Connecting the Theory of Connectivism to Practice

Amanda Rablin

Abstract

The work of George Siemens, as articulated through the learning theory of connectivism, argues that learning in the digital age occurs through the connections between people, knowledge and tools - where the 'network is the learning'. This theory challenges traditional notions of education and is related to the networked nature of online behaviours in social networks and other web 2.0 tools. This study investigates the claim that there is a need to change learning and teaching to be more aligned to connectivist principles through determining their relationship to teacher practice. A mixed methods approach was used for this small-scale research. Data was collected through an online survey relating to the principles of connectivism. The findings indicated that while teachers were in agreement with the principles some were not as readily accepted as others and in practice educators applied the principles less to student learning than to their own professional learning. The study also positioned the use of web 2.0 tools in relation to learning practices. Implications for future practice in schools and suggestions for further research are also made.

Introduction

Today's schools, teachers and learners find themselves in a society filled with digital technologies and the potential for many connections to support learning. This has a profound impact on how we think and interact with each other. There are currently global, social, political, technological and educational pressures at play that will influence the future of education (Siemens and Tittenberger, 2009). Many believe that learners are now thinking and interacting in different ways and Web 2.0 has been a catalyst for this (Downes, 2006). According to McFrederies (2006 cited in Pettenati and Cigognini, 2007), web 2.0 applications allow content to be user-created, require trust within the community, allow for rich user interactions, combine sources to create new services, and become more worthwhile as the number of participants increases. In an educational context, this presents an interesting challenge as traditionally an educational authority prescribes learning content and therefore controls knowledge formation. A study into the future of education (Redecker et al., 2011) predicts that learning strategies will become "personalised, tailor-made and targeted; collaborative and networked; and informal and flexible". Communication is different from how it was in the past and many educators do not understand the impact that these changes can have on education (Siemens, 2006a). Siemens (2006b) states that connections, such as those possible through social networks, define learning and knowledge in today's digital age. Learners now "have the capacity to build their own networks and to form connections in a more organic, chaotic way than is possible in conventional education" (Education.au, 2009:1). Elearning 2.0, the articulation of the impact of web 2.0 on education, is linked to the interests of the learner, is an immersive approach of learning by doing, and occurs when web 2.0 technologies enable global connections and often within informal settings (Downes, 2005).

Social networking technologies provide a platform for informal learning (Pettenati and Cigognini, 2007). These social networks (virtual and face to face) "affect perceptions, beliefs and actions through a variety of structural mechanisms that are socially constructed by relations among entities" (Knoke and Yang, 2008:5). The network creates complex and dynamic interrelations that can be cooperative and competitive and can lead to change at macro and micro levels (Knoke and Yang, 2008). Our "connectivity is increasingly defining the personal and social landscape" (Rennie and Mason, 2004:35) and relationships for learning. This study is positioned within the context of web 2.0 and its impact on learning and teaching.

According to Siemens (2006a) there are several drivers that have led to the need for a new theory of learning. These include our understanding of learning through fields such as neuroscience, the pace of the growth of knowledge, the development of ubiquitous technologies, expectations of 'net generation'
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students, and the complexification of ideas and viewpoints. He proposes that considering these drivers for change, connectivism is better positioned as a theory of knowing and learning. "Connectivism is the view that knowledge and cognition are distributed across networks of people and technology and learning is the process of connecting, growing and navigating these networks" (Siemens and Tittenberger, 2009:11). This theory combines ideas relating to computer networks and web 2.0 with those of learning as a conversation occurring within meaningful collaborative contexts.

In his book "Knowing Knowledge" Siemens (2006b) articulated 9 principles of connectivism as outlined below. The principles are used as a framework for analysing teachers' beliefs about learning and teaching for this study.

• Learning and knowledge require diversity of opinions to present the whole…and to permit selection of best approach.
• Learning is a network formation process of connecting specialized nodes or information sources.
• Knowledge rests in networks.
• Knowledge may reside in non-human appliances, and learning is enabled/facilitated by technology
• Capacity to know more is more critical than what is currently known.
• Learning and knowing are constant, on going processes (not end states or products).
• Ability to see connections and recognize patterns and make sense between fields, ideas, and concepts is the core skill for individuals today.
• Currency (accurate, up-to-date knowledge) is the intent of all connectivist learning activities.
• Decision-making is learning. Choosing what to learn and the meaning of incoming information is 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. (p. 31)

