Connectivism and the Impact of Web 2.0 Technologies on Education

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ABSTRACT :

Educational learning theories like behaviorism, cognitivism and constructivism have shaped all forms of educational instructions in the twentieth century. These theories have their focus on classroom teaching and teacher-pupil (one to one or one to many) relationships and have served education well until now. With the proliferation of Web 2.0 tools in education, there is a need to understand how our classrooms have been transformed and revisit these underpinning learning theories in an attempt to understand our learners. In the twenty first century where the online era of education is increasing rapidly, the new proposed learning theory like connectivism, must be studied to depict if it can be used in learning and teaching, as it deals with trends in learning, the use of technology and networks, and the diminishing life-span of knowledge. This paper discusses connectivism and analyses its impact on learning and the Web 2.0 technologies on education. The results of a study on student's attitudes towards learning are also given. These discussions are important to understand how our classrooms and teaching and learning systems will evolve in the future.

1. INTRODUCTION :

Learning can be described as a process of acquiring knowledge which can be used in a productive manner for the good of society. Research into the process of learning has spawned many models, (Ertmer & Newby, 1993) namely, behaviorism, cognitivism and constructivism. Behavioral systems view the process as one of reflexive and inbuilt into the core and are based on observable changes in behavior – the focus is on new behavioral pattern being repeated until it becomes inert. Cognitive models view the same theme as one where the teacher supervises the learning processes and participates in it by actively understanding where the learners are and need to be at every stage. This helps in guided learning. Constructivist models are unsupervised and rely on the user to learn from the knowledge available. The onus is

placed on the users to construct knowledge. This is perhaps similar to the theories of learning propounded in Artificial Intelligence where the terms reinforcement, supervised and unsupervised learning are used. At the core of the processes mentioned above is the fact that knowledge is an entity to be acquired by means of a formal process.

In 2004 George Siemens advocated the inadequacies of traditional and current theoretical models of learning such as behaviorism, cognitivism and constructivism, and denounced their limitations. In his article "Connectivism: A Learning Theory for the Digital Age", Siemens (2004) characterizes connectivism as the "amplification of learning, knowledge and understanding through the extension of a personal network". One aspect of connectivism is the use of a network with nodes and connections as the

central metaphor for learning. In this metaphor he are not all equal in strength in this metaphor as many connections may be quite weak. (Kerr, 2006).

The following is an excerpt from Siemens seminal paper on connectivism: "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 knowledge." (Siemens, 2004, p. 5).

How to do things and what to do in Siemens theory are supplemented by knowing where to find the knowledge when it is required and meta-learning is becoming just as important as the learning itself. In the article "Connectivism : Learning Theory of Positive of the Self-Amused?" in response largely to criticism by Verhagen (2006), Siemens (2006) cites what he concluded within 2004 to substantiate his views on connectivism. He states "The pipe is more important than the content within the pipe. Our ability to learn what we used for tomorrow is more important that what we know today. A real challenge for any learning theory is to actuate known knowledge at the point of application. When knowledge, however, is needed, but not known, the ability to plug into sources to meet the requirements becomes a vital skill. Connectivism presents a model of learning that acknowledges the tectonic shifts in society where learning is no longer an internal, individualistic activity." (Siemens, 2004, p. 7).

Clearly, connectivism is a twenty-first century concept and term and from 2004 to present there have been many intellectual critiques as to whether it can be considered a learning theory (Siemens, 2006 & Downes, 2007), a pedagogy or an epistemology framework. Verhagen (2006) stated that connectivism is not a new theory

of learning but rather a pedagogical view on education with the apparent underlying philosophy that pupils from an early age need to create connections with the world beyond the school in order to develop the networking skills that will allow them to manage their knowledge effectively and efficiently in the information society. He argues that what knowledge the pupils need to have and what knowledge can remain distributed elsewhere or should be developed elsewhere is an issue which the pupils themselves will have an active voice. Verhagen also looked at Siemens principle of learning and learning objects. The principles that "learning may reside in non-human appliances" and learning defined as "actionable knowledge" that can "reside outside of ourselves (within an organization or a database)" is remarkable but has been with man through the ages. Siemens, Verhagen stresses, connectivism questions should be placed at the curriculum level and not at the instructional level. Learning has always been defined as a result, not as a process. Verhagen believes that if we take this definition of learning then it is trivial. He thus believes that connectivism remains unsubstantiated philosophizing.

Kop & Hill (2008) in their article, "Connectivism: learning theory of the future or vestige of the part?" also commented on if connectivism is a learning theory or an epistemological framework of learning. Siemens (2008) builds on the work of Driscoll, who categorized learning into three epistemological frameworks, and adds his own. The three frameworks are objectivism (related to behaviorism), pragmatism (related to cognitivism) and interpretivism related to constructivism). The fourth is distributed knowledge which is related to connectivism. They concluded that perhaps with Downes (2006) theory of distributed knowledge the rules of the game (deciding what is and is not a learning theory) has not yet fully extended away from the philosophical domain into that of applied educational research and hopes that Siemens connectivism model is a ripe training ground for further studies. Kop & Hill, however, see connectivism as an emerging epistemology framework, and not

as a new learning theory. They agree though that connectivism is playing an important role in education where control is moving from the tutor/teacher to an increasingly more autonomous learner.

