation theories. Siemens added a fourth category called distributed knowledge which relates to the theory of connectivism (Shriram and Warner 2010, 4). Downes (2006) indicated that the theory of distributed knowledge cannot be seen as a learning theory but rather concerns what is or is not a learning theory per se. Scholars view connectivism as more about the rules of the game than a theory.

The basis of the learning theory shares beliefs with Vygotsky's activity theory and social constructivism, in that through interaction, social activity and collaboration learning occurs (Williams 2008). Siemens believes that connectivism is a learning theory for the digital age that appeared as a successor of behaviourism, cognitivism, and constructivism (Al-Shehri 2011, 10). Connectivism proposes that learning exists within networks and not solely in the cognitive aspects of the human mind. Knowledge resides in different databases and networks. For Downes (2008, 2),

> this implies a pedagogy that (a) seeks to describe "successful" networks (as identified by their properties, which [he has] characterized as diversity, autonomy, openness and connectivity) and (b) seeks to describe the practices that lead to such networks, both in the individual and in society.

According to Kop and Hill (2008), connectivism is a theoretical framework for understanding learning. In connectivism, the starting point for learning occurs when knowledge is actuated through the process of learner connections and feeding information into a learning community (Kop and Hill 2008, 1). Siemens (2005a) states, "a community is the clustering of similar areas of interest that allows for interaction, sharing, dialoguing, and thinking together." Siemens (2006) defines learning "as chaotic, continual, co-creation, complexity, connected specialization, continual uncertainty." Connectivism defines learning as a continual process which occurs in different settings, including communities of practice, personal networks and workplace tasks. This is learning that emphasises the role and cultural context (Siemens 2005a). The ability to learn is viewed as a "function of the ability to connect" (Schwier 2011). Knowledge and learning are, essentially, woven into the process of forming the connections that facilitate the eruption of new information.

The connectivist model describes a learning community as a *node* (a computer terminal or other point in a computer network where a message can be created, received, or transmitted), which is always part of a larger network. Nodes can be seen as the central metaphor of learning (Shriram and Warner 2010, 4). According to Al-Shehri (2011), connectivism characterised knowledge as a flow of information that passes through networks of human and non-human channels as these networks consist of nodes. These nodes can be individuals, groups, systems, resources or communities (Al-Shehri 2011, 13). Nodes arise out of the connection points that are found on a network. A network is comprised of two or more nodes linked in order to share resources. Nodes may be of varying sizes and strength, depending on the concentration of information and the number of individuals who are navigating through a particular node. Siemens defines a network as connections between entities, which he calls nodes. Nodes can be individuals, groups, systems, fields, ideas or virtual communities (Kop and Hill 2008, 1). In an ODL context, connectivism as the theory of learning has opened up and created opportunities in an asynchronous and synchronous manner for learners and educational practitioners to learn and share learning material and information across the Web with learners.

According to Shriram and Warner (2010), this digital explosion leads to the creation of new communities of learning in the Fourth Industrial Revolution. The emergence of these new communities of learning and practice started during the period between 1980 to 1990. This was the beginning of the inception of the internet and the creation of networks. It was the start of e-learning and enabled communication between communities of practice that are geographically distant. The period from 1990 to 2000 saw another groundbreaking invention in digital technology: the rise of video and audio internet streaming and platforms for social networking, blogs, wikis and multiple interaction paradigms. It was the start of the shift from traditional face-to-face learning communities (e.g. it's possible to have a live interaction between a learner and a lecturer in a traditional classroom setting) to open virtual learning. It was also the start of the mobile community, spurred by the desire of learners to communicate spontaneously and

receive, send and access information wirelessly (2010, 9). In the late 20th century the smartphone revolutionised learning and teaching and changed the way information was disseminated among learners and lecturers. The virtual connectivity of mobile phones provides learners in rural communities access to learning which is a major advancement for learners from rural communities in South Africa.

