Designing MOOCs for professional learners: Tools and patterns to encourage self-regulated learning

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Employers are becoming aware of the potential of Massive Open Online Courses (MOOCs) as a significant form of learning for work. MOOCs have the potential to transform professional learning, but require learners to be self-regulated. Most MOOCs are not designed in ways that encourage self-regulated learning. Therefore there is a need for design tools that can guide instructional designers and teachers in designing MOOCs that promote self-regulation. This paper presents two toolsets to guide MOOC design. MOOC-SRL (Self-regulated learning) patterns allow the sharing and reuse of MOOC designs that encourage self-regulation. These design patterns demonstrate ways in which courses can take advantage of the knowledge and expertise that professional learners bring to their formal learning experience, and highlight the importance of course design that engages professional learners and meets their individual needs. The MOOC-DTQ (Design Team Questionnaire) is an audit tool that guides instructional designers in pedagogic design decisions made at platform (macro) level as well as at course (micro) level. The tool enables instructional designers to question their design decisions and provides possible interventions that may improve their design. These tools were developed as part of a larger study funded by the Bill and Melinda Gates Foundation MOOC Research Initiative.

Editorial note:

The design tools presented in this paper are outputs from a larger study on Professional Learning in Massive Open Online Courses http://www.gcal.ac.uk/academy/pl-mooc/

The paper includes links to several open research instruments:

- *An online survey instrument designed to measure self-regulated learning: http://dx.doi.org/10.6084/m9.figshare.866774*
- *A script for follow-up interviews: http://dx.doi.org/10.6084/m9.figshare.866773*
- Design recommendations: http://dx.doi.org/10.6084/m9.figshare.1420557
- MOOC Design Team Questionnaire: http://dx.doi.org/10.6084/m9.figshare.907150

1. Introduction

Employers are becoming aware of the potential of Massive Open Online Courses (MOOCs) as an emerging form of professional learning, or learning for work (Radford, Robles, Cataylo, Horn, Thornton, & Whitfield, 2014). Massive Open Online Courses (MOOCs) have the potential to provide unlimited learning opportunities through online, open access. As such, they offer learning that complements other forms of professional development, such as training or on-the-job learning (Milligan & Littlejohn, 2014).

In an era when knowledge and job roles are changing continually, companies are constantly seeking new ways to enable their workforce to upskill quickly, (Littlejohn & Margaryan, 2014). Yet conventional forms of professional learning, such as classroom-based training, are becoming less effective as a means of learning in knowledge-intensive domains (Fiedler, 2014). Conventional training was developed as a means of skilling large numbers of people for specific jobs. However, as work roles evolve, learning for work becomes continual and personalized and people have to be able to determine their own learning pathway through self-regulation (Littlejohn & Margaryan, 2014). Yet, established forms of professional learning generally have not taken advantage of the affordances of social, semantic technologies to support personalised and self-regulated learning.

MOOCs have the potential to transform professional learning by utilizing social, networked technologies to support personalised and self-regulated learning (Milligan & Littlejohn, 2014). However, successful innovation requires good design choices. A study of the design of 76 Massive Open Online Courses concluded that the instructional quality of almost all of the MOOCs examined was low (Margaryan, Bianco & Littlejohn, 2014). Most of the 76 MOOCs scored highly on the organisation and presentation of the course material, but few designs supported interaction and feedback, a key principle of effective instructional design (ibid). Many teachers are experts in a specific discipline or skills area, rather than in pedagogy (Goodyear, 2005). This mismatch in expertise makes it difficult for teachers to design effective MOOCs. This design problem is intensified in professional contexts, where MOOC designs should encourage professionals to actively self-regulate their learning, so that they may tailor their learning to specific work problems (Milligan & Littlejohn, 2014).

MOOC design could be improved using design support tools, such as the pedagogical patterns pioneered by Eckstein, Bergin & Sharp (2002) and Goodyear (2005). These patterns guide teachers and instructional designers in course design, which is particularly important while developing (relatively) new course formats, such as MOOCs. Initiatives such as the MOOC Design Patterns Project (http://www.moocdesign.cde.london.ac.uk/) have sought to articulate emerging MOOC design principles through a pattern approach. This paper outlines the development of patterns to support the design of MOOCs for professional learners.