Kerr (2006) asserts that the connection between internal and external knowledge environments was conveyed by Vygotsky's (1994) formulation of social constructivism, long before any elucidation was provided by connectivism. He further suggest that Papert (1991) theory of constructionism, (which contends that learning occurs through learner's engaging in creative experimentation and activity), and Clark (1997) theory of embodied cognition (which argues that the scaffolding provided by language and objects to think with is a mutual interaction between mind brain and the environment) are the basis of connectivism and have been developed before. Kerr (2007b) indicated that no theory, including the connectivist model, adequately explains higher order thinking "as a mechanism spanning brain, perception and environment." He further challenges connectivism to somehow explain "transferring understanding, making understanding and building understanding", and the internal processes that may lead to "deep thinking and creating understanding."

Siemens proposed learning theory, connectivism, can be viewed as a paradigm shift in educational theory. It has been met with fierce criticisms, and rightly so. It seems more like an emerging epistemology framework or even a learning modality or an up-and-coming pedagogy of learning. The importance of networks in connectivism cannot be easily dismissed, but networks have not changed learning to the place where our contemporaries will throw away all of the established learning theories and simply replace them with a brand new one. Beyond a doubt, connectivism has played a major role in providing e-learning practitioners and educators with tools which has changed the classroom permanently in terms of instruction and learning. To facilitate connections within the ecology of connectivism tools such as blogs, wikis, groupware, collaboration tools, connection-

forming tools (Skype, phone, email, face-to-face), and social networks have been developed. Sims (2008) also states that many thousands of papers have been devoted to computers and learning over the past thirty years and have continued even today and that almost all are focused on some aspect of online or e-learning. Thus Siemens proposed learning theory is the sum of the work done by his predecessors in their bid to bring e-learning concepts in and out of the classroom as beneficial to both learners and instructors, using instructional designers as the vehicle to spearhead this attack. The lack or absence of monies to create such an environment for all throughout the globe is also a crucial setback for connectivism. If this barrier could be broken and replaced by the hardware and software to all then the derivatives of connectivism could be universally felt via Web 2.0 and their ever growing list of OERs such as wikis, blogs, Facebook and YouTube. The easy access to information when someone needs it cannot make connectives a new learning theory neither does it define how individual learn. The existing learning theories rightly characterize how we ascertain, gain knowledge and understand what is being taught or how we assimilate things – even with the assistance of the concept of connectivism.

Connectivism is the integration of principles explored by chaos, network, complexity and self-organization theories. Learning then becomes a process that occurs within nebulous environments of shifting core elements – not entirely under the control of the individual, and can be defined as actionable knowledge and can reside outside of ourselves, within an organization or a database. Learning becomes 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).

One of the premises for connectivism (Downes, 2007) is that the knowledge is present in a network of connections. The process of learning lies in the ability to construct and traverse these networks.

- Why : Knowledge is not in a particular place. But in a network of connections. Hence new methods of learning are needed.
- What : Knowledge is not an entity – but meaningful patterns among distributed sets of information. What to learn is related to the meaning of the content and the context.
- Where : Identify where to find the knowledge
- How : Learn how to form the connections between the knowledge.

The answer to what, where and how forms the new process of "learning". The key of this process is that learning can take place at many different junctions and informally. Why is this important? This is important because of the externalization of the location of knowledge. There is no need to learn (and store) everything. Learners need what is essential and more importantly the ability to access new knowledge (from the network) and organize it. The most important property is *know how* rather than *know what*. Ryan (2009) has suggested that connectivism is a logical evolution from instructivism and constructivism in the new era of web 2.0.

One of the crucial aspects of knowledge itself is Distributive knowledge (Downes, 2007). Connectivism decries the proposition based approaches and instead espouses the cause of distributive knowledge. Semantic netlike structures not only add more meaning, but also provide the crucial context based elements. In a learning context, these structures can help provide wonderful visual, connected representations. Thus, the process of learning is defined as the teacher helping the student find the right network of knowledge and assisting with connecting the knowledge. The learning is a network phenomenon aided by collaborative socialization and technology. Knowledge then becomes literally the set of connections formed by actions and experiences. It follows that connections are formed naturally, through a process of association, and are not 'constructed' through some sort of intentional action. Learning can then be viewed as informal and teachers become facilitators and students adapted to the new

name of learners. It becomes quite easy for learners to think outside the box and be a part of the progression themselves, instead of being a stationary, listless and non-contributing entity.

In connectivism there is no real concept of transferring knowledge, making knowledge, or building knowledge as in the formal traditional classroom. Instead connectivism emphasizes cognitive development. Instead, the teachers as facilitators support the students as learners in analyzing a variety of knowledge, form their own connections, incorporate their own ideas and validate the knowledge. What becomes the role of technology? Technology helps provide the knowledge sources, helps us extend our processes of sifting through the knowledge and organize the information. What is the role of the memory? The memory is helping to handle the adaptive patterns. It is representative of the current state existing in networks. The current state is more dependent on the context.

