

Institution: Durham University
Unit of Assessment: UoA 25, Education
Title: Changing educational practice through 'Threshold Concepts' [ICS1]
<p>1. Summary of the impact</p> <p>A Threshold Concept is a new way of thinking, where a specific element of a curriculum that is difficult for students to understand, such as 'opportunity cost' in Economics or 'stress transformation' in Engineering, irreversibly restructures the learner's understanding once it is grasped. Consequently, by identifying Threshold Concepts, and then by adapting teaching practice and the focus of assessment, educators can significantly benefit students' progress. Durham's conceptualisation of Threshold Concepts has had a transformative effect on educational practice, curriculum design and assessment, particularly in Higher Education (HE), but also on schools, on educational policy as well as on conceptions of work-based learning and games design in international companies such as Nokia. The concept and its application have impacted on professional practice in HE institutions in at least 30 countries. In the UK, Threshold Concepts have been adopted by a number of high profile educational agencies and organisations and are now embedded in the policy and practice of many institutions.</p>
<p>2. Underpinning research</p> <p>A Threshold Concept can be thought of as a student finding a key to a doorway which opens up a new and previously inaccessible way of thinking about something that they are learning. So, for a learner, a Threshold Concept represents a transformation in how they interpret or understand knowledge, such as the idea of 'equilibrium' in ecology. Prior to mastering the concept the student would have been unable to make progress in their learning. A learner's transformation may be sudden or protracted over a considerable period of time, so a learner may find the transition challenging. Threshold Concepts were first introduced by Professor Jan Meyer in 2002. The idea was first formally recognized in a Progress Report (p. 3) of a research project called 'Enhancing Teaching-Learning Environments in Undergraduate Courses' (ETL1) funded through the Teaching and Learning Research Programme (TLRP) by the ESRC from 2001 to 2004. Meyer's notion of a Threshold Concept was introduced into project discussions on learning outcomes as a key idea for differentiating between core learning outcomes that represent 'seeing things in a new way' and those that do not. Early verification of its value resulted from research data collected by the project's Economics team (led by Durham's Nicola Reimann) during 2001-2004.</p> <p>Threshold Concepts were first widely publicised in what is now considered a seminal paper by Meyer and Land [R1] which defines the initial conceptions of the pedagogic characteristics of Threshold Concepts. This work therefore sets the foundations of a framework from which pedagogical experts across disciplines can identify Threshold Concepts within their specific areas. Subsequently, the idea was further enhanced by identifying the analytical detail of a Threshold Concept framework and enriching the framework with specific educational examples collected by the team [R2; R3].</p> <p>Meyer and Land (who has collaborated with Meyer since 2002 and joined Durham in 2012), with other colleagues [R4-5], have since taken Threshold Concepts across disciplines and continents and have further developed and applied the implications of the theory to assessment, curriculum design and interdisciplinarity [R5]. Threshold Concepts therefore serve as a helpful diagnostic in alerting tutors to areas of the curriculum where students are likely to experience conceptual difficulty. In this regard the research has provided:</p> <ul style="list-style-type: none"> - lecturers, teachers and other educators with a conceptual understanding of why students find some areas of their curriculum troublesome; - a framework by which these Threshold Concepts can be identified and documented that is applicable across a range of disciplines; - an instrument with which groups of individuals can articulate ways of improving the practices of learning, teaching and assessment. <p>Threshold Concepts as an innovation have significantly changed the nature of curriculum design and assessment, and have enhanced effective practice, with direct impact on teaching practices and on students' learning.</p>

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Professor JHF 'Erik' Meyer was appointed to Durham University in December 1999 and was an Associate Director of the ETL 1 project. He retired in July 2011. Dr Nicola Reimann was a Research Fellow in the School of Education between February 2002 and June 2005. Professor Ray Land was appointed to the School of Education in January 2012.

