VIRTUAL SCAFFOLDING – CONSTRUCTIVISM IN ONLINE LEARNING

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ABSTRACT

This reflection paper considers the recent growth of online courses, in particular MOOCs, against the backdrop of growing demand for higher education, the failings of our existing higher education models, and the continued but unsuccessful attempts of new technologies to revolutionise education. The authors argue that focusing on technology alone will always be unsuccessful, as it fails to recognise that learning is a social experience, which technology can aid but not replace. They argue that online education must take on board and address the issues of social constructivism in order to be effective. They use their own experience of developing online courses, combined with a consideration of the existing research in the area, to propose a future model for online provision. They conclude by identifying the future research needed to realise this model, and highlighting research on the potential future evolution of higher education.

1. BACKGROUND DISCUSSION

Demand for higher education is exploding around the world and the nature of education is changing (EDUCASE, 2010). As reported by Unesco (2009), between 1970 and 2007, the number of students in higher education increased from 28.6 million to 152.5 million. INTO (2013) has analyzed OECD data, and suggests that, "Within a decade, the demand for higher education will surpass 265 million. That is greater than the population of Nigeria or Russia". However, as reported by the Wall Street Journal (WSJ, 2015) a lot more distance online education is required in future as countries simply cannot cope with the demand, to quote: "Consider India, which has 600 million people under the age of 25 and an outdated university system struggling to grow a workforce to support the third-largest economy in the world. An analysis a few years ago showed that, to address educational needs using traditional methods, India would need to build 1,500 campuses and—even more challenging—find qualified instructors to staff them".

Alongside this rapidly growing demand, there is an increasing realisation that our existing higher education models, both in terms of pedagogy and structure, are becoming less relevant to the requirements of the modern world and modern students. Critics like Sir Ken Robinson (2010) point to the need to step away from an educational system developed to meet the needs of society nearly 200 years ago, and to embrace change in providing educational opportunities designed to enhance creativity and support individual, personal development. This immediately raises the prospect, promoted by many within our community, that technology-enhanced learning, or eLearning, is the answer, and will revolutionise education! However, as ably debunked by Derek Muller (2014), the argument that a novel or ubiquitous technology will revolutionise education has been made many times before, but we still persist with the status quo. It can be argued that this is fundamentally because of inertia in the system, the massively installed base, or a lack of understanding on the part of the students of the benefits of the technology. Alternatively, we can take the view, as Muller does, that technology,

in whatever form, can aid the learning process but should not be seen as a replacement for key constituents of that process. In particular, the concept that learning is a social process, and the role of the tutor is not to deliver information but to provide support and guidance for students in developing their learning skills, and their ability to learn from and with their peers. Whilst this concept has considerable support and longevity in education circles, fundamentally grounded in the *Social Constructivist* theory of education based on the work of Vygotsky (1978) and numerous others, it has been more honoured in the breach than the observance as demonstrated by a three year study by Martin Nystrand (1996) which showed very limited use of social interaction in standard classroom teaching. However, recent developments in the use of technology to aid and support classroom teaching, such as *Flipped Classrooms*, have begun to re-establish social interaction, peer discussion and groupwork as the primary medium for learning, stepping away from didactic, instructional, lecture-based information delivery (Demetry, 2010).

Social constructivism is also at the heart of the Computer-Supported Collaborative Working (CSCW) (Grudin, 1994) and Computer-Supported Co-operative Learning (CSCL) (McConnell, 2000) movements, developed in the 1990s. More recently CSCL has come to mean Computer-Supported Collaborative Learning (Stahl et al, 2006), and it remains an important area in the development of online learning tools and the promotion of online learning, particularly in STEM subjects.

One other major factor in the recent development of online learning has been the rise of the MOOC (Massively Open Online Course) and the impact this has had, in opening up and democratising access to higher education courses, in promoting the potential for new models of learning, but also in the potential negative impact on socialisation in learning and the use of groupwork. Ironically, the massive nature of MOOCs does not imply significant socialisation, and the fact that students can be in different time zones, operating to different agendas of engagement, timing, commitment, etc., makes it near impossible to engage any sort of heavyweight process of group working (Bacon et al., 2015)).

