

Researching Threshold Concepts: Ways of Thinking and Practising in Geoscience

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What are Threshold Concepts?

Threshold Concepts are those key ideas in a discipline that offer the learner a gateway to new ways of thinking (Meyer & Land, 2003). Meyer and Land suggest that Threshold Concepts can be characterised in the following ways:

- **Transformative:** they will change the way students perceive and practice in their discipline;
- **Irreversible:** once grasped, it is unlikely that a Threshold Concept will be forgotten or 'unlearned'; they allow connections to be made between isolated pieces of knowledge;
- **Integrative:** they can help define the boundaries of a subject area or discipline;
- **Bounded:** they can help define the boundaries of a subject area or discipline;
- **Troublesome:** Threshold Concepts may be conceptually challenging to students.

Understanding a Threshold Concept in a particular discipline can "lead to a new and previously inaccessible way of thinking about something". Hence Threshold Concepts are not merely the core components of a discipline, but are ideas and skills which transition the learner from novice to expert and transform their way of looking at the world.



Our Research Project

The authors have recently received a small grant to begin exploring this area. Initial research will include:

- A literature review to identify work conducted on key concepts and student learning in geoscience;
- Research design, interviews and transcription: ~15 face-to-face interviews with students, academics and, where possible, graduates;
- Data analysis & write-up: a grounded theory approach will be taken to code and analyse the interview data.

Ways of thinking and practising are often "taken for granted by practitioners in a subject and therefore rarely made explicit" to students.



Researching Threshold Concepts

In many cases, Threshold Concepts are likely to be embodied in the work and ways of knowing by experts to such an extent that they may not be overtly introduced to students. A variety of research methodologies will need to be employed in order to uncover Threshold Concepts, such as:

- Interviews (open-ended questions; specific tasks)
 - Experts (from academia & industry)
 - Novices (general public, freshmen)
 - Geoscience majors (sophomore, junior & senior)
 - Graduate students
- Longitudinal studies
- Re-analysis / integration of other relevant research (e.g. Geoscience Concept Inventory)
- Review of literature on core geoscience concepts
- National and international collaboration / comparison

What do we Want to Know About Threshold Concepts?

- Do threshold concepts exist in the geosciences? If so, what are they?
- Threshold skills and/or Threshold Concepts?
- What are the roles of a) experts and b) learning environments in helping students to master Threshold Concepts?
- How do we know when they've 'got it'?
- How do students experience the transformation that comes with mastery of Threshold Concepts?

How can the findings be applied?

- **Curriculum development:** identifying the core concepts / easing the 'stuffed curriculum'
- **Faculty development:** help faculty better articulate their own skills and support their students' learning
- **Cataloguing of teaching and learning resources:** identifying the key areas where students have difficulty
- **Public understanding and outreach:** better understanding of the novice perception of geoscience leading to better communication with them.



Get Involved!

The study of Threshold Concepts has implications for learning, teaching and outreach of the geosciences. It is important, therefore, that we consult / collaborate widely with other practitioners and researchers. Our pilot research project will only involve a small number of participants; if successful, however we are keen to extend it both nationally and internationally.

International Collaboration

Following discussions at the 2nd International Threshold Concepts conference in Canada, June 2008, a group of geoscientists have been identified who are interested in taking this research further. This includes colleagues from Canada, Ireland, South Africa, UK and USA.

If you would like to know more or get involved you can:

- Join our mailing list;
- Keep up-to-date with our activities via our blog: <http://geo-thresholdconcepts.blogspot.com>
- Contact us for more information: helen@helenkingconsultancy.co.uk
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