The process of learning takes place through the virtual building of online connections (nodes) between learning in a transactional distance. What is clear about connectivism is that learning is not seen to reside in the brain or cognitive areas only, as in the traditional learning theories, cognitivism, behaviourism and constructivism, but also in network connections with electronic and human components (transhumanism) which the learner has developed in the course of his/her (generic) learning. Unlike the traditional classroom setting, connectivism as a leaning or instructional theory requires a network environment (Siemens 2005a). Learning according to followers of connectivism is based on networks of information, contacts, and resources that are used to solve problems of learning in a virtual classroom environment. The learning process requires learners to gather, classify and prioritise information. For Downes, connectivism and connective knowledge are not simply about the use of networks of diverse technologies, it is a network of diverse technologies (2006).

Information is constantly changing and its validity and accuracy may change over time depending on the discovery of new information pertaining to the subject. The ability to make decisions on the basis of information that has been acquired is considered integral to the learning process. The learning process is cyclical in that learners will connect to a network to share and find new information, will modify their beliefs on the basis of new learning, and will connect to a network to share and find new information once more. Learning is considered a "knowledge creation process … not only knowledge intake, banked or knowledge being memorised" (Kop and Hill 2008, 2). One's personal learning network is formed on the basis of how one's connection to learning communities are organised. The ability to see connections between fields, ideas and concepts is core to connectivism. The connective metaphor is timely because of the direction-finding of the internet, which means information dispersed on the internet provides a strong bedrock for Siemens' departure and assertions to argue for the acceptance of connectivism as a learning theory (Kop and Hill 2008, 2).

Where connectivism draws strength is through Web-based activities. An example of learning is to look through the connectivist lens. Learning depends on the learner's ability to identify complex networks. These networks are internal, like neural networks, and external networks in which we adapt to the world around us (Siemens 2006, 10). Learning consists of the ability to construct and traverse networks. This leads us to look at the principles of connectivism.

## Principles of Connectivism in Relation to ODL Theory and Practice

In his article "Constructivism: A Learning Theory for the Digital Age," which can be considered the very first principles that developed connectivism into learning theory, Siemens (2005a) identifies the principles of connectivism and how such principles can be adapted to online learning from different networks:

- Learning and knowledge rely on diversity of opinions (different databases, e.g. the Web);
- Learning is a process of connecting specialised nodes or information;
- The capacity to know more is more critical than what is currently known in sources;
- Learning may reside in non-human appliances (i.e. technological devices, e.g. computers, phones, Web servers);
- Connections need to be nurtured and maintained to facilitate continual learning (e.g. Web servers powered by 4G and 5G fibre technology);
- The ability to see connections between fields, ideas, and concepts is a core skill;
- Currency (accurate, up-to-date knowledge) is the intent of all connectivist learning activities; and
- Decision-making is itself a learning process. Choosing what to learn and the meaning of incoming information are seen through the lens of a shifting reality. While there is a right answer now, it may be wrong tomorrow due to alterations in the information climate, affecting the decision to learn (Siemens 2005a).

The underpinning principles of connectivism are explored by chaos, network, and the complexity of self-organisation theories. It is a learning theory that details ways to understand and explore learning in the networked digital age (Siemens 2005b).

Connectivity is rooted in the assumption that learners have access to powerful networks and are technologically literate enough to exploit these networks. The first task of connectivism is to expose students to networks. Learning happens best in a network context. According to Siemens (Siemens 2005b cited by Anderson and Dron 2011, 34), "a network is comprised of learning resources, machines that both store and generate information as learners synthesise personalised knowledge by connecting it to the ideas and artefacts of others in their networks." Knowledge and learning "can exist outside of a human being, in the databases, devices, tools and communities within which the learner acts."

In constructivist learning, the teaching presence is created by the building of the learning and by the design and support of other learners' interactions in the classroom These learners make connections to existing and new knowledge resources. The teacher is not solely responsible for defining, generating and assigning new knowledge. Learners and teachers collaborate to create the content of the study, and in the process recreate that content for the future use of other learners. Teaching practice in a connectivist learning environment focuses on teaching by example. Connectivist learning includes learners teaching teachers and each other in a virtual classroom. The stress of teaching practice in a connectivist paradigm inheres in the rapid change of technology (Anderson and Dron 2011, 88).