2. CURRENT THINKING

The research shows that the characteristics of the students, relative to the type of online learning and the demands it makes on them, will be a key factor in determining the success of an online course (Authors ref, anonymised). MOOCs were originally established to attract audiences of experienced, metacognitive adult learners, who could successfully manage their own learning in a heutagogic environment, but the reality is that the majority of learners in MOOCs require considerably more support than envisaged in that model (Beaven et al, 2014). In our experience, open courses attract a wide range of learners, ranging from aspirational novices to experienced students, and as a result have to tailor the collaborative elements and expectations accordingly. Clearly, online courses that offer lightweight collaborative activities, of a discursive nature, that do not require timed or timely attendance and offer participants a shared experience of learning, can be open to all. However, as the requirement changes to expect participants to take on roles within the group (Belbin, 2012), to expect regular participation at fixed times and for fixed durations, and to expect individual participants to take on responsibilities for learning and sharing with the group, the need to select and filter participants grows. Heavyweight processes, which we define as those processes that require the sharing of technical expertise and knowledge in a structured and agreed format, and require synchronous commitment and delivery, really require selection on the basis of prior experience, or selection based on known commitment and motivation.

We envisage a future mixed economy of online courses, where participants sign up to closed, selective courses to learn heavyweight processes, that they can then apply in more open courses, and a wide range of open courses using lightweight collaborative processes that are available for participant selection (Bacon & MacKinnon, 2016). In this model, we also envisage the growth of the use of social media in combination with MOOCs and similar online courses, providing the opportunities to support group activity, particularly maintenance activities, and socialisation of learning. Figure 1 shows a simple graphical representation of the relationship between student characteristics and type of online course.
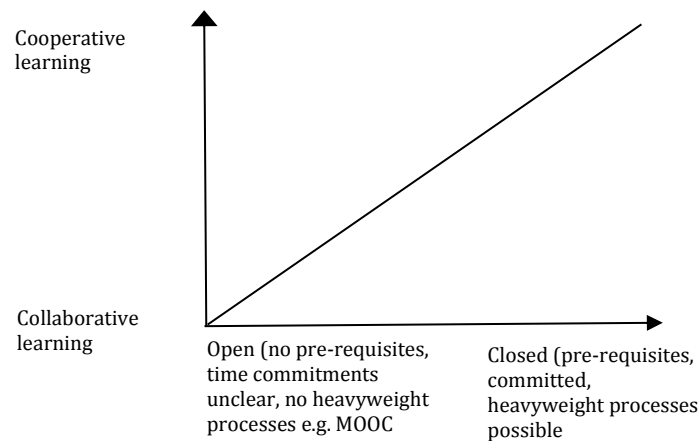
Figure 1: Graphical illustration of online course requirements

Teachonline in Canada (2016a) have published their analysis of current and future developments in online learning, and identify that "collaborative technologies and knowledge sharing will emerge as key resources for all forms of learning", as one of their key technology patterns. Whilst this may not seem a particularly surprising finding, it does once again highlight the importance of preparing our students to be effective collaborative learners.

In terms of MOOCs, the term GROOC has recently been defined, by Professor Mintzberg of McGill University (2015), to describe group-oriented MOOCs, based on one he has developed on social activism. He also argues that there is no requirement to provide additional support to address group dynamics, stating that groups should be able to handle losing a few members and still function appropriately (Poets & Quants, 2015). Whilst this might be true for collaborative learning, as discussed earlier, because no joint group output is required, i.e. it doesn't matter if all members of the group don't contribute equally or in a timely manner, or if some drop in or out, or others disappear, learning can still take place through dialogue and discussion. It probably also doesn't matter if some of the communication is not understood by all, or the composition of the group i.e. people can be randomly assigned to small groups and the particular strengths and weaknesses of individuals probably don't matter that much. However, if you are trying to achieve cooperative learning through a MOOC, which requires a group to jointly solve a problem, then the skills of the people in the group, the timeliness of their communication, their understanding of the problem etc. is critical to a successful outcome. The group may be able to sustain the loss of some members if it is large enough and those members are not assigned a critical role in the production of the joint output, but in general such losses are very damaging to cooperative learning groups. Whilst collaborative learning is important in engineering and related disciplines, cooperative learning is an absolute core requirement, and therefore the use of GROOCs or MOOCs, as currently defined, can be particularly challenging in this context (MacKinnon & Bacon, 2016).