The theory is not without its critics. Bloggers such as Bill Kerr (2006) question the integrity of Siemens’ work saying that it too easily dismisses the work and influence of other learning theorists and the role that technologies have played in determining these theories. In his 2004 article "Connectivism: A Learning Theory for a Digital Age", Siemens attacks the theory of constructivism from what Kerr describes as a shallow understanding of what constructivism is. Verhagen (2006) also critiqued the theory of connectivism, labeling it a pedagogical view and a philosophy rather than a learning theory. To be a learning theory, he argues, the focus should be at the curriculum level and identify what is learned and why. This interpretation is in contrast to the ideas and principles that are central to connectivism. Siemens (2006a) acknowledges that personal epistemology influences how the connectivist principles are interpreted and argues that learning theories and how they are classified can often be contradictory. He then analyses and compares connectivism with other learning theories and positions each within a theoretical and historical context. It could be argued that knowledge is more complex than cognitive models acknowledge (Downes, 2006). Knowledge is neither stored in the brain nor within the network but it is a recognition of patterns within a set of events. Learning is the process of making meaning within this context (Downes, 2006).

As yet there are limited examples of research that make links between the theory of connectivism and its practical application. Pettenati and Cigognini (2007) applied the ideas of connectivism to formal, non-formal and informal learning through the use of web 2.0 tools (social networking and a personal learning environment) within a higher education context. They devised a 'knowledge flow model' that attempted to link the connectivist theory to practical learning stages. In their model there are five enabling conditions, namely, basic skills, generation and support to motivation, meaning perception, group culture, and social climate. These conditions support 4 stages of the learning experience that are 1) awareness and receptivity; 2) connection forming and selection filtering; 3) contribution and involvement; and 4) reflection and metacognition. While providing a possible model for the practical implementation of connectivist approaches and a speculative example for formal education, they do not make direct links to existing practices.

There is a need for research that identifies the impacts of connectivism on practice in the context of teacher and student learning. This exploratory research project investigates possibilities for adapting learning and teaching to be more aligned to connectivist principles through examining the relationship between those principles and teacher practice. It aims to examine the degree to which connected
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Method

An online survey was developed to examine the degree to which teachers value the principles of connectivism (Siemens, 2006b), whether they apply these principles to student learning, and what they believe constitutes connected practice. From each of the nine principles from Siemens (2006b) a statement relating to teacher learning and a statement relating to teachers' work with students were created. Each statement was matched to a 5 point Likert scale (from strongly agree to strongly disagree). Two open-ended questions were also included for respondents to share the practices and tools that they use to support both their own professional learning and in their work with students. Questions to gather demographic information for location, students taught and teaching experience were included.

Because the research was intended to explore the practices of connected teachers related to connectivist principles, participants were recruited from the researcher’s Professional Learning Network (PLN). Messages with a link to the survey and inviting participation were posted to Twitter, Facebook, Yammer and selected Ning communities using private and public channels. Recipients were encouraged to share the message and link with their own networks.

The online survey was administered using a Google Form and was left open for a period of 5 days. At the conclusion of the survey period the data were downloaded and transferred to SPSS for analysis.

Results

The survey recorded 65 responses. A majority of the responses were from Australian teachers (47) but responses also came from New Zealand (7), USA (5), UK (2), Thailand (1), Canada (1), Korea (1), and Guatemala (1). The participants taught students from all levels of K-12 education, tertiary and teacher education with a diverse range of teaching experience from beginner to greater than 30 years.

The Likert scale questions relating to the principles of connectivism scored a Cronbach's Alpha of .909 indicating that the scale has high internal consistency. Ratings of the scale were converted into numeric values (5 = strongly agree, 1= strongly disagree) for basic statistical analysis within the SPSS program. The median value for all questions was between 4 and 5 indicating that most educators who completed the survey agreed or strongly agreed. For seven of the questions the median was 5, indicating that more than half of the respondents selected strongly agree.

Questions were paired (teacher-focused with student-focused) for each principle. Principle 2 appears twice as there were 2 student statements and 1 teacher statement for this principle. Means were compared for each principle as displayed in Figure 2. The mean teacher-focused ratings were higher than the student-focused ratings for all principles except for principle 9.
Figure 2. *Comparison of Means for Teacher-focused and Student-focused Questions*

Mean values for the pairs were also compared through a t-test to determine if there was significant difference between teacher and student-focused results (Table 3). The pairs for principles 5 and 9 were not significantly different but all the others were (p < .01) with teachers rating the application to their own learning higher than their work with students.