It is noteworthy that the connectivism theories have been challenged by various researchers like Kerr (2006) and Hagen (2006). Their viewpoints relate to whether Connectivism is really a learning theory? If so, in what ways can this be applied in learning? Have the important parts of Connectivism already been covered by earlier thinkers such as Papert, Bruner and Vygotsky. Is connectivism a pedagogical view of learning? Can learning reside in non-human appliances?

Some of the criticism is answered by Siemens (2006). In his view, the theories of learning need to adapt to the changing dynamics of the workforce and the technological resources. Connectivism as a theory can address these needs and be relevant and also help bring together many theories from different backgrounds and perspectives.

The fundamental ingredient for the future of education is how to instill this process in a teaching session. In engineering software design, the process is distilled into the designers at a very early age. The fundamental object to note is that the developer does not know everything and are

not needed to know. What they do need is the ability to work as a team bringing out the best skills of every contributor. In such a case, the knowledge that a new member acquires is in the network. The network of team-member processes and systems provide the knowledge. Thus developers who work in different time zones learn many aspects on the job and in a real-time - manner. When such workers who work onsite need some specific knowledge or skill, to solve a new problem, they use the network as a resource. The network may be an entity, people or a process. And this is welcomed development to organizations. When employees at a major leading software company were asked to name their biggest friend, they replied that it was Google, the search engine. It is important to note and mindboggling to consider that with the amount of questions being asked on search engines and responses given, what the world was like before their existence and what it will be without them.

While this process is called Scaffolding in a more conventional language, the secret lies in the network. The network enables a process of learning and is not limited to a single paradigm. Hence, calling the process 'connectivism' is not just symbolic, but needs a whole range of processes that need to be put in place to simulate and help the learner. While this software engineering process has been in vogue for a long time, it has not been called connectivism. These practices provide a very important resource for connectivism.

In our view, the biggest challenge that connectivism will encounter is in placing the practice in the context of learning across multiple disciplines. Not just 'web' based technologies, but in all aspects of learning (Kop & Hill, 2008).

2. METHODS :

The major aspects of the Web 2.0 (Reilly, 2005) environment are the architecture of participation and services, software above the level of a single device, and harnessing collective intelligence. These aspects are also tied in with the characteristics of the learners. The network - the core of connectivism - has evolved by leaps and bounds, especially with the proliferation of the Web 2.0 technologies. Blogs, wikis and twitters are accepted as a way for learners and teachers to collaborate and communicate freely and at any time. Learning management systems are the norm for all the stakeholders in education and where learning is taking place. The network largely fueled by the internet has become the glue for helping the students to learn.

What web 2.0 technologies all have in common is the term 'community'. A community (Sugumaran & Shriram, 2009) is composed of users, a shared purpose and communication systems that enable access to the community. Community services enable users who share common interests to join together in a closed user group (*community*), and have the means to communicate with each other, interact among each other via chat, whiteboards, or messaging services. The main terms are shared interests, communication ability and paradigms of interaction.

In the evolution of communities it has been predicted (Sugumaran & Shriram, 2009) that our notions of communities have changed from being neighbourhood communities (Figure 1) to global unconnected and asynchronous entities without any personal interaction or attachments. For example the earliest mailing list SF-LISTS (science fiction lists, a version of mailing lists in the 1970s) was mediated by computers but largely in a closed community.

With the newsgroups (Stanoevska-Slabeva & Schmid, 2000), the mode of interaction was mainly one-to-one. This particular technology intervention can be traced back to the communications via telephones, desktops and two-way radios and so on, thus remaining as 'neighborhood' communities (Simões & Gouveia, 2008). During this period, the technologies like radio and television were the preferred medium of communicating with the learners in an educational context. One-to-many interactions was the norm. The classroom and the neighbourhood were the networks.
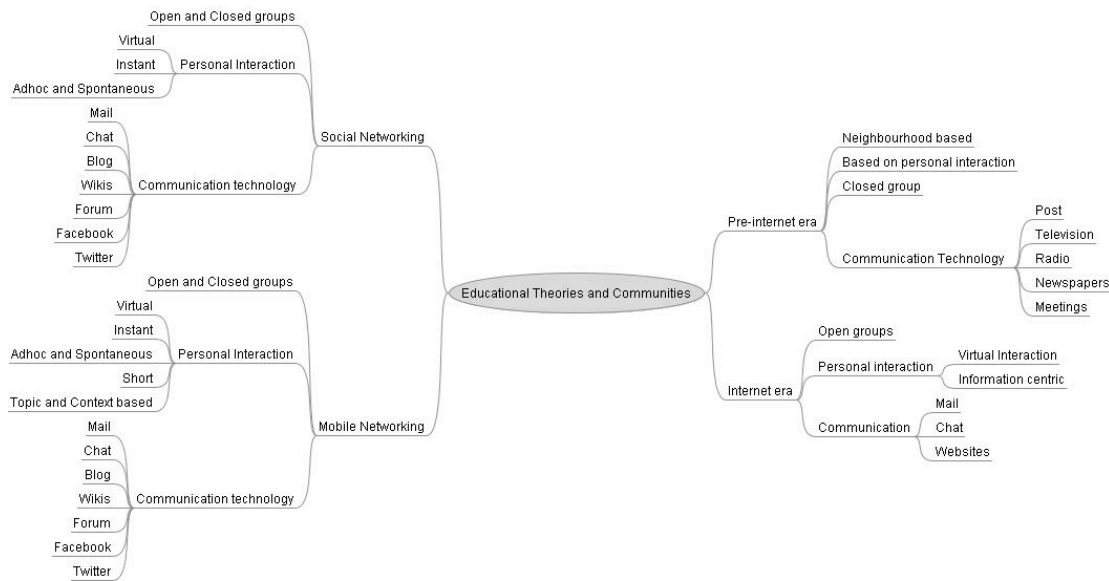
Figure 1 : Evolution of technologies for community networks

