

PL-MOOC: PROFESSIONAL LEARNING THROUGH MASSIVE OPEN ONLINE COURSES

This study, funded by the [Bill and Melinda Gates Foundation](#) through its MOOC Research Initiative funding stream, explored the role of Massive Open Online Courses (MOOCs) in supporting and enabling professional learning, or learning for work. The project ran between October 2013 and April 2014.

The study 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 (in the Harvard Clinical and Translational Science Center), and offered by the online learning platform [edX](#).

Overview

This study explored the role of Massive Open Online Courses (MOOCs) in supporting and enabling professional learning, or learning for work. The research examined how professionals self-regulate their learning in MOOCs. The study was informed by contemporary theories of professional learning, that argue that conventional forms of learning are no longer effective in knowledge-intensive domains (Littlejohn & Margaryan, 2013).

As work roles evolve and learning for work becomes continual and personalised, self-regulation is becoming a critical element of professional learning. Yet established forms of professional learning generally have not taken advantage of the affordances of social, semantic technologies to support self-regulated learning. MOOCs present a potentially useful approach to professional learning that may be designed to encourage self-regulated learning.

The study 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, and offered by the online learning platform [edX](#).

Research data was gathered and analysed by the Caledonian Academy at Glasgow Caledonian University, an established Technology Enhanced Learning research centre in the UK.

The research design built on previous studies in the areas of Technology Enhanced Learning and Professional Learning led by this centre, notably Self-Regulated Learning in MOOCs (SRL-MOOC), which provided evidence of the learning behaviours of education professionals in the Change 11 MOOC (Milligan, Margaryan &

Littlejohn, 2013; Milligan, Littlejohn & Margaryan, 2013). Validated methods and instruments from this study were adapted and employed.

The research was unique in providing evidence around two critical aspects of MOOCs that are not well understood: the course design features, skills and dispositions necessary for self-regulated learning in MOOC environments, and how MOOCs can be designed to encourage professional learning. A range of outputs is available, designed to be of use to the learning, research and MOOC development communities.

The use of MOOCs for professional learning opens up access to high quality learning for professionals working in conditions where opportunities for professional development are limited, in line with the principles of the Bill and Melinda Gates Foundation.

Bibliography

The PL-MOOC project drew on our previous work on professional learning, and our initial work exploring SRL in Massive Open Online Courses:

- Littlejohn, A., & Margaryan, A. (2013). Technology Enhanced Professional Learning: Mapping out a new domain. In A. Littlejohn, & A. Margaryan (Eds.), *Technology-enhanced professional learning: Processes, practices and tools* (pp. 1-13). London: Routledge.
- Milligan, C., Littlejohn, A., & Margaryan, A. (2013). [Patterns of engagement in connectivist MOOCs](#). *Journal of Online Learning and Teaching*, 9(2), 149-159. ([contents of special issue](#))
- Milligan, C., Margaryan, A., & Littlejohn, A. (2013). [Goal-setting behaviour in massive open online courses](#). EARLI 2013 Conference. Munich, Germany, 27-31 August, 2013.

Timeline

Research design overview and research questions

This study explored the role of MOOCs in supporting and enabling professional learning as people learn for work. The research project ran from October 2013 - March 2014 in three phases.

Phase 1: October - November 2013.

The first phase explored the design strategies used by instructional designers at Harvard University as they organised a Massive Open Online Course for health professionals. Key components of the MOOC design were mapped against the sub-processes of self-regulated learning, to identify

PL-MOOC: PROFESSIONAL LEARNING THROUGH MASSIVE OPEN ONLINE COURSES

how the course had been designed to support and encourage self-regulated learning behaviours. This phase addressed **RQ1: How are Massive Open Online Courses currently designed to support self-regulated learning?** Phase 1 comprised four activities:

Desk research. We reviewed literature on SRL in online contexts to explore learning behaviours associated with key SRL sub-processes, and how these behaviours might be encouraged in MOOCs.