### Table 3 - Mean comparisons Teacher-focused to Student-focused items (N = ?)

<table>
<thead>
<tr>
<th>Principle</th>
<th>Teacher-focused (T) and Student-focused (S) items</th>
<th>Teacher Mean</th>
<th>Student Mean</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
</table>
| 1         | T: I learn and acquire new knowledge through a diversity of opinions and sources so that I can select what I believe to be the best approaches or ideas  
S: I support students to engage with and form connections with people and information with diverse opinions | 4.67         | 4.36         | 3.420 | .001  |
| 2a        | T: I learn through the process of creating new connections with other people and information  
S: I support students in the process of making connections with others | 4.68         | 4.38         | 3.260 | .002  |
| 2b        | T: I learn through the process of creating new connections with other people and information  
S: As part of their learning, my students value their connections with others and ideas | 4.68         | 3.92         | 7.164 | <.001 |
| 3         | T: Knowledge is contained within and created through the networks I'm part of  
S: I help my students to understand that knowledge can exist because of the network it resides in | 4.38         | 3.91         | 4.103 | <.001 |
| 4         | T: I use technologies that enable learning through connecting with others and information  
S: My students use technologies that help them connect with others and information | 4.61         | 4.26         | 3.136 | .003  |
| 5         | T: I value the processes and potential for knowledge creation or connections more than specific knowledge or content  
S: I help my students to value the processes of locating and creating knowledge rather than learning specific content | 4.22         | 4.17         | .490  | .626  |
| 6         | T: My learning and knowledge are fluid and changing rather than fixed  
S: My students value knowing and learning as constant and ongoing rather than viewing assessment items as the end product of learning | 4.62         | 3.60         | 8.002 | <.001 |
| 7         | T: I value seeing connections and patterns between ideas, concepts and people as a core skill  
S: I foster my students' skills in identifying connections and patterns between ideas, concepts and people | 4.63         | 4.18         | 4.792 | <.001 |
| 8         | T: Through the connections I have for my learning I am able to stay current with knowledge and ideas  
S: My students use the connections they have for their learning I am able to stay current with knowledge and ideas | 4.65         | 3.82         | 7.975 | <.001 |
| 9         | T: I make decisions as part of learning and my choices differ due to ever-changing knowledge  
S: I support students in developing decision making skills as integral to their learning | 4.42         | 4.47         | -5.54 | .598  |

Principles 2b, 6 and 8 showed the most difference between teacher and student means. The student-focused items for these principles were all prefaced with "My students" indicating a focus on student values or action in the learning process rather than that of the teacher. Individual graphs for these items are shown in Figures 3, 4 and 5.
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Figure 3- Graph of Responses for Principle 2(b)

Figure 4 - Graph of Responses for Principle 6

Figure 5 - Item Graphs for Principle 8
The two open-ended questions in the survey were:

- Provide an example of your own learning that has occurred through being part of a professional learning network. How does your learning occur through connected networks?
- Describe how you support students to connect their learning to a network of people, places, tools and ideas. How do you support students to learn through connected networks?

The learning processes and issues mentioned in the responses to these questions are summarised in Table 4. Processes common to descriptions of both teacher and student learning are shown in bold. Teachers had a more diverse range of activities to share relating to their own learning. There were more issues identified for practice with student learning than for teacher learning.