The period between the1980s to 1990s saw the advent of the internet which allowed widespread use of web portals based assistance adding visual interfaces, the trend of online communities, and various forms of communications software like instant messengers, chat tools, etc. This in turn creates the entire dynamics of electronic learning (e-learning) to develop and propagate. The internet dissolved the element of distance in personal communities and enabled communication between geographically distant people. This shifted the landscape in intensifying the personal communities and weakening the emphasis on neighborhood communities. However, the asynchronous nature of these interaction modes meant that the internet was considered as a support system to mediate community interaction and simulate -learning. While communications were globalized, they still remained one to one, thus, emphasizing 'networked' individualism. In terms of learning, the technology graduated into an important support element. The concepts of e-learning were in its infancy.

The period in the late 1990s and 2000s has seen the rise of audio and video internet streaming and provided a platform to social networking, practice based communities and applications like blogs and wikis, with the emphasis shifting to multiple interaction paradigms. The phenomenon also saw the intensification of ties posed by internet and perhaps removing the need for face-to-face interaction for learning. This meant that learning can be accomplished purely online.

In practice based communities, the interactions can be related to the single issue alone and may not necessitate any face-to-face contact. The transaction based communities also evolved posing revenue opportunities and web based business models in business-to-business and business to consumer paradigms. The scope for interaction in personal communities also expanded as the opportunistic and spontaneous interaction became more and more possible. The advent of social networking tools gave more scope for discovering the right people, and socializing. Hence, the role of the 'individual' networks produced a sea of changes, as communities could be formed over specific issues, have a short life span and not entail any personal interaction at all. This is perhaps the most crucial period.

A mobile community (Hillebrand et al., 2002) is a common interest based group

with the desire to be spontaneous, communicate and get information wireless at any place and anytime. The reason for the separation of the online community era and social networking era is that social networking and communities took off in a completely new resounding way after the advent of the web 2.0 era's wiki's, blogs and practice-based communities. While online or virtual communities have traditionally evolved as a way for people in a homogenous location to keep in touch, the social networking era allowed spontaneous interactions (often for very small periods of time) between completely different people to get in touch and form communities. Studies opine that by 2020, pervasive collaboration (anytime anywhere availability), context-based proactive anticipative technologies, people-centric and knowledge-focused social computing paradigms which are scalable, will be the future of collaborative environments (Ballersteros, 2006).

The evolution of mobile community networks with ubiquitous device support in the coming years will fuel a big paradigm shift in learning systems. It is this generation of learners and learning styles that are targeted by connectivism. The needs are anytime, anywhere access, using heterogeneous technologies. The social face-to-face networks may be weaker, but asynchronous and synchronous virtual communication is the norm. One of the key punch lines of connectivism is that we need to know the pipeline of the content, in other words, the know-how to access the quality content. In the next section, OERs are introduced and place in context of connectivism and the web 2.0 technologies.

3. RESULTS :

Educational software began by being machine dependant, inadequate and expensive. With the advent of the internet and speed of connectivity, availability and popularity came a gamete of web-based educational and training software. Then as learning resources were considered as major intellectual property and competitive

instruments, more and more institutions and individuals choose the path of making educational resources freely available on the Internet. The main idea or concept involved in open educational resources (http://oedb.org/blogs/wideopen/category/o pencourseware/) is that education could be greatly improved by making education resources freely, openly available and visible. The idea when harnessed with a strong and committed practice of reflection leads to a sustainable eco system (Liyoshi & Kumar, 2003). These open educational resources initiatives aim to ensure that course materials in different disciplines are available freely for teachers and learners. The important aspects are quality, organization and accessibility of educational resources. The initiative started with the MIT's Open Courseware project (http://en.wikipedia.org/wiki/MIT_OpenCo urseWare) in 2002. Over time the project has expanded in MIT, with material from over 1800 courses available online. The project has caught on in other Universities around the world. In India, the government started a scheme called NPTEL (National Programme on Technology Enhanced Learning) (http://nptel.iitm.ac.in/) to replicate the MIT's experience. Eight leading institutions (Indian Institutes of Technology and Indian Institute of Science) got together and pooled their resources to create and make available online over 100 courses.

The purpose of open educational resources is knowledge sharing and to ultimately get in touch with everyone. This is in line with the trend towards openness, namely, open source software. While courseware was definitely available internally in the Universities even before the OCW movement, the trend towards openness in the content ultimately changed the entire approach for the better all over the world. In the case of our context, the Indian Institutes of Technology, which are renowned institutions of learning in India, was able to reach out to the length and breadth of the country by the OCW movement.

