Feedback generators: providing feedback in MOOCs

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Abstract

Massive Open Online Courses (MOOCs) are receiving increasing attention from UK HE, and the provision of appropriate assessment and feedback in a MOOC is a relevant and urgent question. This paper introduces the novel conceptualisation of a "feedback generator" to provide the massive feedback needed by a massive OOC seeking to ensure feedback comparable to that of a conventional course, and identifies three types – simulations, serious games, and semi-automated formative assessments. The salient notion revolves around developing a toolkit to support assessment and feedback using ILOs in MOOCs for authoring and remixing the underlying ILO map(s) and their associated feedback generators.

Introduction

Massive Open and Online courses (MOOCs) have been growing in popularity since 2008. The main recent drivers have come from the Open Educational Resources movement in Canada and the 2008 event about Connectivism and Connective Knowledge, led by Stephen Davies and George Siemens through the University of Manitoba. These processes constructed MOOCs so that participants could use the technologies of their choice and interact freely with the content and each other. The theoretical premises for the construction and delivery of MOOCs were those of connectivism (Siemens, 2004), described as a Learning Theory for the Digital Age. This modern theory takes into account the use of social networking and the availability of a plethora of information on the web, which can be shared around the world almost instantaneously.

Siemens has set out 8 questions, whose answers provide the principles of connectivism:

- How are learning theories impacted when knowledge is no long acquired in the linear manner?
- What adjustments need to be made with learning theories when technology performs may of the cognitive operations previously performed by learners (information storage and retrieval)
- How can we continue to stay current in a rapidly evolving information ecology?
- How do learning theories address moments where performance is needed in the absence of complete understanding?
- What is the impact of networks and complexity theories on learning?
- What is the impact of chaos as a complex pattern recognition process on learning?
- With increased recognition of interconnections in differing fields of knowledge, how are systems and ecology theories perceived in light of learning tasks?

Designing a MOOC from these principles means that autonomy, diversity, openness, connectedness, and interactivity are the essential supports for learning in these types of environments.

In many ways what is created has been termed an 'uncourse' by Hirst (2009) since anyone can contribute anywhere and in fact some learners do not use the course tools but prefer to collaborate using wikis, blogs, Facebook, or Twitter (Beetham, 2008; Guldberg & Mackness, 2009). This presents a number of challenges, not least that large numbers of participants can produce too many forum posts. This in itself can result in students resorting to communicating in smaller groups outside the given platform such as working in their blogs (Mak, Williams & Mackness, 2009).

Mackness et al (2010) have found that the more connected the learners are in a course which exhibits autonomy, diversity, and openness, the more potential for learning is restricted due to the "lack of structure, support and moderation normally associated with an online course". This results in learners resorting to working in traditional groups and not as envisaged by this open network. Mackness et al raise the question of whether MOOCs can actually support courses that will produce certification and enhance the student experience. However, their concerns have been largely ignored with the development of commercial platforms such as Coursera, Udacity, and edXand where there has been little support provided for the learners.

This paper proposes the development of a toolkit for instructors and students to support sharing, contributing, discovering, annotating, collaborating, authoring, adapting and remixing associated feedback generators to assist with the assessment and feedback of

large numbers of students in these new learning environments. The main purpose is to provide autonomy for students as described by Siemens and Downes within a more personalised environment that can provide "advice for action" (Whitelock, 2011)

Intended learning outcome-based competence maps

A pedagogically informed learning activity is based upon the existing competence of the learner, is coupled with prerequisite competences, and seeks to develop one or more articulated desired competences. A pedagogically informed (top level) competence is conceived as an acyclic directed graph of enabling competences, each competence (top level and enabling) comprising a contextualised intended learning outcome (ILO). An ILO is composed of a learned capability, often expressed using Bloom's taxonomy (Bloom, 1956; Anderson and Krathwohl, 2001), and its associated subject matter content, often expressed using Merrill's Component Display Theory structure (Merrill, 1983). Pedagogically informed teaching activities associated with the specified learning activities include the provision of appropriate materials, the assessment of learner performance on the desired competences, and the provision of feedback which is well-timed, contingent, and specific.