Design document review. The course (and associated) design documents were analysed to explore the pedagogical decisions of the MOOC design team. Analysis focused on key SRL sub-processes identified during desk research. The audit tool developed to support this (and the next) activity is available at: <http://tinyurl.com/PL-MOOC-DTQ> (PDF)

Design team interview. We worked with the design team to explore design decisions related to course content and target audience, with particular reference to SRL phases and sub-processes.

Data analysis and synthesis. We mapped components of this MOOC design against sub-processes of self-regulated learning.

Phase 2: October 2013 - February 2014.

The second phase examined the self-regulated learning behaviours of health professionals as they participate in the edX MOOC. We measured the SRL profiles of health professionals participating in the MOOC and selected those with high and low SRL scores to analyse their learning behaviours in more detail through semi-structured interviews. From this phase, we are producing a set of learner use cases describing different patterns of self-regulated learning behaviours, addressing **RQ2 What self-regulated learning strategies and behaviours do professionals adopt?** Phase 2 comprised three main activities:

Learner survey. Research participants were recruited through an announcement on the course discussion board and course website. Study participants were invited to complete an SRL survey instrument during week 5 of the course. The survey instrument was adapted from one designed for our previous MOOC study (available from <http://figshare.com/authors/Colin%20Milligan/100462>) and is based on validated instruments devised by Pintrich, Smith, Garcia and McKeachie (1991) and others (full details at: http://figshare.com/articles/Survey_Instrument_SRL_in_Massive_Open_Online_Courses/767291). The SRLMQ instrument is available from figshare: <http://tinyurl.com/PL-MOOC-SRLMQ> (PDF)

Learner interviews. Health professionals who completed the survey were invited to take part in a telephone/skype interview. We interviewed 35 learners midway through the course (December 2013 – January 2014). As a prelude to the interview, research participants were asked to reflect on the impact that the MOOC has had/is likely to have on their professional practice. The interview explored this in more detail and probed their learning strategies and the networks they had drawn upon. The semi-structured interview script is available from figshare: <http://tinyurl.com/PL-MOOC-Interview> (PDF).

Data analysis and synthesis. All data collected in this phase will be analysed (using nVIVO and SPSS) to map learner behaviour patterns. Descriptive data summaries for the quantitative data set are available from <http://tinyurl.com/PL-MOOC-DataSummary> (PDF).

Phase 3: February - March 2014.

Phase 3: February - March 2014.

In the final phase we integrated the findings of phases 1 and 2 to extend our understanding of the relationship between course/environment design and learners' self-regulated learning behaviours. We examined how learner behaviour varies with each learner's capacity to self-regulate their learning in the MOOC context, as measured through their SRL profile. As a complement to the scientific outputs from this study, the main deliverable is a set of recommendations for the design of MOOC learning platforms and courses for professional learning, addressing **RQ3 How can MOOCs be designed to encourage professionals to self-regulate their learning?** Phase 3 comprised two main activities:

Data analysis. The data from Phases 1 and 2 were combined and analysed to identify misalignment between the design strategies applied to MOOCs and professionals' self-regulated learning behaviours. This analysis is ongoing, while other analysis of learner behaviour in the MOOC has been submitted as a journal article. The findings were synthesised into a set of recommendations for the design of MOOCs intended for

professional learning (see below). Draft recommendations are available from https://figshare.com/articles/MOOC_Design_Recommendations/1420557 (PDF).

Findings

The findings of the project can be summarised as follows:

RQ1 How are MOOCs currently designed to support self-regulated learning?

While MOOC designs take a variety of shapes and forms, the Fundamentals of Clinical Trials MOOC represents a course design typical of the key MOOC providers (e.g. [edX](#), [Coursera](#), [FutureLearn](#)), therefore we can build some generalizable conclusions.