This work was funded by the Bill and Melinda Gates Foundation MOOC Research Initiative ('Professional Learning in MOOCs' http://www.gcu.ac.uk/academy/pl-mooc/). The research addresses the research question How can Massive Open Online Courses be designed to support self-regulated learning? Toolsets to support MOOC design are outlined. The first is a set of design patterns to guide teachers in designing MOOCs environments that encourage self-regulated learning and meet the needs of professional learners. The second toolset, the Design Team Questionnaire (MOOC-DTQ), can be used post-design to audit MOOC designs against principles of self-regulated learning to identify effectiveness and potential scope for improvement.

The article outlines the development of these toolsets. The paper begins by problematizing MOOC design. The tool development methods are then presented. Finally the tools are described and discussed.

2. Problems with MOOC design

MOOC learning is suited to the networked society, founded upon the near ubiquity of digital, networked connections (Castells, 1996). Rather than viewing learning as the transmission of expert knowledge from an instructor to learners, MOOCs were originally conceptualised around connectivist principles, based on the idea that learning occurs through network connections, as learners connect with their peers and with knowledge resources (Siemens, 2005; Downes, 2009). As such, MOOCs seem to offer a powerful means of professional learning, where considerable knowledge and expertise resides with the learner as well as with the instructor.

In professional learning each learner brings a unique knowledge set to the learning setting, along with their professional and personal networks (Littlejohn, Milligan & Margaryan, 2012). The networked environment acts as a catalyst for the formation of heterogeneous, dynamic learning communities that facilitate knowledge exchange. From this perspective MOOCs appear to offer a useful environment to support and encourage professional learning. However, although digital networks provide environments that connect work and learning, established forms of professional learning largely have not taken advantage of the multiple ways in which people and resources can be brought together to enhance learning (Littlejohn & Margaryan, 2014). There are untapped opportunities around how people collaborate and how feedback can be generated and exploited for learning.

In conventional face-to-face teaching the teacher has a better view of the learner's progress and pathway than in a MOOC.

Metrics of success range from registration, participation, retention and progression to completion or assessment data and pass rates, with the assumption that these indicators indirectly signify learning. These conventional metrics are being applied to Massive Open Online Courses as a measure of 'success'. However learners have fewer opportunities to be seen by and to interact directly with instructors, so the responsibility is on the learner to remain active throughout the course. An assumption underlying MOOC design is that learners have the necessary ability to learn autonomously. However, MOOCs attract a broad range of learners and not all of them self-regulate their learning (Milligan, Littlejohn & Margaryan, 2013; Milligan & Littlejohn, 2014).

Self-regulation is a critical aspect of professional learning, as learning for work becomes continual and individualised (Eraut, 2000; Tynjälä, 2008). In many organisations people's work roles are fluid and constantly changing, people have to draw continuously from knowledge across disciplinary or sectoral frontiers, working within the complex networks found in knowledge intensive workplaces (Veen, van Staalduinen & Hennis, 2011). Self-regulation is critical under these circumstances (ibid). Self-regulated learning enables people to 'future-proof' their skills, making them more flexible as workers (Lefrere, 2007), allowing them to plan, share and co-develop their learning goals to learn within and from their professional networks (Siadaty Jovanović & Gašević, 2013).