Connectivist learning is based upon the production of knowledge rather than the consumption of knowledge like in traditional learning environments. Connectivist cognitive presence is enhanced by the focus on reflections and distributions of these reflections on blogs, Twitter posts and multimedia webcasts, podcasts and Facebook. The activities of learners are reflected in their contributions to wikis, Twitter, threaded conferences (Skype) and webcasts (Anderson and Dron 2011, 88). The relationship between course content and the learner should be closely tied and then the learning process will be more effective.

For Siemens (2005b), the future of connectivism will necessitate a multi-theoretical approach to learner-centred pedagogy due to the impact of Web 2.0 technologies on teaching and learning with respect to the expanded abilities of the learners. For Siemens, connectivism is a learning theory for a digital era, knowledge is networked, and the act of learning takes place inside virtual networks and virtual communities of practice through social action in sharing pieces information to create integrated knowledge. Learning happens in many different ways through online courses, e-mail, communities of scholarship, online conversations (wikis, blogs, discussion forums, online tests and different social platforms), Web searches and reading e-books. Learning consists of the individual's ability to construct, curate and extract value from those networks in a virtual learning context.

Verhagen (2006) clearly states that connectivism is not a new learning theory but rather a pedagogical view on education. Verhagen further indicates that knowledge has always resided within human beings throughout ages and generations, but for Siemens knowledge now resides in organisations, databases and networks. In the scholarly community the question has been raised whether connectivism should be placed at the curriculum level as a learning theory. For Verhagen (2006) connectivism as a learning theory remains philosophically and empirically unsubstantiated. According to Kerr (2007), connectivism does not explain higher cognitive thinking. This has to do with understanding, making understanding and building understanding in a learner-centred environment. Siemens' theory on connectivism as learning theory has been met with fierce criticism by the academic community. Beyond a doubt, connections played a major role in the prompting of e-learning practitioners to provide educators with tools

that have changed the classroom permanently in terms of instructional design and learning (Shriram and Warner 2010, 5–6). Kop and Hill do not see connectivism as a learning theory but rather as the emergence of an epistemological framework in a digital age (2008). These perceptions remain in question with the emergence of the Fourth Industrial Revolution and the daily changes in the way educators teach and disseminate knowledge in a learner-centred environment.

The result of connectivism as learning theory has helped in a learner-centred open distance learning (ODL) environment to facilitate connection tools for learners such as blogs, wikis, collaboration tools, and social networks. It further led to break the control of education in the classroom from tutor to teacher to autonomous lifelong learner.

## Conclusion

In the last two decades, Web 2.0 technologies have transformed learning and teaching for those from the other side, historically subjugated in South Africa. It has transformed rural villages into global communities of learning in a virtual learning environment. As long as the learner is on the network he/she (generically) can engage in learning. Open distance learning and connectivism challenge the way we teach in a digital age, how we connect and how we share knowledge. There has been a paradigmatic shift from traditional learning theories (e.g. behaviourism, cognitivism and constructivism) and blended learning approaches to virtual and online learning. Connectivism builds on a constructivist model of learning, with the learner at the centre, connecting and constructing new knowledge in a context that includes external networks and social media platforms. It is literally a classroom without borders that connects our learners to a virtual world of endless knowledge. Connectivism presents a model of learning where learning is no longer only a cognitive or an individualistic activity in the learning process but a collaboration of scholarship which is not subjected to time or space but rather transacts through time and space—irrespective of distance, place or time, learning can be done anywhere and everywhere. Lastly, connectivism provides new learning strategies and skills needed for learners to flourish in a digital age. As knowledge continually grows and evolves, access to what is needed is more important than what the learner currently possesses (Siemens 2005b). Connectivism destroys the false ideological perceptions of learning that belong to a privileged group of people and opens a new sense of freedom in a virtual classroom context like UNISA for those that were previously excluded from learning, in connecting the poor and oppressed to a remarkable world of learning in a digital age.

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