From our observations, the highly structured MOOC design focuses on content provision, which the participants are very positive about. However, the structure does not encourage participants to act in a self-regulatory manner. If anything, participants, even those with high self-regulated learning ability, tend to limit their activity to reading/ interacting with course content, overlooking opportunities to integrate theory with practice.

For example, there is no or limited provision for learners to choose their own goals, to personalize their learning experience or to integrate course content with their own experience within the course structure. Although the course discussion forum is intended as a space for communication and interaction, usability issues, coupled with learners' perception of the discussion forum as being outside the core of course participation together mean that the level of interaction within the course is poor for most participants.

MOOC design should enable and encourage learners to actively initiate self-regulatory behaviours. However, there are cultural issues around formal learning and motivational factors for the learner (e.g. the learner may be motivated to gain credit or to have a general overview of the concepts, rather than to develop expertise) that influence learning behaviours and strategies.

RQ2 What self-regulated learning strategies and behaviours do professionals adopt?

The participants in our study demonstrated a range of SRL ability based on their completion of the SRLMQ profile instrument.

From analysis of **quantitative data** we saw evidence of high SRL learners presenting more precise goals and expectations, whatever their motivation for taking the course, than low SRL learners.

From **qualitative data**, we observed that professional learners tend to conform to passive behaviours in a highly structured MOOC design. Learners focused on activities such as watching videos and taking tests, with little evidence of learners relating new knowledge to practice, or of connecting with their peers through the discussion board.

Learners should take specific actions to develop theoretical and practical expertise, for instance by integrating scientific knowledge developed through formal learning with practical knowledge learned through on-the-job learning. Learners should develop relational and self-regulatory expertise through interactions with the diverse range of participants in the MOOC.

RQ3 How can MOOCs be designed to encourage professionals to self-regulate their learning?

MOOC providers and designers should recognize that to be effective, professional learning should provide opportunities to integrate theoretical and practical knowledge.

There must be a cultural shift around conceptions of learning and teaching and of learner and teacher roles to capitalize on the experience and expertise that professionals bring to their learning (see related work by this group: Littlejohn, Falconer and McGill, 2014).

The three main sources of data (the findings from the SRL literature review, the Design Team Questions tool, and the qualitative and quantitative data sets) were used to develop a set of recommendations for design of MOOCs to support professional learning.

The first three recommendations focus on improving the link between theory and practice in line with principles of integrative pedagogy (Tynjälä & Kallio, 2009).

The second three recommendations focus on capitalizing on diversity and encouraging the development of regulatory expertise (also in line with the principles of integrative pedagogy).

These recommendations are summarized below, with further detail

at: https://figshare.com/articles/MOOC_Design_Recommendations/1420557 (PDF).

Recommendations

The design of MOOCs that seek to support professional learning should (where possible):

1. Enable professional learners to link theory learned in the MOOC with their work practice by setting personal goals, or personalizing course goals. The integration of expertise developed through the MOOC with expertise through professional practice could lead to improved learning.
2. Help professional learners to reflect on the knowledge gained from the course and how it may be embedded into their work practice before the end of the course.
3. Support professional learners to continually monitor their learning to determine its ultimate value beyond their immediate learning experience.
4. Capitalize on the diversity of motivation, expectation, and prior knowledge and experience that is inherent within all MOOC cohorts.
5. Encourage professional learners to discuss ideas from the course with co-workers in their external professional network as well as with other learners on the course.
6. Utilize the existing knowledge and experience that professional learners bring to the learning context.

References

- Littlejohn, A., Falconer, I., & McGill, L. (2014). Open life-wide learning: A vision. In A. Littlejohn & C. Pegler (Eds.), *Reusing Open Resources*. New York: Routledge.
- 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.

Outputs

Each phase of the project produced associated outputs, mostly public.

Phase 1

This phase produced the following key outputs:

Literature review. This output defined a list of sub-processes of SRL, outlining (from the literature review) which of these can be encouraged and supported through course/environment design. The review underpinned the design of the instruments created by the study and is reflected in the papers produced to report the findings of the study.