Self-regulation includes 'self-generated thoughts, feelings and actions that are planned and cyclically adapted to the attainment of personal goals' (Zimmerman, 2000, p. 14). Zimmermann's theory describes learning in three phases (planning, performance and self-reflection) interconnected through affective, behavioural and cognitive sub-processes. Sub-processes range from cognitive factors such as motivation, and interest, self-reflection and self-evaluation, to behavioural factors such as goal-setting and learning strategies, to cognitive factors including self-efficacy and self-satisfaction (Fontana Milligan, Littlejohn & Margaryan, 2015)

Previous research examining how professionals learn in MOOCs provide empirical evidence that learners with high self-regulation have different cognitive, affective and behavioural responses to learning in a MOOC than those displaying low self-regulation (Milligan & Littlejohn, under review; Hood, Littlejohn, & Milligan, under review). Self-regulated learners tend to follow the parts of a MOOC that help them solve a problem. They link their participation in the MOOC to work performance or personal interest. This motivation impacts learners' goal-setting, self-evaluation, and self-satisfaction. There is evidence that highly self-regulated learners self-evaluate their performance against their own benchmarks, measuring their progress in relation to their intended goals and ambition. This strategy has a positive impact on self-satisfaction. By contrast low self-regulators tend to follow the instructional pathway of the course. Self-evaluation is more challenging, because these learners self-evaluate their progress against externally prescribed benchmarks set by the course designers. This situation impacted on their self-satisfaction (Hood, Littlejohn, & Milligan, under review) Self-regulated learning is not a 'learning style' rather; it is a response to a learning situation. A learner's ability to self-regulate is context dependent - influenced not just by their personal dispositions, but also by factors associated with the environment in which they are learning. There is evidence that learning strategies in MOOCs are influenced not only by learners' motivation and confidence, but also by the structure of course, the delivery environment and the perceived value of learning (Kop, 2011). In formal learning contexts, Cho and Kim (2013), Barnard, Paton and Lan (2008) and others have explored the role of self-regulation in learner behaviour online. In these studies, a clear link between self-regulation and learning success in online environments is established focusing on self-efficacy, interactions with others, and strategies for regulation.

Some cognitive, affective and behavioural factors associated with self-regulation can be encouraged through the design of the learning environment (see Bernacki, Aguilar & Byrnes, 2011 for a comprehensive overview of how online course environments promote self-regulated learning). Factors that are relatively easy to influence include help-seeking or learning strategies while other factors, such as self-efficacy, are more difficult to impact. Nevertheless there is opportunity here to design MOOCs that promote self-regulated learning behaviour.

The following section describes the method used to develop pre and post design tools developed to support MOOC design. These design tools are outputs from a larger study on Professional Learning in Massive Open Online Courses http://www.gcal.ac.uk/academy/pl-mooc/

3. Method

The study of 'Professional Learning in MOOCs' was contextualised within 'Fundamentals of Clinical Trials', a MOOC for health

professionals designed and run by the Harvard Medical School, Harvard School of Public Health, and Harvard Catalyst, the Harvard Clinical and Translational Science Center. The course was offered on the edX platform from October 2013 until February 2014, providing an introduction to the scientific, statistical, and ethical aspects of clinical trials research. Weekly video lectures and course readings were presented, accompanied by multiple-choice, computer-marked assessments. To gain a certificate of completion, participants had to pass the assessments (80%) and participate in two moderated case study discussions in an online forum on the edX platform. Opportunities for learners to interact and learn together largely were limited to the focus activity, though learners found other ways to interact outside the MOOC environment, either online and at a distance (e.g. via social network sites such as Facebook) or face-to-face in local meeting places in different countries. The reason for selecting this MOOC was because the course was likely to attract a high number of participants working in the health domain with a professional interest in the topic. The course was intended for people interested in clinical trials and who had foundations in epidemiology and biostatistics. Over 22,000 learners from 168 countries registered prior to the start of the course, including medical students and medical and health professionals.

3.1 Pre-design guide: SRL-Patterns

The patterns reported here emerged through synthesis of the findings from the 'Professional Learning in MOOCs' study. The study used qualitative and quantitative instruments to collect data regarding learners SRL profiles, their expectations and goals, and their experience of learning in the *Fundamentals of Clinical Trials* MOOC. Ethical standards for the study were adopted in accordance with local regulations.

An online survey instrument designed to measure a range of SRL sub-processes across three phases of self-regulated learning (Zimmerman, 2000) was circulated in week three of the course. The instrument is available at http://dx.doi.org/10.6084/m9.figshare.866774. A total of 350 participants from 76 countries completed the instrument, and the data collected was used to generate an individual profile of how each individual self-regulated their learning.