**Table 4 - Summary of Open-Ended Responses**

<table>
<thead>
<tr>
<th>Processes</th>
<th>Teacher-focused</th>
<th>Student-focused</th>
</tr>
</thead>
<tbody>
<tr>
<td>ask questions</td>
<td>• professional reflection</td>
<td>• share and celebrate learning locally and globally</td>
</tr>
<tr>
<td>• exposure to and collection of ideas for practice</td>
<td>• apply ideas to practice</td>
<td>• comments and questions from parents and community</td>
</tr>
<tr>
<td>• participate in professional learning</td>
<td>• support learning</td>
<td>• explore</td>
</tr>
<tr>
<td>• support assessment</td>
<td>• engage in conversation</td>
<td>• create</td>
</tr>
<tr>
<td>• exposure to different opinions, pedagogies, learning and ways of thinking</td>
<td>• learn about technologies</td>
<td>• value opinions and form their own</td>
</tr>
<tr>
<td>• gather ideas, inspiration, resources share ideas, wisdom and experiences</td>
<td>• support for student learning (eg. commenting on blogs of other classes)</td>
<td>• share products of learning</td>
</tr>
<tr>
<td>• collaborate</td>
<td>• spontaneous learning</td>
<td>• collaborate</td>
</tr>
<tr>
<td>• receive feedback</td>
<td>• create and maintain professional connections</td>
<td>• independent learning</td>
</tr>
<tr>
<td>• spontaneous learning</td>
<td>• socialise</td>
<td>• contribute</td>
</tr>
<tr>
<td>• create and maintain professional connections</td>
<td>• gather evidence for a need to change practices</td>
<td>• construct new ideas</td>
</tr>
<tr>
<td>• socialise</td>
<td>• provide links and resources</td>
<td>• challenge alternative conceptions</td>
</tr>
<tr>
<td>• gather evidence for a need to change practices</td>
<td>• introduce tools</td>
<td>• provide and respond to feedback</td>
</tr>
<tr>
<td>• provide links and resources</td>
<td>• build awareness of networks</td>
<td>• engage in dialogue/conversation</td>
</tr>
<tr>
<td>• introduce tools</td>
<td>• teach concepts and impact of tools</td>
<td>• socialise</td>
</tr>
<tr>
<td>• build awareness of networks</td>
<td>• questioning</td>
<td>• reflection</td>
</tr>
<tr>
<td>• teach concepts and impact of tools</td>
<td>• modeling network participation</td>
<td>• research</td>
</tr>
<tr>
<td>• questioning</td>
<td>• provide information</td>
<td>• link current and ongoing learning</td>
</tr>
<tr>
<td>• modeling network participation</td>
<td>• share beyond course confines</td>
<td>• just-in-time learning</td>
</tr>
<tr>
<td>• provide information</td>
<td>• provide options and support student choice</td>
<td>• building community</td>
</tr>
<tr>
<td>• share beyond course confines</td>
<td>• model and scaffold risk taking</td>
<td>• create connections beyond the classroom</td>
</tr>
<tr>
<td>• provide options and support student choice</td>
<td></td>
<td>• take risks</td>
</tr>
<tr>
<td>• model and scaffold risk taking</td>
<td></td>
<td>• enter new environments</td>
</tr>
</tbody>
</table>

| Issues/ Benefits                                                          |                                                                 |                                                                                     |
| being part of a PLN                                                       | • teachers need to understand how to create networks                   | • prescriptive teaching programs restrict ability to be collaborative              |
| international connections                                                 | • can be risky and difficult to connect beyond the classroom environment | • can be risky and difficult to connect beyond the classroom environment          |
|                                                                                | • blending of socialisation and learning                                 | • blending of socialisation and learning                                           |
|                                                                                | • students focus more on assessment criteria than life long learning - only do what they have to | • students focus more on assessment criteria than life long learning - only do what they have to |
|                                                                                | • motivation is to satisfy the teacher and students don’t naturally explore on their own | • motivation is to satisfy the teacher and students don’t naturally explore on their own |
Discussion

While several points for further discussion were identified through this study, it is not possible to address them also in detail in this report. The following areas were key issues or point for discussion and will be the focus of this section:

- the nature of assessment
- the tension between content and connections
- differences teacher and student learning
- the place and value of web 2.0 in learning
- methodological issues
- suggestions for further research

Assessment

To sustain connected learning we need to value critical skills and create different assessment methods; teachers should enable "learning rather than delivering or directing it" (Rennie and Mason, 2004:43). Changes in pedagogy require changes in assessment and curriculum (Redeck et al., 2011). The responses to the open-ended survey questions identify a concern about the relevance of current assessment methods to a connected approach to learning. Participants suggested that structures for assessment could be on 21st Century skills such as those by Jenkins et al. (2006), the Partnership for 21 Century Skills (2007) and ISTE (2007). Siemens (2006b) also recommends skills that could be used to define what it means to be multi-literate. These skills frameworks could be reviewed and linked to the connectivist principles to determine more meaningful assessment structures.

These changes would have implications for how students view learning and assessment practices. The student-focused statement for Principle 6, learning is constant, received the most disagree and strongly disagree responses (see Figure 4). This indicates that 11 of the teachers surveyed believed their students viewed assessment as only the 'end product' of learning. One of the participants identified that how students viewed learning was an issue that prevented connected learning practices. Rennie and Mason (2004) believe that students need support to shift their learning practices from traditional to connected models. Any changes to assessment processes should consider how to encourage students to value these new methods.

Content vs Connections

Traditionally content is prescribed to learners by a learning institution. When learning is viewed from a connectivist perspective, "the concepts of what it is to know and what it is to teach are different from the traditional theories that dominate" education (Downes, 2006). Learning is not simply the transfer of content. Content is accessed through a learner’s connections rather than as part of a defined process of knowledge building. Content "is used rather than read" and created by students (not just teachers) within a structure that resembles a conversation and not a course program (Downes, 2006). Learning occurs through the process of making connections to content and to other ‘nodes’. Within these networks "the role of teaching is one of guiding, directing and curating the quality of networks learners are forming" (Siemens and Tittenberger, 2009:13).