MOOC design strategies. Analysis of MOOC Design Strategies led to the development of The **Design Team Questions tool**: an instrument to audit MOOC designs based on SRL sub-processes described by Zimmerman is available at <http://tinyurl.com/PL-MOOC-DTQ> (PDF).

Networked Learning Conference (NLC) paper. A short paper linking this study to our previous research on SRL in MOOCs has been accepted for the 9th [Networked Learning Conference](#) (Edinburgh, UK: April 2014). NLC is a key conference for showcasing MOOC research: Milligan, C., Littlejohn, A., & Ukadike, O. (2014). [Professional Learning in Massive Open Online Courses](#). In S. Bayne, C. Jones, M. de Laat, T. Ryberg, & C. Sinclair (Eds.) *Proceedings of the Ninth Networked Learning Conference* (pp. 368-371), Edinburgh, UK, 7-9 April, 2014. [[Pecha Kucha](#) presentation. NB Most of what was said is in the notes for each slide]. Open Access.

Phase 2

This phase led to the following key outputs:

Use Cases of learner behaviours. A set of use cases provide a narrative description of the different learner behaviour patterns observed and provides an insight into SRL behaviour patterns that will be of interest to learning scientists. The use cases collected led to the development of a series of design patterns described in an Open Access article written for eLearning papers: Littlejohn, A, and Milligan, C. (2015) [Designing MOOCs for Professional learners: tools and patterns to encourage self-regulated learning](#). *eLearning Papers*, 42, 38-45.

Conference presentation. Interim findings (specifically the results of the learner survey, and design strategies analysis) were presented and discussed with the MOOC Research community

PL-MOOC: PROFESSIONAL LEARNING THROUGH MASSIVE OPEN ONLINE COURSES

at the **MRI Conference**, Arlington TX, 5-6 December 2013. [MRI2013](#)

A descriptive analysis of the quantitative data collected is available

at https://figshare.com/articles/PL-MOOC_Data_Summaries/5999996 (PDF).

Phase 3

This phase led to the following key outputs:

Final report This report provides a summary of the progress and findings from the study as a whole to the funders and wider MOOC community. A public version of the final report is available [here](#).

MOOC design recommendations This document provides a concise set of recommendations for designing MOOCs for professional learning. The recommendations will be reviewed against the design of two KCL FutureLearn MOOCs. The primary audience for this output will be MOOC design teams and practitioners. MOOC design is still in its infancy, influenced more by previous experiences of delivering online learning than actual evidence collected in MOOC contexts. In contrast, these recommendations will be derived directly from empirical observation, integrated with the findings from our previous research and that of others. April 2014: [Recommendations](#)

Journal articles Three articles reporting this research have been accepted for publication.

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

Milligan, C., & Littlejohn, A., (2016) [How Health Professionals Regulate their Learning in Massive Open Online Courses](#) *The Internet and Higher Education* 31, 113-121

Milligan, C., & Littlejohn, A., (2017), [Why study a MOOC: the motives of students and professionals](#). *The International Review of Research in Open and Distance Learning*, 18(2), 92-102.

Two further articles used the same methodology to look at other MOOCs:

Littlejohn, A., Hood, N., Milligan, C., & Mustain, P. (2016) [Learning in MOOCs: motivations and self-regulated learning](#) *The Internet and Higher Education* 29, 40-48

Hood, N., Littlejohn, A., and Milligan, C., (2015) [Context counts: How Learners' Contexts influence learning in a MOOC](#). *Computers and Education* 91, 83-91

Professional Magazine Article A key goal of the project was to present its' findings through different outlets aimed at different audiences. This article in eLearning Papers provides a more readable summary of the work aimed at a practitioner audience?:

Littlejohn, A, and Milligan, C. (2015) [Designing MOOCs for Professional learners: tools and patterns to encourage self-regulated learning](#). *eLearning Papers*, 42, 38-45.