Participants who completed the survey instrument, and who identified as healthcare professionals (n=126), were invited to participate in a semi-structured interview to explore in detail how and why they approach, enact and reflect on their learning during MOOC participation. The interview script is available at http://dx.doi.org/10.6084/m9.figshare.866773. 35 participants (16 male and 19 female) from 23 countries agreed to be interviewed. Transcripts were analysed and coded using codes corresponding to the sub-processes of self-regulated learning described by Zimmerman (2000).

Interviews were conducted and recorded via Skype during November and December 2013.Each interviewee was emailed in advance and prompted to recount a scenario of how they learned in the MOOC to help illustrate their learning strategies. The interview questions were designed to probe self-regulated learning sub-processes, and the scenarios detailed by the participants illustrated most but not all of those probed. The qualitative data was integrated with the quantitative data to illustrate how learners self-regulate their learning in each of the SRL sub-processes. The development of these instruments has been described in Milligan, Littlejohn & Ukadike, (2014), and study findings reported in Milligan & Littlejohn (2014) and Milligan & Littlejohn (under review). The quantitative and qualitative data was analysed to identify key design features of MOOCs that could encourage self-regulated learning behaviours and would meet the learning needs and expectations of professional learners. The findings were synthesised as design recommendations (available from: http://dx.doi.org/10.6084/m9.figshare.1420557) and as MOOC design patterns in this paper.

3.2 Post-design audit tool: MOOC-Design Team Questionnaire

The MOOC Design Team Questionnaire (MOOC-DTQ) tool was designed as an audit instrument to examine the design decisions underlying the MOOC environment and learning design. The tool development process was carried out in four phases:

Phase 1 involved desk research. A literature review of self-regulated learning in online contexts was carried out. The literature review identified empirical articles providing evidence of interventions (online learning activities) that support self-regulated learning. These findings were used to develop the questions for the analytic instrument.

Phase 2 was a MOOC design document review. Course design documents from the Fundamentals of Clinical Trials MOOC were analysed to identify the rationale behind pedagogical design decisions of the MOOC instructional design team.

In Phase 3, members of the instructional design team were interviewed to elucidate their design decisions. Questions in the interview instrument were structured around SRL sub-processes.

The final phase was instrument development, resulting in the 54 item questionnaire detailed below.

4. MOOC Design Tools

This section describes pre and post design tools developed to support teachers with MOOC design. First the MOOC-SRL patterns were designed to guide teachers and instructional designers on MOOC design features that encourage self-regulated learning. Second, the MOOC Design Team Questionnaire (MOOC-DTQ) tool is a post-design audit instrument to examine the design decisions underlying MOOC environment and learning design.

4.1 MOOC-SRL patterns

1. ADAPTABLE COURSE GOALS/OBJECTIVES

You want to make sure professional learners are engaged in the course, but you find the learners do not need to learn all the course objectives, so you enable the learners to set their own objectives.

XXX

Learning objectives are used as a key organiser of course content, yet they can limit professional learners who bring different levels of knowledge and expertise, and who have a clear and precise understanding of the gaps in their knowledge (compared with undergraduate learners).

Professional learners have high self-efficacy and confidence (Hood, Littlejohn & Milligan, under review). Many are able to adapt course objectives to their own learning context. In fact professionals often enter study with specific learning goals in mind, focused on their learning needs at work. Research has shown that highly self-regulated professionals often follow their own goals, rather than following the objectives of the MOOC (Milligan & Littlejohn, 2014). Following self-organised goals is recognised as motivating for highly self-regulated learners. Several studies (e.g. Chang, Tseng & Liao, 2013) highlight the importance of goal-setting in improving motivation, increased persistence, and academic achievement.

Instead of setting rigid course objectives and content, courses can be designed flexibly to allow learners to personalise their learning goals. In this way the course can helping learners to gain specific knowledge they need for work. Tasks could be set encouraging learners to reflect on their personal learning needs and to set their own goals/learning objectives. Guidance would be provided to ensure learners chose goals that are compatible with the course objectives.