The learning theory appropriate for this model from the perspective of instruction is

constructivism. Constructivism views each learner as unique with his or her own background knowledge. The individual learns through processes of assimilation and accommodation constructing the knowledge from their experiences. In this case as the learners are mostly individual learners, who incorporate or accommodate knowledge to their own experiential occurrences. It is also interesting to view the open educational resources as cognitive scaffolding (http://mfeldstein.com/itoe-comparing-two-opencourseware-styles/). Such cognitive scaffolding is an aid to the teacher to help a student achieve a goal which would be beyond his unassisted efforts. A computer, textbook, or laboratory materials may serve as proxy for a "teacher." Open educational resources can be viewed as a scaffold used by the teachers or learners for a specific task. In the case of a teacher or a learner, it could be with the goal of enhancing their knowledge about a particular topic.

If our teachers use connectivism, the same OERs will serve as the contents in the pipeline. The creation of the pipeline will be the job of the learners. In other words, OERs become a resource, but the major task is the discovery of the appropriate use and understanding of how to use this resource in the context of our own tasks. This conclusion is supported by the results of the open courseware project in MIT (http://oedb.org/blogs/wideopen/category/opencourseware/). Over 50 % of the learners were independent learners followed by students at 30% and finally educators 15%. This shows a high degree of independent thinking. This figure is also consistent with our own classroom experiences. A fairly high percentage of students and faculty with regular access to the internet have used some version of open courseware for their studies.

Open educational resources (OER) are becoming relevant due to the Web 2.0 technologies. The advent of blogs, wikis and social networking needs has opened accessible resources for learning. Most students today are very impatient in learning new skills and concepts and their insatiable search for knowledge on the internet and not in real libraries is testimony

to their experiences. The traditional concept of copyrighted resources is still valid in learning. But, the open educational resources have a vital role in augmenting the skills and development for practice based learning, especially for skill augmentation in a short period of time. Also, the OERs are vital in bridging the digital divide of learning resources. The sustainability of the initiatives is an important issue. In the Indian context, the authors of the books have, based on their experiences churned out textbooks in the respective domains. Thus the open courseware systems have been feeders for a broader ecosystem of knowledge creation. The participation in OER has given the authors visibility and a platform. While this is not true for all the authors, broadly this is the way to go. The other aspect of the initiative at least in India is the funding from the government.

For connectivism to be viable in the long run, teachers need to migrate to this recently discovered teaching and learning methodology (connectivism) where the network is the fundamental focal point. The network of resources and knowledge feeds are essential. The information used in connectivism through the concept of a pipeline will be the quality of content. By design, OERs are normally created after a rigorous process of validation and refinement. The process consists of running a complete course for one semester, testing the contents with students and then disseminating the resource to a wider audience. While this means that for a new course, the lapse in time e is large, the quality needs of the process mean that this is a necessary evil. Thus, the value aspect is remedied. In addition a team of capable individuals validated the handouts to verify that copyright and plagiarism issues were not breeched. This made certain that there are no problems in the future and in practice insured that these questions of owners of the content are adequately addressed. These processes guarantee that the pipeline is of a high quality.

In connectivism, the pipeline for information is very significant and imperative. These OERs and the OCWs are

the contents of the pipeline. Hence, once the pipeline is established, the leading and outstanding issue is the appropriate deployment of the teaching and learning processes. It is impossible to fathom a world today without the connectivism concept of a pipeline. It would resemble existing in a domain without search engines like Google, where questions cannot be freely asked and millions of options given to the respondents

4. DISCUSSION :

In the pre-internet age, the environment was closed and hence, students received most of their authentic information in formal traditional settings. Hence, the need to teach them how to use the informal environment was non-existent. Presently, there is wealth of complex information that there is a need to teach the learners how to disambiguate them. To us, connectivism is a step in this direction. For a connected user, the premise that the knowledge they need is the network will mean that they look for ways to access and leverage the unique experience of the various nodes. The learning will also be in establishing the nodes, aggregating the information and synthesizing it for use in a current context or in the context they are searching.

Unlike a community of practice, the users would connect to each other when needed. For the synchronous connection, a network is needed. The person could choose amongst the connections and networks to suit and improve the learning. Overall the emphasis is on the learner**.** The learners of today are increasingly digital natives. They are the children of the baby-boomers and are commonly known as generation Y and were born into and reared in technological inventions. "They have also learned how to navigate efficiently and effectively through information, how to communicate, and how to build effectively on a network of peers" (Rheingold, 2003). Connectivism is an appropriate and adequate model for such learners (Veen, 2005). Connectivism and its variants are already present in some form of teaching and learning presently, although

some (of these users) are oblivious to that fact. The research conducted consisted of approximately 150 respondents. The study's intentioned was to analyze these learners' attitudes toward the use of OERs in their learning encounters in the classroom. The respondents were queried using online surveys, face-to-face interviews and written questionnaire responses. The respondents are pursuing regular undergraduate Engineering face-to-face education classes and represent a cross section of the educated and connected students of today. The students participating in the survey belonged to all education levels (above average, average and poor academically) and from diverse backgrounds – rural, semi-urban and urban.