To develop an effective framework for assessment it is essential to support pedagogically-informed statements of intended learning outcomes (Ambrose et al, 2010; Biggs and Tang, 2011). The relevant elements of such support are illustrated in the conceptual model of Figure 1.

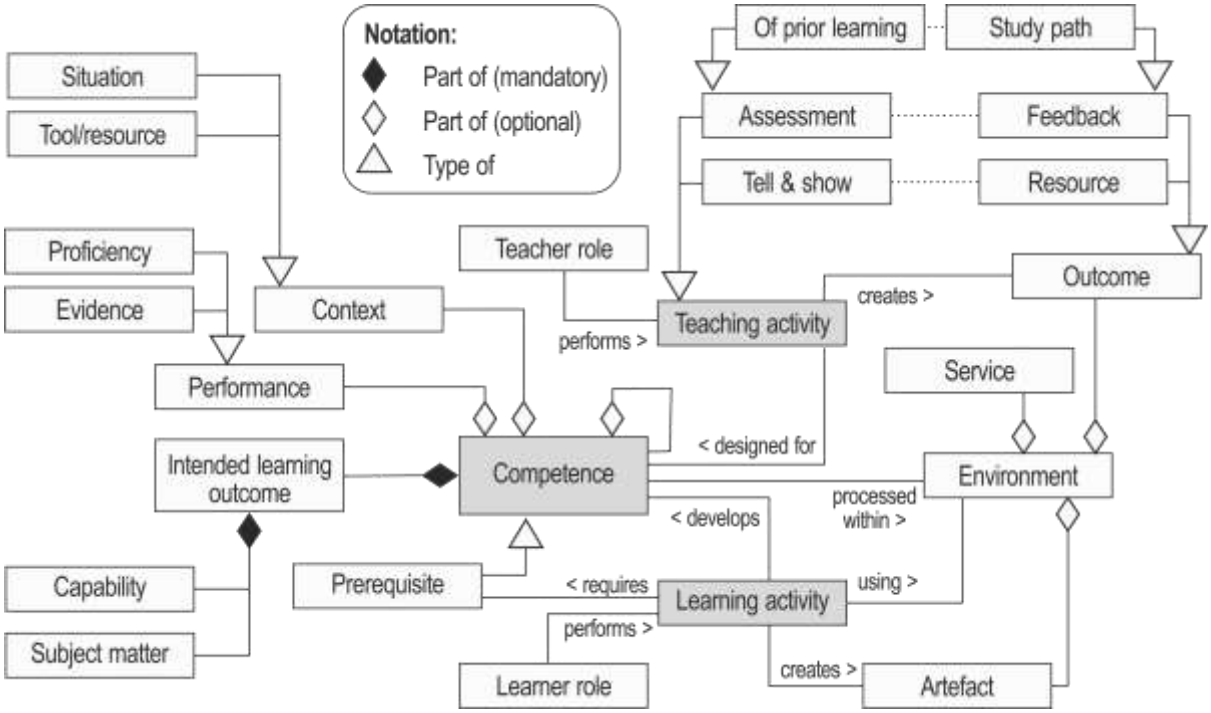

Figure 1. Conceptual model of intended learning outcomes and competence

MOOCs and intended learning outcome based competence maps

Our vision is the provision of massive feedback to match the massive OOC demands, and the general support of learning and teaching in MOOCs, by using ILO-based competence maps. Figure 2 illustrates a competence map, which is essentially a structured, connected, and elaborated set of ILOs, where each ILO identifies a subject matter topic and its associated capability or skill.