CONSIDER: This approach to goal-setting is challenging for learners who do not want to expend effort in setting their own learning goals. However, by providing a set of outline learning objectives, inexperienced learners towards could be scaffolded in developing their own learning goals.

XXX

This pattern links with [REFLECT ON BOTH THEORY AND PRACTICE]

2. REFLECT ON BOTH THEORY AND PRACTICE

You want the learning to be valuable to the learner's ongoing professional practice, but you find a misalignment between the course content and the learner's work. So you encourage the learners to align the theory learned in the course with their professional practice.

XXX

For professional learners, the value of learning is increased when the link between content and practice is clear. Providing opportunities for professional learners to explicitly integrate the theory learned on the course with their work practice and context not only enhances learning and engagement, but links theoretical expertise with practical expertise.

Integrating the conceptual or theoretical knowledge learned through a formal course with practical or experiential knowledge learned in informal, practice-based settings is important for professional learning (Tynjälä & Gijbels, 2012). Tynjälä's framework for integrative pedagogy (Tynjälä & Kallio, 2009) provides insight into how different types of expertise can be integrated across the formal learning-informal workplace boundary. Self-regulated learning research in formal contexts (e.g. Kauffman, 2004) demonstrates that learners who were encouraged to reflect on their learning, gained more knowledge. This activity enhances learning effectiveness and increases motivation.

Course design should include tasks that explicitly require learners to link what they are learning in theory (in formal education) to their current practice (while learning on-the-job). Additional tasks could require learners to articulate and share action plans for embedding theoretical knowledge into their work practice. Examples generated by learners could form a growing resource, illustrating diverse ways in which theory and practice might be linked. This resource could also be used to refine and enhance course content.

CONSIDER: Linking theory with practice requires concepts to be taken across boundaries from one context (the course) to another (the workplace). This boundary crossing presents a challenge to experienced professional learners. Some learners will need to be supported in doing this through, for example, the inclusion of real world case studies that encourage reflection as an integral component of the course.

XXX

3. CAPITALISE ON DIVERSITY

You want to make your MOOC valuable to all your learners, but their backgrounds and aspirations are diverse. So you encourage the learners to learn through sharing and building knowledge, capitalising on their diversity.

XXX

Turn the problem of diversity into a benefit, by using the diverse experience of MOOC learners to enrich course content.

MOOCs attract a broad range of learners. These learners differ in their motivation (e.g. to address a specific learning need, or to gain accreditation), expectations (e.g. that the learner will gain access to high quality learning materials, or to exchange ideas with other professionals) as well as prior knowledge and experience (ranging from those who have strong theoretical knowledge but no practical experience, to those who have no formal knowledge but a wealth of experience). Innovative MOOC designs capitalise on this diversity. Not every learner needs to learn the same content, nor take the same path through the learning material. Instead, they can choose the learning pathway that fits their specific goals.

From a course design perspective, some learner interactions could be scaffolded, for example by matching learners with similar intentions. Flexible design could extend to certification, with achievement being linked to personal goals and progress where possible. This recommendation provides an opportunity for learners to develop relational expertise (Tynjälä & Kallio, 2009) as they interact and negotiate with others.

CONSIDER: As course designer, you need to accommodate the specific needs of individual participants. While some learners may sign up to meet other learners who are just like them, others may seek learners with complementary expertise. Designs that accommodate different models in parallel, and that can support learners in finding the right community for them, can create strong communities.

XXX

4. BREAK DOWN THE BARRIERS

You want to take advantage of the wealth of learning opportunities that your learners have access to within their professional networks. But the learners tend to stick to the course pathway (i.e. pre-determined activities and knowledge within the course), so you encourage learners to discuss their learning with a wide range of people across their professional networks, as well as within the course.

XXX

In contrast to undergraduate learners, professional learners bring ready-made professional networks that can provide valuable expertise to complement course materials. By focusing on course content, or internal discussion forums, MOOC designs miss an opportunity to access this powerful resource.