The participants in the survey rated the teacher-focused statement for Principle 5 (I value the processes and potential for knowledge creation or connections more than specific knowledge or content) lower than the other statements (See Figure 2), this could indicate that placing more importance on connections than on content could be a point of contention for some of the teachers. However, the mean for this item was still greater than 4 and the response patterns for this mirrored those with a student-focus. A larger and more diverse sampling of teachers could be used to investigate this possibility further.

Differences in Teacher Learning and Student Learning

The results indicate that teachers apply the principles more in their own practice than in their work with students. This could be influenced by several factors such as familiarity with a learning process or tool before using it with students, a greater emphasis on informal learning for teacher learning, or...
constraints placed on connectivist approaches within a traditional education setting. The significant difference in teacher and student results for Principles 2b (network formation), 6 (learning is constant) and 8 (currency of knowledge) could be because these principles are more difficult to put into practice, not currently valued within educational settings or are difficult for teachers to know whether they are valued and applied by students. Wording could have been a factor that led to lower student-focused responses as these statements all began with "my students value" or "my students use". Further research would need to be conducted to determine the attributing factors to the differences in responses.

The Place and Value of Web 2.0 in Learning

Teachers provided a variety of examples of web 2.0 tools and collaborative processes in their responses to the open-ended questions. From the tools indicated it could be said that social tools were more commonly used by teachers and tools for creating were more commonly used by students, although teachers were not required to list all the tools that they use. The impact of web 2.0 tools on learning may be more dependent on teacher pedagogy and understanding than the tools themselves. Siemens and Tittenberger (2009) agree that a certain mindset is required to teach with technology in a connectivist manner. This includes being open to experimentation, co-creation with students, letting go of control and accepting failure.

Methodological Issues

The methods used in this study present a few concerns. Firstly, the survey questions could be improved by applying consistent wording and reverse coding some statements to avoid participants applying the same answer to each item. The wording of student questions was inconsistent as some items began with "I support" and others with "My students". There is a difference between teachers making assumptions about what students value and do as opposed to stating whether or not teachers apply a principle in their pedagogical practice.

Secondly, there are issues with the distribution methods and the sample that participated. Twitter seemed to remain the main network used for spreading the survey through professional networks of teachers, although it is difficult to trace the invitations as they may also have occurred on other networks and through private channels. This sampling approach could be labeled as haphazard and it is therefore not appropriate to generalise these results to a wider population. If applied to other studies, a modified survey could be distributed to a targeted group of educators that are a more representative sample of educators in general or targeted to a specific educational context (eg. Primary School).

Suggestions for Further Research

While more analysis could be done with the data collected in this study, the relevance of connectivist approaches could be investigated in other ways. A more detailed analysis of the impact of connectivism at a practical classroom level could use an existing class or network as a case for an ethnographic study that incorporates the use of methods such as social network analysis (as outlined by Knoke and Yang, 2008) for collecting and analysing data. This would be a way of identifying relationships and patterns that occur within a connected learning network with potential for documenting the complex interactions that take place and how they present as a practical implementation of connectivism. This study identified there is an issue with regard to how schools, teachers and learners could transition toward more connectivist practices and this area is recommended for future studies.

Conclusion

This small-scale research project investigated the relationship between the principles of connectivism and teacher practice. It identified that teachers were more likely to apply these principles in their own learning and the change to more connectivist approaches presents some issues. Rennie and Mason (2004) argued that while traditional teaching needs to change, this would be more of an evolution than a revolution. Establishing a connectivist future for education will require experimentation, risk taking
and reflection on the needs of learners with consideration of the society in which they are co-constructing (Siemens and Tittenberger, 2009; Redecker et al., 2011). There are implications for classroom practice during this period of experimentation. Greater focus would need to be placed on connectivist approaches to learning and modeling this to students. Assessment methods and practices would need to be reconsidered and there is also a need to create and share examples of practice to support teacher growth. Schools could support this transition through opportunities and scaffolds for highly reflective professional learning that enables teachers to experience the 'power of connections' for their own learning and to develop a connected mindset. Initiatives that involve the use of web 2.0 tools should have a clear purpose and be aligned to the values inherent in the principles of connectivism. Further research is required to make practical links to the theory of connectivism and to assist teachers and students in co-creating the future of learning.

References