The first question in the study was to find the preferred mode of learning to students.

This result (Figure 2) validates a widely held view in education (Domizi, 2008) that students learnt more through the inter-student relationships in the class room than from the formal face to face teacher alone.

The next question tested the level of awareness about OERs.

This study found (Figure 3) that the students were very much aware about OERs and had used them in learning. For example, when we previously asked students to take a seminar/course for a particular class with specific prescribed content, this information to be presented would be exclusively found in a textbook or the teacher/lecturer notes. The teacher's noted are sometimes more than a decade old. There was little room or option (beside the physical library) to gather other information. This accounted for the class being teacher-centered. Now the students can access the web through the new generation Web 2.0 tools, contact other learners or educators, learn from others experiences through blogs, podcasts (via YouTube for example) and wikis and present their assignments with "rich" content. In this new framework the teacher/lecturer helps the students by showing them how to obtain authentic information and guiding them in the process. The students are free to explore and discover the web, and to build and share
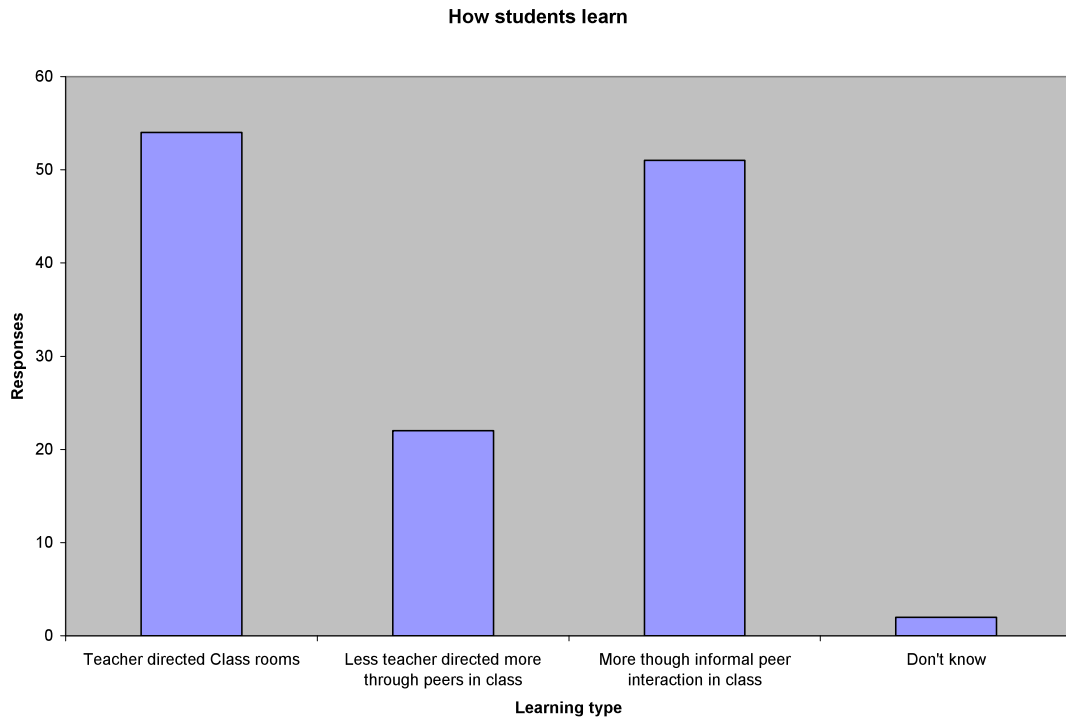
How students learn

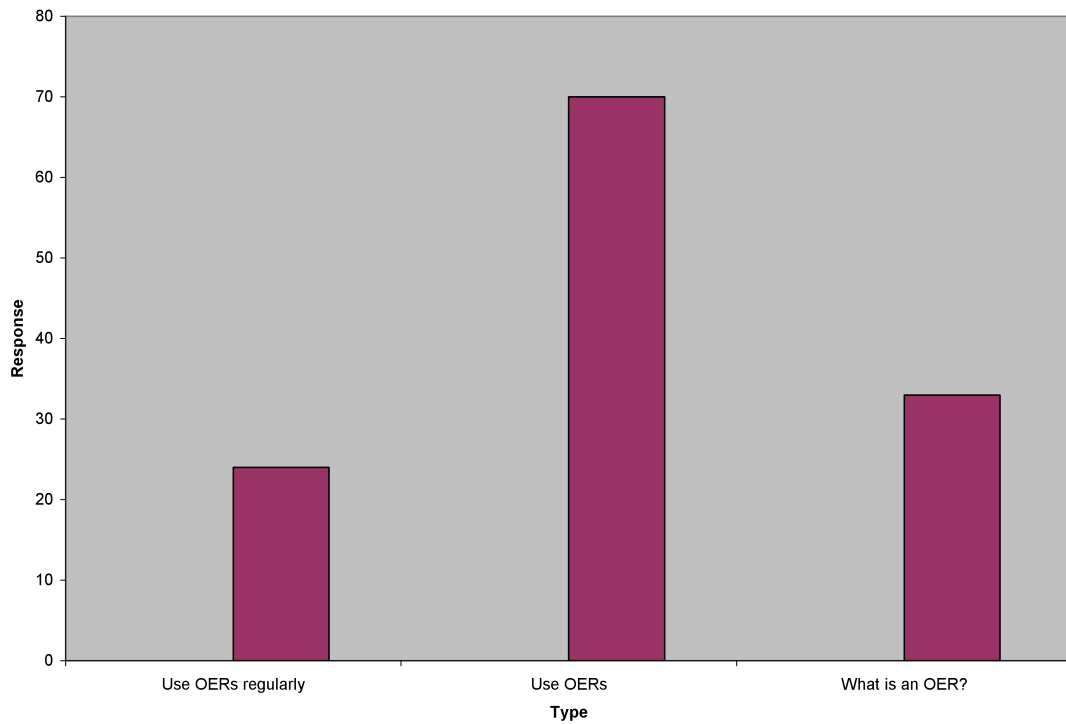Figure 2 : Student's preferred mode of learning