Most MOOCs focus on the resources (eg text, video and other media) that form the core course content. Learners may be encouraged to utilise course discussion forums to discuss course content will peers. These discussion forums can be unsatisfactory, as they may be focused on technical issues, or dominated by a few individuals who intimidate other participants. But professional learners often have their own mature professional networks developed over years and focused on their own situation. Discussion with one's own colleagues is high value as it is localised and directly relevant to practice. An individual's existing network is a trusted resource and can be

activated easily through platforms such as Facebook, Yammer or Twitter.

Instead of attempting to create new, high quality communities inside courses form scratch for every cohort, designers can encourage learners to use their pre-existing networks to discuss course ideas and the questions they have. Interaction with an external network encourages breakdown of barriers between learning and work and can have lasting value in fostering personal learning networks. To complement this (and to support learners who do not have professional networks or who seek to broaden their network), course designers should also encourage focused communities to develop. Communities could emerge around language (MOOC participants can lack confidence to engage when they are not confident about expressing themselves in a second language), or role (e.g. school teachers and university academics in parallel communities) or motivation (based on different expectations).

CONSIDER: You have to achieve a careful balance to encourage learners to share new knowledge they have gained back into the course environment, perhaps through specially designed tasks. Some learners may not have an appropriate external network to draw upon, in which case learners should still be able to use the course discussion forums to find other learners.

XXX

5. PRODUCTIVE MOOCS

You want to leave your learners with more than a certificate at the end of the course. But you find the learners focus on achieving the course certificate. So you encourage learners to engage in authentic tasks to help them gain lasting knowledge.

XXX

Instead of a certificate, course designs can be tailored to support learners in creating an output (e.g. a knowledge artefact) of lasting value to evidence their learning.

MOOCs typically last several weeks, requiring around 10 hours effort each week. Upon successful completion of the MOOC, the learner may be awarded a certificate of completion. However, certificates may have limited value for some professionals. For some professionals (particularly those who are already well-qualified) it may be more valuable to use the time learning on the MOOC to create new knowledge that demonstrates their learning directly.

Set authentic tasks which have a clear useful output that learners can include in their portfolio as a record of achievement. For example:

- **learners could be asked to specify an output based on a current challenge, and work to complete it through the course.**
- **learners with similar backgrounds could work together to critique policy or conduct a foresighting exercise.**
- **learners with complementary expertise could be brought together to define and resolve real-world problems as ad hoc transient communities (Berlanga, Sloep, Kester, Brouns, Rosmalen, & Koper, 2008). See [CAPTALISE ON DIVERSITY]**

CONSIDER: You have to cede some control to your learners – you don't know what they will come up with, or have any way of ensuring its quality. Designs which encourage peer-evaluation could be adapted to mitigate this.

XXX

This pattern links with [CAPITALISE ON DIVERSITY]

4.2 MOOC Design Team Questionnaire

The MOOC Design Team Questionnaire collects information on MOOC design. The instrument is structured as a set of 54 questions, each focused on the phases and sub-processes of self-regulated learning (Zimmerman, 2000). Each question probes whether the course design would encourage particular self-regulated learning behaviours.

The audit tool is designed to be used by an independent researcher or self-administered by the course designers. Questions are directed at different members of the course team, dependent on their focus: questions about the overall course philosophy are directed to the strategic lead; technical questions are directed to the platform developer, questions about the specific learning design of the course are directed to the course design team, and finally, questions about how the course works in practice are directed to course teaching assistants. A copy of the instrument is available from figshare at: http://dx.doi.org/10.6084/m9.figshare.907150 and was trialled with a team of instructional designers who designed

Fundamentals of Clinical Trials MOOC (https://www.edX.org/course/harvard-university/hsph-hms214x/fundamentals-clinical-trials/941). This audit highlighted the inward focus of the course as well as the inflexibility of the platform. These observations were confirmed in our study interviews as participants articulated how they engaged with the course and their professional networks.