3. CONCLUSIONS & FUTURE THINKING

In terms of group work, it has been demonstrated that collaborative work, in the sense of discussion and debate to deepen thinking and understanding, can be successful. For example Mackness et al (2010) formed groups by getting students to pro-actively put themselves forward to be placed in a group and then when there were a sufficient number to form a group, another one was started. However, for STEM courses requiring heavyweight interactive processes, the need for cooperative learning is paramount, and this requires greater selectivity in the group formation process and greater maturity and commitment by the participants.

Given the rapidly increasing global demand for higher education, and the inability of many countries to meet their local demand, it is inevitable that, due to cost, the demand for online education will increase and the mass market of MOOCs is likely to play a part in that space. STEM subjects will be part of that demand and it is therefore important the more research is undertaken to find a mechanism to develop well-formed groups in

MOOCs, so that future students can benefit from a structured approach to cooperative learning using heavyweight tools and techniques. We are currently engaged in developing research on the use of social media in combination with MOOCs to determine if that can provide an appropriate level of socialisation to enhance commitment, retention and completion by participants.

The model of developing a mixed economy of online courses will also require the identification and description of the optimum types and structures of courses to be used to help guide and develop learners relative to specific skills and knowledge. For example, we might argue that a selective, closed online course (SCOC) would be best suited to help learners develop their Groupwork skills, and then develop or encourage the development of such courses for inexperienced learners. In this context, the tutor again becomes the guide and mentor for the learners, identifying the early stage, introductory courses that will enable them to develop their skills and become metacognitive, and then "fading" back to permit the learners to take control of their own learning experience. This becomes particularly important if we are to provide effective support for lifelong learning, especially in STEM subjects, that offers student-centric control, in an andragogic, or even heutagogic, environment.

Teachonline (2016b) have identified 8 key changes for Program Design, and 7 key changes for Teaching and Learning, that we can expect to see in the immediate future, as online learning impacts across the sector:

Program Design
- More flexible program designs
- More use of open educational resources
- More creative assessment processes
- More micro-credit and nano-degrees
- More co-op and experiential components within programs
- More international collaborative programs
- More transfer and international recognition agreements
- Blurring of lines between College and University

Teaching and Learning
- Learning will no longer be defined by time, place or institutional offerings
- Learners will create their own learning agendas, which reflect their own career, personal and lifelong learning goals
- Learners will secure their learning outcomes through a combination of formal, informal, self-directed, instructor-delivered, in class and online learning
- Learners will expect personalised learning services and supports for their learning agenda
- New mechanisms for meeting personal learning agendas will appear in the marketplace as the "unbundling" of learning continues
- Courses will be less important than mentoring, coaching, counselling, advising and assessment
- Diverse and new forms of credentials will appear which reflect the varied needs of learners, employers, social agencies, innovation organisations and entrepreneurs.

The vast majority of higher education institutions will be engaged with some or all of these areas, and for many of us this reflects a process that has been going on for many years. However, the argument now is simple, this is no longer a movement, or isolated instances of good practice, but rather the culmination of the movement, requiring of us significant change across every aspect of higher education. This is not about technology revolutionising education, but the evolution of a new model of education supported and enhanced by technology. Deciding how we will support the social nature of learning, and thereby enable our students to become successful collaborative learners, in online courses, is a key step forward.

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