Instruments and datasets. The instruments used in the study has been made publicly available for others to use through figshare: http://figshare.com/authors/Colin_Milligan/100462. The 3 key instruments developed during the project are available now:

SRLMQ: an SRL profile tool adapted from existing validated instruments and tailored to assess SRL behavior in MOOCs. <http://tinyurl.com/PL-MOOC-SRLMQ>(PDF)

Design Team Questions: an instrument to audit MOOC designs based on SRL sub-processes described by Zimmerman. <http://tinyurl.com/PL-MOOC-DTQ>(.docx)

Semi-structured Interview Script exploring learner behavior in MOOCs again based on the SRL sub-processes described by Zimmerman. <http://tinyurl.com/PL-MOOC-Interview>(PDF)

Additional presentations of project ideas and findings.

Public Lecture: Technology-enhanced Professional Learning, Oxford Learning Institute, University of Oxford, UK, 28th November 2013.

Keynote (AL): Learning Through Technology, Scottish Government, Edinburgh, UK, April 2014.

An analysis of the qualitative data exploring SRL behaviours was presented by Allison Littlejohn at the EDEN Research Workshop in Oxford, October 2014:

The work was presented at EARLI 2015 Conference. Limassol, Cyprus, 25-29 August, 2015 (www.earli2015.org/). Milligan, C. & Littlejohn, A (2015) Self-regulated learning behaviour and MOOC participation - [Extended Abstract](#) - [Slides with notes](#)

The synthesis of the PL-MOOC and OSRL studies was presented at the **4th European Stakeholders Summit**, Graz, 22-24 February, 2016: Milligan, C., Littlejohn, A. Hood, N. (2016) [Learning in](#)

PL-MOOC: PROFESSIONAL LEARNING THROUGH MASSIVE OPEN ONLINE COURSES

[MOOCs. A Comparison Study](#). In M. Khalil, M. Ebner, M. Kopp A. Lorenz and M. Kalz (Eds.) *Proceedings of the European Stakeholders Summit on experiences and best practices in and around MOOCs (eMOOCS 2016)*, Graz, 22-24 February, 2016 (pp. 15-26). [Slides and notes](#).

Team

The project was led and co-ordinated by the Caledonian Academy within [Glasgow Caledonian University](#), liaising with our partners at [Harvard University](#).

The core project team (undertaking the data collection and analysis) was:

[Professor Allison Littlejohn](#) (PhD), Director of the Caledonian Academy and Chair of Learning Technology at Glasgow Caledonian University.

Allison has been Principal Investigator or Senior Scientist on over 50 research projects and has published around 150 academic articles, including three books on Technology-Enhanced Learning. Allison is a Fellow and former Scholar of the Higher Education Academy and has received international fellowships from ASCILITE (Australasia), and the Churchill Trust (UK).

[Dr Colin Milligan](#), a Research Fellow with the Caledonian Academy at Glasgow Caledonian University.

His research focuses on professionals and the personal learning networks they construct to support their learning. At the Caledonian Academy, Colin has been involved in studies exploring learning practices and behaviours in knowledge-intensive organisations and connectivist MOOCs.

[Lou McGill](#), an independent consultant who conducted the interviews.

Throughout the project we received input and course liaison assistance from the course development team at [Harvard Medical School](#). Our contact at Harvard was:

[Obiageli Ukadike](#), an Education Program Developer with Harvard Catalyst in The Harvard Clinical and

Contact

For more information about the project, please contact:

Dr Colin Milligan

Research Fellow, Caledonian Academy, Glasgow Caledonian University, Glasgow, Scotland

email: colin.milligan@gcu.ac.uk or follow [@cdmilligan](#)

Bibliography

The study drew on the following literature sources.

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.

Beckett, D. & Hager, P. J.(2002), *Life, work and learning : practice in postmodernity*. London, Routledge.

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.

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.

Dall'Alba, G. (2009). *Learning to be professionals. Innovation and change in professional education* (Vol. 4). Dordrecht: Springer.