Data collected by the instrument provides a record of the learning design of the MOOC, focusing on the mechanisms by which it supports, or fails to support learners in self-regulating their learning. The instrument highlights how design can be influenced by strategic or technical factors, in addition to pedagogical decisions. It also collects information from teaching assistants regarding how the course is perceived by learners and how those learners engage with the course. The data collected can be used to identify gaps, and opportunities for subsequent design revision.

5. Conclusions

MOOC environments can be designed in ways to encourage self-regulated learning. This paper has outlined two toolsets that can be used to guide MOOC design to encourage self-regulation.

The MOOC SRL-patterns present a mechanism for sharing design experience of value both to researchers and practitioners. The patterns described here emphasise the importance of accommodating the particular needs of professional learners and capitalising on the networks and expertise they bring with them to their as they learn. For researchers, the patterns provide a common language for describing MOOC designs to support further study. For practitioners, these design patterns demonstrate ways in which courses can take advantage of the knowledge and expertise that professional learners bring to their formal learning experience, and highlight the importance of course design that engages professional learners and meets their individual needs.

The MOOC-DTQ tool guides instructional designers in pedagogic design decisions made at platform (macro) level as well as at course (micro) level. This tool enables instructional designers to audit their design decisions and provides examples of possible interventions that may improve their design. Many of these activities are applicable within Massive Open Online Courses, though the context, discipline and level of study have to be taken into consideration.

References

Berlanga, A. J., Sloep, P. B., Kester, L., Brouns, F., Rosmalen, P., & Koper, R. (2008). Ad hoc transient communities: towards fostering knowledge sharing in learning networks. International Journal of Learning Technology, 3(4), 443-458.

Bernacki, M. L., Aguilar, A., & Byrnes, J. (2011). Self-regulated learning and technology-enhanced learning environments: An opportunity propensity analysis. In G. Dettori and D. Persico (Eds.), Fostering self-regulated learning through ICT (pp. 1-26). Hershey, PA: IGI Global Publishers.

Barnard, L., Paton, V., & Lan, W. (2008). Online self-regulatory learning behaviours as a mediator in the relationship between online course perceptions and achievements. International Review of Open and Distance Learning, 9 (2), 1-11.

Castells, M. (1996). The information age: economy, society and culture: The rise of the networked society. Oxford, UK: Blackwell.

Cho, M-H., & Kim, B.J. (2013). Students' self-regulation for interaction with others in online learning environments. The Internet and higher Education, 17, 69-75.

Chang, C-C, Tseng, K-H, Liang, C., & Liao, Y-M (2013) Constructing and evaluating online goal setting mechanisms in web-based portfolio assessment systems for facilitating self-regulated learning. Computers and Education 69; 237-249

Downes, S. (2009). Connectivist dynamics in communities. Retrieved from http://halfanhour.blogspot.co.uk/2009/02/connectivist-dynamics-in-communities.html

Eckstein, J., Bergin, J., & Sharp, H. (2002). Patterns for active learning. In Proceedings of PloP (Vol. 2002).

Eraut, M. (2000). Non-formal learning and tacit knowledge in professional work. British Journal of Educational Psychology, 70, 113-136.

Fiedler, S.H.D. (2014). Commentary on Section I: Work Practices. In Littlejohn, A., & Margaryan, A. (Eds.). Technology-enhanced professional learning: Processes, practices and tools (pp. 50-56). London: Routledge.

Fontana, R.P., Milligan, C., Littlejohn, A., and Margaryan, A. (2015) Measuring self-regulated learning in the workplace. International Journal of Training and Development. 19 (1) 32-52.

Goodyear, P. (2005) Educational design and networked learning: Patterns, pattern languages and design practice, Australian Journal of Educational Technology, 21 (1), 82-101 Available from: http://www.ascilite.org.au/ajet/ajet21/goodyear.html

Hood, N., Littlejohn, A., & Milligan, C. (under review). Context counts: Learning in a MOOC.