3. References to the research

- R1. Meyer, J.H.F. and Land, R. (2003). 'Threshold concepts and troublesome knowledge: Linkages to ways of thinking and practising within the disciplines', in Rust, C. (ed.), *Improving Student Learning: Improving Student Learning Theory and Practice – Ten Years On*. Oxford: Oxford Centre for Staff and Learning Development.
This highly cited chapter defines characteristics of threshold concepts and establishes Meyer's role in developing the concept. It was republished from the original Occasional Report (4, May 2003) from ETL1.
- R2. Meyer, J.H.F. and Land, R. (2005) 'Threshold Concepts and Troublesome Knowledge (2) – Epistemological Considerations and a Conceptual Framework for Teaching and Learning' *Higher Education*, 49: 373–388. DOI 10.1007/s10734-004-6779-5.
This article in the leading peer-reviewed journal on higher education was submitted as one of Meyer's outputs in RAE 2008.
- R3. Land R., Cousin G., Meyer, J.H.F. and Davies, P. (2005) Threshold Concepts and Troublesome Knowledge (3): Implications for Course Design and Evaluation in *Improving Student Learning – Equality and Diversity*. C.Rust (Ed), OCSLD, Oxford.
This is the third of the key theoretical papers defining and illustrating 'threshold concepts' and their value in conceptualising student learning. The following two chapters further define and expand the initial conceptualisation, exploring variation and assessment.
- R4. Meyer, J.H.F. and Land, R. (2008) Threshold Concepts and Troublesome Knowledge (4): Issues of Variation and Variability in R. Land, J.H.F. Meyer, & J. Smith (Eds) *Threshold Concepts within the Disciplines*. Rotterdam and Taipei: Sense Publishing.
- R5. Land, R. & Meyer, J.H.F. (2010) Threshold Concepts and Troublesome Knowledge (5): Dynamics of Assessment in J.H.F Meyer, R. Land & C. Baillie (2010) *Threshold Concepts and Transformational Learning*. Rotterdam, Boston and Taipei: Sense Publishing.

4. Details of the impact

Changing practice in HE

Our case for the impact of Threshold Concepts is the change in the behaviours and practice of practitioners in higher education and other teaching contexts resulting from an understanding of the idea. This has produced a greater emphasis on the student learning experience during curriculum design and assessment. It has also created a new clarity of focus around the areas of a curriculum that students tend to find most challenging. Overall, the impact of Meyer's 'Threshold Concepts' as a pedagogic tool to support changes in practice has been demonstrated on individuals, on groups and communities of HE practitioners across disciplines and around the world. In addition, it has spread beyond these constituencies to other educational contexts in schools, FE and policy-making and has also transferred to industry through 'serious games' design for staff development.

The catalytic effect of the idea of Threshold Concepts was almost immediate, but between 2008 and 2013 this has extended across subjects and disciplines to 32 countries around the world [S1]. The identification, application or practices to support teaching through Threshold Concepts have been explored and published across subjects representing each of the 19 HEFCE JACS codes [S1]. More than 500 disciplinary case studies, reports or scholarly practice articles have been published within REF period (with a further 400 which focused specifically on Education). These document how Threshold Concepts are being used by lecturers and teachers to examine their current practice from a student's perspective and to change their future teaching and assessment in order to enhance their students' learning [S1].

Impact on curriculum design courses and funding

The benefit of considering Threshold Concepts within curriculum design has also been widely recognised by numerous educational agencies within the UK. For instance:

- the HE Academy has facilitated over 40 disciplinary practice-based workshops on Threshold Concepts [S1];
- in September 2008 JISC (formerly the Joint Information Services Council) produced an

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- ‘infokit’ using work on Threshold Concepts to support embedding e-portfolios in HE [S2];
- the Staff and Educational Development Association (SEDA) has produced materials for recommended inclusion in ‘PGCert in HE’ courses; Threshold Concepts are widely used in university teaching qualifications including Bath, LSE, Middlesex & Salford universities [S1].

This impact is significant and in some cases dramatic, such as in Georgetown University in the US where they state that Threshold Concepts “shape the undergraduate experience” of writing in the disciplines [S3]. There has also been world-wide acknowledgement of the strategic benefit of Threshold Concepts to improve teaching. For instance, various national government funding organisations have released significant competitive and practiced-based teaching and learning funding to examine their impact on specific curricular, including:

- \$NZ 200,000 for ‘re-envisioning tertiary teaching’ (2012-14) by the NZ Teaching and Learning Research Initiative to document changes in lecturers’ threshold-concept-informed teaching and supervision and the impact of a threshold concept-informed curriculum, pedagogy, and assessment on student learning in electronics engineering, doctoral research and writing, and management communication [S4];
- \$AUS 1,014,400 for projects considering approaches adapting Threshold Concepts to engineering, mechanics, and biology for curriculum renewal by the Australian Learning and Teaching Council [S1: section #projects];
- \$US 149,998 for Threshold Concepts in sustainability and environmental engineering by the US National Science Foundation (NSF) [S5].

Impact on practitioners’ reflective practice

Threshold Concepts have led to significant reflective practitioner engagement in reviewing existing pedagogical strategies. This is evidenced in extensive social media interest. There is a Wikipedia entry (average 500 views per month), a wiki (Edutech with 2956 accesses), a Facebook account and a JISC email-list [S1]. Reflections on changes in practice can be found in teachers’ on-line blogs and Facebook contributions [e.g. S6]. Projects, workshops and other researchers’ outcomes have resulted in clearly identified changes in practice. For instance:

- a special issue of the Journal of Faculty Development [S7] documents changes in practices in faculty development programs in the USA and provides evidence for Threshold Concepts resulting in student learning that the authors state “transforms faculty members’ conceptions of teaching”;
- the Economics Network’s Handbook for Economics Lecturers has a section embedding Threshold Concepts in undergraduate teaching [S8].