Figure 3 : Awareness about open educational resources

their knowledge. This is one example which illustrates what we are moving towards and in some countries and societies where they are moving to rapidly. The paths that the students take are different and personalized according to their own needs.

The preference levels (Figure 4) of student's to the learning was tested next.

It was found that an overwhelming number of students preferred informal learning models in their everyday life. This result is consistent with the overall present trend in learning we have witnessed. While these results are subjective, they show a pattern that emerges in educational systems. As the technology imbibes and enhances opportunities for informal education, educational models and learning theories must also keep pace. Thus the importance of connectivism as a learning theory and OERs become very critical.

Another aspect of connectivism which we have observed in practice is in the preparation for 'placement' activities. The students use a variety of tools for their own

purposes. There is no external evaluation mechanism. The validation is only in the success or failure in the interview sessions. Here too the learners can gain the help of technology from tutors or the community of students, usually a combination of both.

The third aspect is that increasingly, even in face to face education, universities and colleges are supplementing their education instruction by using Learning Management Systems (LMS) which support the technologies of web 2.0 (blogs, wikis and forums) in their core architectures. The idea was to attract the students to the portal of the course continuously by a mixture of formal and informal activities. This frequent interaction can over time help the students' own learning process.

In our universities, we have seen a tremendous explosion in the use of the web 2.0 technologies not only for fun, but learning. What we see is that increasingly large quantities of data are being uploaded and accessed. At the same time, we see that the process of traditional learning is limited
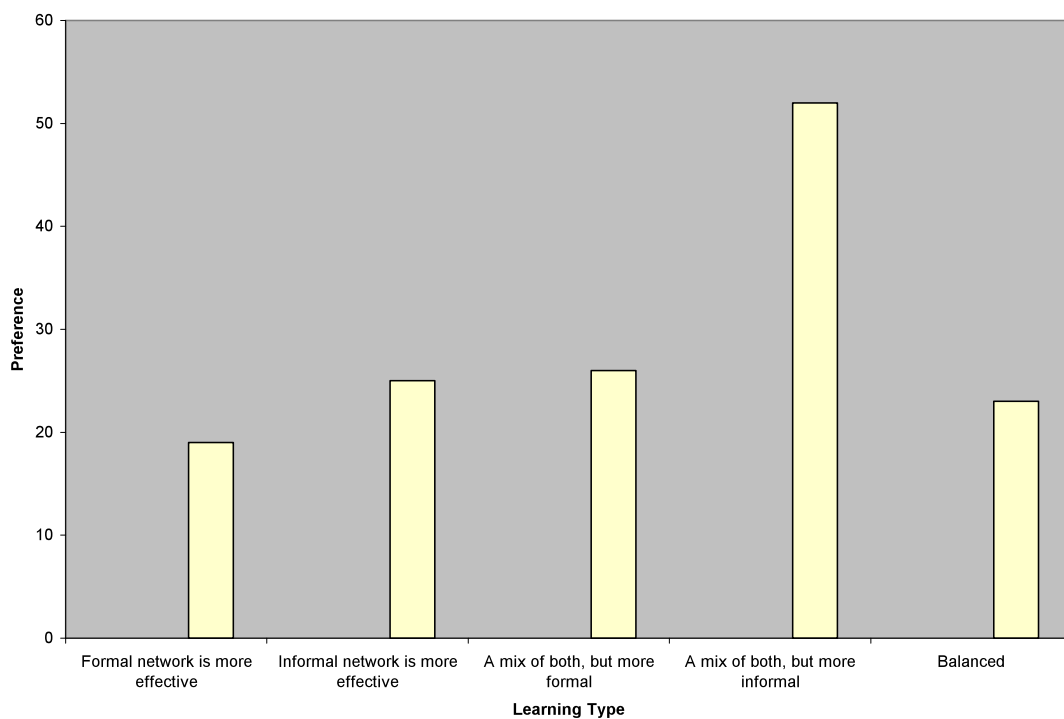

Figure 4 : Preferred learning model

to practice based activities, which are largely on the periphery of the education. Not yet integrated as an essential aspect in the teaching learning process.