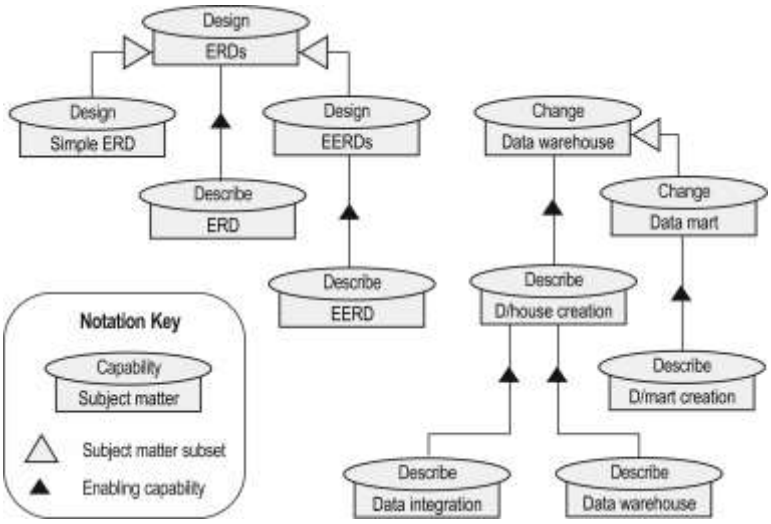

Figure 2. Example competence map for an introductory course on databases

Competence maps are of particular value in MOOCs by providing for an explicit, articulated, machine-processable view of pedagogic intentions. As illustrated in Figure 3, such maps support instructors and participants in sharing, contributing, discovering, and collaborating on the educational objectives of the MOOC, as well as supporting the authoring of original, or the adapting of existing, assessments, lesson plans, and materials.

In particular, Figure 3 shows "feedback generators" based upon the competence map(s) of a given MOOC. A feedback generator, in this novel conceptualisation, provides the massive feedback needed by a MOOC as it seeks to provide feedback comparable to that of a conventional course. Our design identifies three candidate types of feedback generator – simulations, serious games, and automated and semi-automated formative assessments (Wills, Gilbert & Recio, 2010).

Figure 3 provides an outline for instructors and students to support the shaded activities and shaded component objects. The adoption of this approach is one way to ensure the continued development and availability of the ideals of the open educational resources movement in seeking more scalable, sustainable, accessible, and personalised education, particularly assessment and feedback, amongst a wider participating audience.

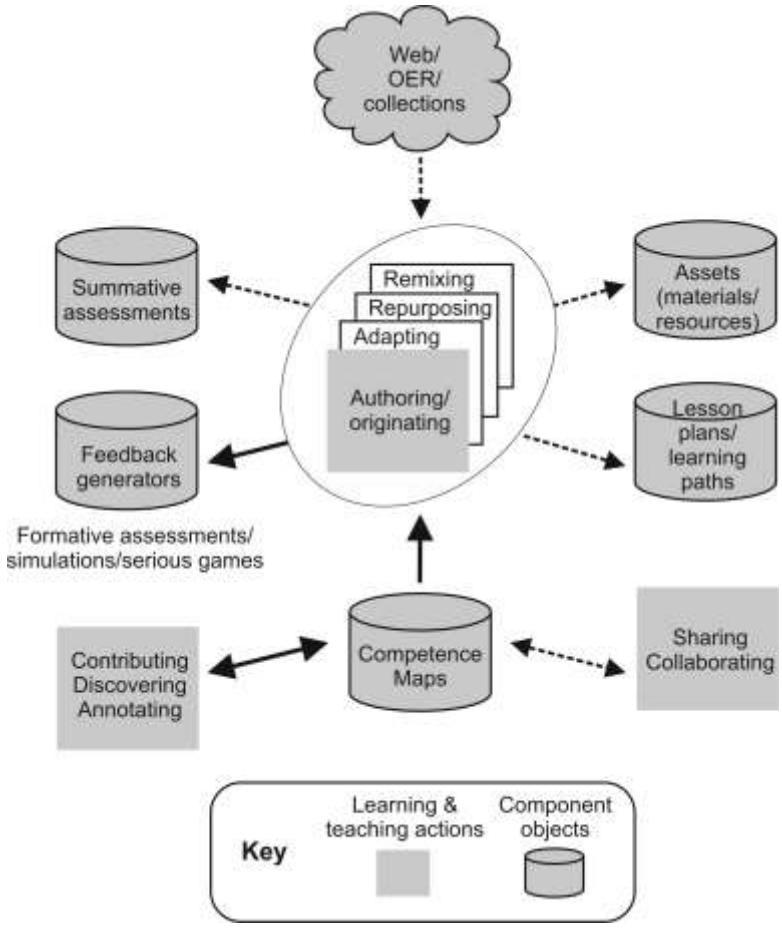

Figure 3. Competence maps in support of learning and teaching in MOOCs and learning and teaching in general

Discussion

Richard Feynman (1997) famously referred to educational research as "cargo cult" science. Instead, this approach intends to contribute underlying substance to the evidence-based development of scientific, or at the least, engineering approaches to the provision of educational environments. As illustrated in Figure 3, it intends to do this by demonstrating how pedagogic intentions, formalised as ILO-based competence maps, can better support student learning activities, assessments for and of learning, feedback, and lesson plans and learning paths. More importantly the ILOs provide an Assessment for Learning pedagogical route for students which is open to test with respect to scalability, efficiency, and student motivation to complete the course.