The considerable funding devoted to this area in Australia has created many such case studies, including:

- the Australian Council of Engineering Deans supported a national workshop series on Threshold Concepts, one of the outcomes being the UWA Faculty designing a new curriculum for engineering courses introduced in 2012;
- the University of Queensland’s Occupational Therapy Department who identified five Threshold Concepts, designed their curricula around them and flagged their importance to students with details in their Student Guide.

Institutions and professional bodies have also recognised the impact of Threshold Concepts through a number of personal awards made to individuals embedding Threshold Concepts in their work of their institutions. These include:

- a British International Studies Association (BISA) / Higher Education Academy (HEA) Teaching Award for Excellence in Teaching International Studies (2008-2009) for work on Threshold Concepts through Enactive Learning (awarded through C-SAP, the HEA’s former Subject Network for Sociology, Anthropology and Politics) [S1: section #awards];
- an Aberystwyth University Teaching Excellence Award (2009-2010) for using Threshold Concepts in conjunction with differentiation as a teaching technique [S1: section #awards].

Wider impact in education

Uptake of Threshold Concepts as a means to support curriculum planning and assessment is also evident in FE and Foundation courses [S1: section #found] and in schools [S9] where, for example, the ideas have been adopted to support an exploration of how Threshold Concepts in secondary school geography might inform development of students’ capabilities in terms of ‘thinking geographically’. Similar work using Threshold Concepts with secondary school Geography

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teachers has also been undertaken in Korea [S1: section #SK].

Impact on industry

There is also evidence of impact on industry where companies like Nokia, Atos and Virtech have used Threshold Concepts in 'serious games' design for the training of staff. This was through a €9.4 million EU collaborative project which developed the 'TARGET' framework (Transformative, Adaptive, Responsive and enGaging Environment) and which embedded Threshold Concepts as knowledge gateways that transform a person's understanding of a knowledge domain to learn professional skills in areas that are important to them, their peers, their employers and society. The project involved six European technology companies with academic partners in five different countries developing a framework for staff development using virtual learning environments to support rapid competence development [S10].

4. Sources to corroborate the impact

- S1. Threshold Concepts: Undergraduate Teaching, Postgraduate Training and Professional Development: A short introduction and bibliography.
<http://www.ee.ucl.ac.uk/~mflanaga/thresholds.html> This is a key reference source, maintained independently by a member of staff at University College London. It lists several hundred websites and publications on Threshold Concepts which provide evidence of impact on the practice of teachers and academics. It also contains links to examples of curriculum development and institutional embedding of Threshold Concepts as well as impact on assessment practices, along with video and Powerpoint presentations. It has an A-Z Subject Index and A-Z Author Index, theses and dissertations on the application of Threshold Concepts to improve teaching and learning and documenting impact on practice. Also listed are Threshold Concepts conferences, teaching awards and project awards, a list of publications by country (31 countries) and links to other Threshold Concepts websites, links to social media such as the Facebook Threshold Concepts site, the Doceo site supporting work in FE, together with a statistical analysis.
- S2. JISC Infokit <http://www.jiscinfonet.ac.uk/infokits/e-portfolios/considerations/threshold-concepts/>.
- S3. <http://assessment.aas.duke.edu/documents/ThresholdsofWritingProjectFinal2011-FinalReport.pdf> ; see also an educator and administrator's blog from Georgetown University <https://blogs.commonstudies.org/bassr/category/threshold-concepts/>.
- S4. New Zealand' Teaching and Learning Research Initiative: <http://www.tlri.org.nz/tlri-research/research-progress/post-school-sector/re-envisioning-tertiary-teaching-and-learning>
- S5. The USA's National Science Foundation (NSF) awards: http://www.nsf.gov/awardsearch/showAward?AWD_ID=0935174 .
- S6. Threshold Concepts Facebook group: <https://www.facebook.com/groups/265003370204301/> .
- S7. Journal of Faculty Development Special Issue <http://store.newforums.com/Threshold-Concepts-in-Educational-Development-JFD263.htm> .
- S8. Davies, P. and Mangan, J (2011) *The Economics Network Handbook for Economics Lecturers: Threshold Concepts in Economics*
<http://www.economicsnetwork.ac.uk/handbook/threshold-concepts> .
- S9. Threshold concepts in Secondary School Geography
http://www.geography.org.uk/download/GA_Conf11Slinger.pdf .
- S10. €9.4 million EU Cordis project and partners
http://cordis.europa.eu/projects/rcn/89491_en.html .
The linked TARGET website (<http://www.reachyourtarget.org>) has a number of references to Threshold Concepts and their use in the project framework e.g.:
http://www.reachyourtarget.org/attachments/article/24/TARGET_Brochure_ENG_updated.pdf .