Kauffman, D. F. (2004). Self-regulated learning in web-based environments: Instructional tools designed to facilitate cognitive strategy use, metacognitive processing, and motivational beliefs. Journal of Educational Computing Research, 30(1), 139–161. doi:10.2190/AX2D-Y9VMV7PX-0TAD

Kop, R. (2011). The challenges to connectivist learning on open online networks: Learning experiences during a Massive Open Online Course. The International Review of Research in Open and Distributed Learning , 12 (3), 19-38.

Lefrere, P. (2007). "Business success - the special contribution of self-regulated learning." In J. Beishuizen, R. Carniero & K. Steffens (Eds.) Self-regulated Learning in Technology Enhanced Learning Environments: Individual Learning and Communities of Learners. pp. 49-53. Shaker Verlag: Aachen.

Littlejohn, A., Milligan, C., & Margaryan, A. (2012). Charting Collective Knowledge: Supporting self-regulated learning in the workplace. Journal of Workplace Learning, 24(3) 226-238.

Littlejohn, A., & Margaryan, A. (2014). Technology-enhanced professional learning: Mapping out a new domain. In Littlejohn, A., & Margaryan, A. (Eds.). Technology-enhanced professional learning: Processes, practices and tools (pp. 1-13). London: Routledge.

Margaryan, A., Bianco, M., & Littlejohn, A. (2015). Instructional quality of Massive Open Online Courses (MOOCs). Computers and Education, 80, 77-83.

Milligan, C., Littlejohn, A., & Margaryan, A. (2013) Patterns of engagement in connectivist MOOCs. Journal of Online Learning and Teaching 9 (2) 149-159.

Milligan, C. & Littlejohn, A. (2014) Supporting professional learning in a massive open online course. International Review of Research in Open and Distributed Learning 15 (5) 197-213.

Milligan, C., Littlejohn, A., & Ukadike, O. (2014). Professional Learning in Massive Open Online Courses. in S. Bayne, C. Jones, M. de Laat, T. Ryberg, and C. Sinclair (Eds) Proceedings of the Ninth Networked Learning Conference, Edinburgh, UK, 7-9 April, 2014 p368-371.

Milligan, C. & Littlejohn, A. (under review) Self-regulated learning and MOOC Participation.

Radford, A. W., Robles, J., Cataylo, S., Horn, L., Thornton, J., & Whitfield, K. E. (2014). The employer potential of MOOCs: A mixed-methods study of human resource professionals' thinking on MOOCs. The International Review of Research in Open and Distributed Learning, 15(5) 1-25.

Siadaty, M., Jovanović, J., & Gašević, D. (2013). The social semantic web and workplace learning. Chapter 12 in Littlejohn, A., & Margaryan, A. (Eds.). Technology-enhanced professional learning: Processes, practices and tools. Pp132-143. London, Routledge.

Siemens, G. (2005). Connectivism: A learning theory for the digital age. International Journal of Instructional Technology and Distance Learning, 2(1), 3-10. Retrieved from http://www.itdl.org/Journal/Jan_05/article01.htm

Tynjälä, P. (2008). Perspectives into learning at the workplace. Educational Research Review, 3 (2), 130-154.

Tynjälä, P., & Kallio, E. (2009). Integrative pedagogy for developing vocational and professional expertise. Paper presented at the 13th Biennial Conference for Learning and Instruction, Amsterdam, Netherlands.

Tynjälä, P. & Gijbels, D. (2012) Changing World: Changing Pedagogy. In P. Tynjälä , M-L. Stenström, and M. Saarnivaara. (Eds.), Transitions and Transformations in Learning and Education, pp 205-226. Dordrecht, Springer

Veen, W., van Staalduinen, J-P. , & Hennis, T. (2011). Informal self-regulated learning in corporate organizations. In G. Dettori & D. Persico (Eds.), Fostering Self-regulated learning through ICT, (pp. 364-379). Hershey, PA: IGI Global.

Zimmerman, B. J. (2000). Attaining Self-regulation: A Social Cognitive Perspective. In M. Boekaerts, P.R. Pintrich, & M. Zeidner (Eds.), Handbook of self-regulation, San Diego, Academic Press.

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