This work has the potential to impact on an exceptionally wide range of academics, in part, because much learning in higher education involves the use of feedback (Whitelock & Cross, 2012). It is particularly relevant to academics using simulations and serious games in courses to engage students and provide situated learning, as these types of feedback generators will help them to provide appropriate and timely feedback. Improving the students' experience by providing them with better feedback can also support Downes' (2007; 2008; 2009) vision of creating courses that increase autonomy, diversity, and openness.

References

Ambrose, S.A., Bridges, M.W., DiPietro, M., Lovett, M.C., and Norman, M.K. (2010). How Learning Works: Seven Research-Based Principles for Smart Teaching. Jossey-Bass.

Anderson, L. and Krathwohl, D.A. (2001). Taxonomy for Learning, Teaching and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives. Longman.

Beetham, H. (2008). *Learners' experiences of e-learning: research from the UK*

http://www.networkedlearningconference.org.uk/past/nlc2008/abstracts/PDFs/BeethamIntro_464-466.pdf [viewed 04-05-2013]

Biggs, J. and Tang, C. (2011). Teaching for Quality Learning at University: What the Student does. Society for Research Into Higher Education.

Downes, S. (2007). *What connectivism is*.

http://halfanhour.blogspot.com/2007/02/what-connectivism-is.html [viewed 04-05-2013]

Downes, S. (2008). *Connectivism: A Theory of Personal Learning*

http://www.slideshare.net/Downes/connectivism-a-theory-of-personal-learning [viewed 04-05-2013]

Downes, S. (2009). *Connectivism Dynamics in Communities.*

http://halfanhour.blogspot.com/2009/02/connectivist-dynamics-in-communities.html [viewed 04-05-2013]

Feynman, R. (1997). *Surely You're Joking, Mr. Feynman*! Norton.

Gilbert, L., & Gale, V. (2008). *Principles of e-Learning Systems Engineering*. Chandos.

Guldberg, K. & Mackness, J. (2009). Foundations of Communities of Practice: enablers and barriers to participation. *J. Computer Assisted Learning*.

Hirst, T. (2009). *Non-Linear Uncourses – Time for Linked Ed?*

http://ouseful.wordpress.com/2009/01/30/non-linear-uncourses-time-for-linked-ed/ [viewed 04-05-2013]

Mackness, J., Mak, S.F.J. & Williams, R. (2010) The Ideals and Reality of participating in a MOOC. Proceedings of the 7th International Conference on Networked Learning 2010, Aalborg, Denmark

Mak, S.F.J., Williams, R. and Mackness, J. (2009) *Blogs and Forums as Communication and Learning Tools in a MOOC.* Networked Learning Conference, 2010.

Merrill, M.D. (1983). Component display theory. In C.M. Reigeluth (Ed.) Instructional design theories and models: An overview of their current status. Lawrence Erlbaum.

Siemens, G. (2004). Connectivism: A learning theory for the digital age. *elearnspace*. http://www.elearnspace.org/Articles/connectivism.htm [viewed 04-05-2013]

Whitelock, D. (2011) 'Activating Assessment for Learning: are we on the way with Web 2.0?' In M.J.W. Lee & C. McLoughlin (Eds.) *Web 2.0-Based-E-Learning: Applying Social Informatics for Tertiary Teaching.* IGI Global. pp 319–342.

Whitelock, D. & Cross, S. (2012). Authentic assessment: What does it mean and how is it instantiated by a group of distance learning academics*? International Journal of e-Assessment,* 2(1).

Wills, G., Gilbert, L. & Recio, A. (2012). *Towards a framework for games and simulations in STEM subject assessments*. In CAA 2012: International Computer Assisted Assessment Conference, Southampton, 10 - 11 Jul 2012.