Our study shows (Figure 5) that a majority of respondents felt that social networking tools can help in learning. While this represents a classical dilemma in respondents as the numbers for and against are fairly consistent, there exists a middle ground of students who firmly believe that applying web 2.0 tools like twitter, blogs and Facebook can help in the acquisition, dissemination and analysis of information and knowledge.

However, applying Connectivism and Web 2.0 technologies in practice is a non-trivial task. At the core is the fact that teachers must move away from the traditional blackboard, presentation apparatus like the over-head projector (and its refined invention – presentation software), lecture paradigm to networked teaching prototype. This was implemented in two experiments in class. In the first, the students were given a task "developing a video to explain how the internet works for students". The students were shown similar successful videos from You Tube. Also there was a healthy discussion on the structure and components of precursors. The students were encouraged to augment their knowledge from blog, and wiki postings. After a period of time, the video was developed by the students, which were very successful. The success was attributed to the network and the process.

In the same experiment, a session on what students must do for getting placed into certain collaborative groups was initiated. The web-based session had the students divided into different groups. These groups accessed the resources from the web and later discussed during a face-to-face classroom session. It was found that the depth of knowledge acquired from such a session was interestingly large. While not necessarily and entirely connectivism at work, these sessions were a step in this direction.
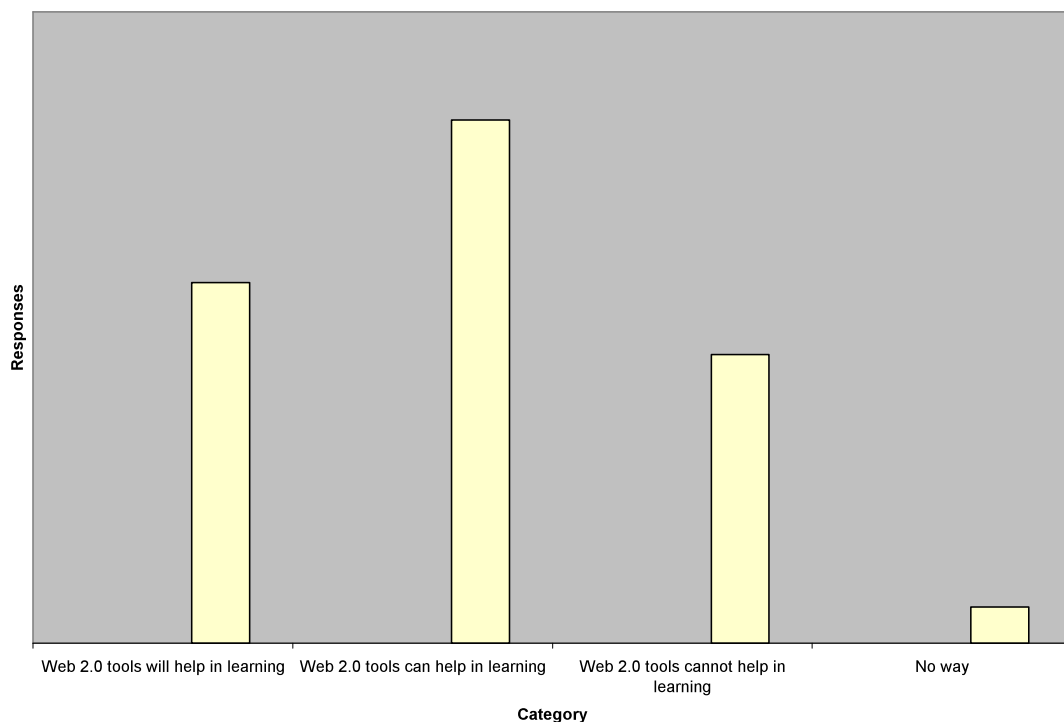

Figure 5 : Web 2.0 and learning

In the above cases, the connectivist paradigm is observed to swallow in learners' activities, whose purpose is the discovery itself and the correlated knowledge sharing, editing and creation due to the exploratory behavior. These cases need to be studied further and common practices developed before large-scale deployment of its findings are concretized and used as valid educational models.

5. CONCLUSION :

The future learning systems will consist of interconnected communities of interest, practice, and people. The offered content, in the form of Open Educational Resources, weblogs, wikis, podcasts and other Web 2.0 tools will be extremely diverse, in quality as well as in discipline, and available for everyone. While the opportunities to learn in this era are large due to the proliferation of the web, the need is for learning models that can harness the potential in a methodical manner. Connectivism is one step in this direction. Emerson eloquently remarked that "As to methods there may be a million and then some, but principles are few. The man who grasps principles can successfully select his own methods. The man who tries methods, ignoring principles, is sure to have trouble" (http://brichotomy.com/post/45629053/as-to-methods-there-may-be-a-million-and-then). Ultimately, whatever the theory or theories used, the goal is to ascertain that students are transformed to learners and that educational institutions are in the business of creating lifelong learners. The need is for teachers to pass on the skills on "how to bring out the intellectual prowess of individuals so that they can contribute meaningfully to our global knowledge-based economy". It is our belief that this article takes a small step in enhancing the understanding in this domain.

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