Daniel, J. (2012). Making Sense of MOOCs: Musings in a Maze of Myth, Paradox and Possibility. *Journal of Interactive Media In Education*, 3(0). Retrieved August 8, 2013, from <http://www-jime.open.ac.uk/jime/article/view/2012-18>

Downes, S. (2009). *Connectivist dynamics in communities*. Retrieved 26 February 2013 from <http://halfanhour.blogspot.co.uk/2009/02/connectivist-dynamics-in-communities.html>

Engeström, R. (2009). Who Is Acting in an Activity System? In A. Sannino, H. Daniels, & K. D. Gutiérrez (Eds.), *Learning and Expanding with Activity Theory*, pp. 257-273. New York, NY: Cambridge University Press.

Eraut, M. (2000). Non-formal learning and tacit knowledge in professional work. *British Journal*

PL-MOOC: PROFESSIONAL LEARNING THROUGH MASSIVE OPEN ONLINE COURSES

- of *Educational Psychology*, 70, 113-136. Eraut, M. (2007) Learning from other people in the workplace, *Oxford Review of Education*, 33: 4, 403-422.
- 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.
- 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 Distance Learning*, 12 (3), 19-38.
- Kop, R., & Fournier, H. (2011). New dimensions to self-directed learning in an open networked learning environment. *International J. of Self-Directed Learning*, 7 (2), 1-18.
- 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, Falconer and McGill (2014) 'Open life-wide learning: a vision' In Littlejohn, A. and Pegler, C. (Eds) *Reusing Open Resources*, Routledge, NY
- Littlejohn, A., Milligan, C., & Margaryan, A. (2011). Collective learning in the workplace: Important knowledge sharing behaviours. *International Journal of Advanced Corporate Learning*, 4 (4) 26-31.
- Littlejohn, A., & Margaryan, A. (2013). Technology Enhanced Professional Learning: mapping out a new domain. In Littlejohn, A., & Margaryan, A. (Eds.). *Technology-enhanced professional learning: Processes, practices and tools*. pp1-13. London, Routledge.
- Liyanagunawardena, T. R., Adams, A. A., & Williams, S.A. (2013). MOOCs: A systematic study of the published literature 2008-2012, *International Review of Research in Open and Distance Learning*, 14 (3) 202-227.
- Milligan, C. Littlejohn, A., & Margaryan, A. (2013). [Patterns of Engagement in Connectivist MOOCs](#). *Journal of Online Learning & Teaching* 9 (2) 149-159.
- Milligan, C., Margaryan, A., & Littlejohn, A. (2013). [Goal-setting behaviour in massive open online courses](#), *EARLI 2013 Conference*. Munich Germany, 27-31 August, 2013.
- Pintrich, P. R., Smith, D., García, T., & McKeachie, W. (1991). *A manual for the use of the Motivated Strategies for Learning Questionnaire (MSLQ)*. Ann Arbor. Michigan.
- Schunk, D. H. (2001). Self-regulation through goal-setting, *ERIC Digest*. Retrieved August 8, 2013, from <http://www.counseling.org/Resources/Library/ERIC%20Digests/2001-08.pdf>
- 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*. (forthcoming) 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.
- Sitzmann, T., & Ely, K. (2011). A meta-analysis of self-regulated learning in work-related training and educational attainment: What we know and where we need to go. *Psychological Bulletin*, 137(3), 421–442.
- Tynjälä, P. (2008). Perspectives into learning in the workplace. *Educational Research Review*, 3, 130-154.
- Tynjälä, P. & Gijbels, D. (2012) *Changing World: Changing Pedagogy*. In P. Tynjälä, Stenström, M-L and Saarnivaara, M. (eds.), *Transitions and Transformations in Learning and Education*. pp 205-222. Dordrecht, Springer.
- 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*.
- 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. IGI Global: Hershey, PA,
- 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.